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Minnesota Experiment Station

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Bulletin 21

I. Sugar beets. II. Sorghum.

D. N. Harper.

UNIVERSITY OF MINNESOTA.

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# Agricultural Experiment Station.

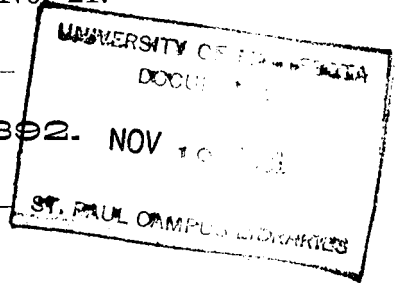
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BULLETIN No. 21.

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JUNE, 1892. NOV 10 1911


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I.—SUGAR BEETS. II.—SORGHUM.

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ST. ANTHONY PARK, RAMSEY CO.,  
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## SUGAR BEETS.

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D. N. HARPER.

The production of Beet Sugar has been attempted in this country many times and in various places. Within the past few years it has proven successful in California and is now being carried on also in Utah and Nebraska.

Since 1830 it has been a very profitable industry in Germany, Austria and France, and more recently in various other European countries. While the natural conditions in various parts of this country are more favorable to the production of beets and the manufacture of sugar from the beets than they are in any of the European countries the industry cannot yet be said to be fairly established here.

During the past four years experiments have been made by the Experiment Station as to the adaptability of the climate and other conditions of Minnesota to the production of good beets. Each year the results have been reasonably satisfactory. The experiments of 1890 were so encouraging and promised so much that it was deemed advisable to make very extensive tests during the following year.

Seed was imported in considerable quantity from Germany and distributed, with the kindness of the railroads, free, to about twenty-five hundred farmers in all parts of the state, together with instructions for the planting, cultivation, and harvesting of the beets. The railroad companies very kindly permitted free transportation of samples of the crop from all farmers who would send the same in, and the State Agricultural Society provided premiums for the best fifteen samples.

Owing to the disturbed conditions of the Experiment Station, the delivery of the seed was very much delayed and a large part of it sent out failed to reach the farmers in time for planting. There were, however, a great many

who returned beets for analysis, and a statement of the results is given in the following pages.

The work upon the State farm was arranged to show the cost of production, the yield per acre, the quality of the beets as affected by cultivation, and to test the use of various machines in the planting and cultivation of the beets. As it was to be expected, the beets grown upon the farm were much better than those produced anywhere else.

In the last sugar beet bulletin published, it was stated that the establishment of the beet sugar industry in this country depends chiefly and primarily upon the farmer. The results of last year gave renewed evidence of this.

Upon the State Farm the results as to the quality of the beets were all that could be expected, and show that we possess the conditions necessary for the production of the best beets for the purpose of sugar manufacture. While the results elsewhere in the state vary greatly, this variation is chiefly due to the difference in cultivation given.

Many farmers had the mistaken idea that it was necessary to have highly manured lands in order to grow good beets. This, it was pointed out in the last bulletin, is just what we must guard against. The best lands in our state for the raising of beets are those lands which have been cropped for a considerable number of years to grain, and are what may be termed our "worn out" lands. By careful production of beets these can be restored to their native fertility.

The detailed results of analyses are as follows:

All the analyses of sugar beets recorded in the following tables were made by Mr. John Thompson, assistant in the chemical laboratory at the station.

ANOKA COUNTY.

Town	Name of Party.	Variety	Date Analyzed	Sugar Per Cent.....	Purity Per Cent.....	Sugar Per Ton.....	Ave. Weight of Beets. Oz.
Anoka.....	John Hunter.....	Vilmorin White Improved.....	October 26	15.5	64.9	310	10
".....	".....	".....	November 6	14.6	77.6	292	16
".....	C. E. Merrill.....	".....	November 12	10.5	77.2	210	25

BECKER COUNTY,

Frazee City.....	J. M. Schlehr.....	.....	November 4	11.9	71.3	238	18
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BLUE EARTH COUNTY.

Mankato.....	W. R. Veigel.....	.....	October 23	10.9	81.4	218	53
do.....	J. S. Darr.....	.....	do do	11.0	71.4	220	32
do.....	Frank Holste.....	.....	do do	11.6	77.3	232	32
do.....	M. J. King.....	.....	do do	9.65	63.8	193	34
do.....	L. A. Foster.....	.....	do do	10.2	70.3	204	29
do.....	Jno. Danber.....	.....	do do	8.6	66.7	172	32
do.....	J. J. Stephens.....	.....	do do	9.3	67.9	186	35
do.....	Wm. Phillips.....	.....	do do	10.5	74.1	210	40
do.....	M. Sherer.....	.....	do do	9.8	69.0	196	29
do.....	Asa McCallon.....	.....	do do	8.7	70.0	174	32
do.....	J. M. Davis.....	.....	do do	10.4	69.8	208	23
do.....	David E. Evans.....	.....	do 24	7.5	65.2	150	75
do.....	Thos. Y. Davis.....	.....	do do	10.8	72.0	216	37
do.....	J. O. Smith.....	.....	do do	12.9	78.7	258	22

BLUE EARTH (Continued.)

Town.	Name of Party.	Variety.	Date Analyzed	Sugar per cent.	Purity per cent.	Sugar per Ton.	Avg. weight of Beets, Oz.
Mankato	Aug. Dusterkoff.		October 24	10.5	71.9	210	32
do.	Henry Knoff.		November 7	11.6	73.9	232	40
do.	M. Uhlman		do do	10.3	72.6	206	31
do.	M. J. King		do do	12.1	75.7	242	39
do.	G. Darr	French Very Rich	October 14	11.95	76.9	239	
do.	J. J. Stevens		November 7	11.5	73.7	230	36
do.	Norman Beebe		do do	11.8	76.6	236	32
do.	Ferdinand Walzen		October 23	9.6	66.2	192	26
do.	Wm. Mason		do do	9.1	69.4	182	35
do.	T. A. Becker		do do	10.8	71.1	216	32
do.	C. A. Goodrich		do do	13.6	82.9	272	31
do.	Mike Uhlman		do do	10.1	71.1	202	56
do.	D. R. Brooks		do do	11.6	72.0	232	32
do.	Wm. Hemecke		do do	12.4	76.1	248	25
do.	M. Hynson		do do	12.5	79.1	250	21
do.	Geo. McKee		do do	10.5	75.6	210	32
do.	George Arnold		do do	8.1	62.8	162	48
do.	Chas. Farm		do do	10.9	74.7	218	36
do.	M. J. King	French Very Rich	November 7	12.2	76.2	244	24
do.	Wm. Heinecke		do do	14.5	81.0	290	24
do.	W. R. Veigel		do do	13.8	75.4	276	25
do.	Frank Halstad		do 9	14.0	74.0	280	40
do.	J. M. Davis		do do	14.5	76.3	290	18
do.	L. S. Foster		do do	14.1	78.4	282	21
do.	Alex Roach		do do	12.8	81.5	256	33
do.	C. H. Goodrich	Vilmorin White Improved	do do	12.0	75.5	240	40
do.	G. Darr		do do	13.2	79.5	264	8
South Bend	Chris. Hammel		October 23	11.8	76.6	236	16
	J. A. Jones		November 17	11.3	70.0	226	26

### BROWN COUNTY.

New Ulm	A. Manderfield		November 3	13.6	75.6	272	18
do do	H. L. Runk		do 12	16.4	77.0	328	24
do do	H. Miller		do do	11.7	69.0	234	12
do do	Thos. Klippstein		do do	16.4	79.2	328	19
do do	Jas. Schuller		do do	14.5	77.5	290	16
do do	Jno. Hansenstien	White Improved	do do	15.0	79.8	300	20
do do	Andrew Becker	Dippe's Kleinwanzleben	October 21	14.3	80.8	286	13
Springfield	Dan'l Burns		November 3	11.1	71.2	222	12
do do	S. P. Bently	Dippe's Imperial	do do	13.2	77.6	264	20

### CARLTON COUNTY.

Mahtowa	John Stkinson		October 5	13.54	84.4	270.8	
do do	M. Paderson		do 7	10.86	80.4	217.2	
do do	Chas. Christenson		do 14	12.9	79.7	258	
Moose Lake	Frank Ekman		do 24	11.1	76.3	222	27
do do	Peter Force		November 3	12.2	77.6	264	21
do do	L. S. Gotchier		October 8	13.05	81.2	261	20
do do	Chris. Rahlf		do 10	10.93	75.7	218.6	
Barnum	J. H. Kahring		do 24	14.0	83.3	280	18
do do	J. Murphy	Dippe's Imperial	do do	14.8	83.1	296	18
do do	Walt & Gardahl		do do	11.6	78.9	232	18

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### CARVER COUNTY.

Carver	W. G. Japs	Vilmorin White Improved	October 26	13.7	80.1	274	24
do do	H. Muhlberg	Vilmorin White Improved	do 24	6.5	60.2	130	25
do do	C. Jobs		November 7	14.6	80.7	292	23
Norwood	Aug. Hoeffken		October 26	12.15	76.2	222	18

### CH SAGO COUNTY.

Rush City	John Briet		November 3	13.2	73.7	264	10
do do	Martell Johnson		do do	13.1	77.5	262	20
do do	Fred Marty		do do	11.5	75.7	230	31
do do	Napoleon Young		do do	12.2	75.3	244	27



CHISAGO COUNTY (Continued).

Town	Name of Party	Variety	Date Analyzed	Sugar per cent.....	Purity per cent.....	Sugar per Ton.....	Avg. weight of beets Oz.
Rush City.....	John Berg.....		October 24	13.9	81.3	278	36
Harris.....	L. J. Stark.....		do 17	12.55	77.8	251	49
do .....	Jno. Jarchow.....		November 3	14.0	79.1	280	20
North Branch.....	Jno. Sjohnh.....		October 31	13.9	88.3	278	18
South Branch.....	A. Rice.....		do 24	12.0	77.9	240	7
Centre City.....	J. H. Magry.....		do 7	13.23	80.0	264.6	
do do .....	Chas. Andrews.....		do 15	13.4	85.1	268	
Lindstrom.....	A. Wallmark.....		November 3	13.6	81.9	272	20
Taylor's Falls.....	Alais Aydt.....		October 14	12.25	81.5	245	
do do .....	John Peterson.....		do 24	12.25	76.8	245	11
Pine City.....	Lambert Bros.....		November 3	13.2	73.7	264	19
Stacy.....	Fred Lendt.....		October 14	12.6	81.8	252	
do .....	Jessie Brom.....		do 3	13.33	88.7	267	
Stacy.....	Harry Lendt.....		do 9	13.0	81.8	278	
Stacy.....	John Ekstrom.....		do 24	13.3	83.1	266	12
Chisago City.....	Aug. Lofgren.....		do do	14.3	88.9	286	23
do do .....			do do	13.8	81.2	276	9

CLAY COUNTY.

Sabin.....	Geo. Fredericks.....	Dippe's Vilmorin Improved..	October 15	12.57	78.8	251.4	
do .....	G. K. Rozel.....		do 24	14.9	88.7	298	20
Georgetown.....	Jacob Wamback.....		do 27	10.2	73.1	204	17
Muscoda.....	T. B. C. Evans.....	Dippe's Vilmorin.....	do 21	11.85	77.8	237	18
Morehead.....	P. Eastland.....		November 7	12.2	76.2	244	24
Kragnes... ..	Chas. Brendemuehl.....		do 7	10.2	68.0	204	58

CROW WING COUNTY.

Brainerd.....	Geo. Kirtland.....	Kleinwanzleben Elite.....	December 1	17.1	88.6	342	24
Brainerd.....	do do .....	Zuckerreichste.....	do do	18	92.8	360	17

### COTTONWOOD COUNTY.

Windom.....	S. Huntington.....		October 15	10.0	72.5	200	
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### DAKOTA COUNTY.

Randolph.....	H. Matz.....		October 27	15.2	88.9	304	18
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### DOUGLAS COUNTY.

Alexandria.....	Moses Robinson.....	Dippe's Vilmorin Improved....	November 3	14.4	80.9	288	16
do .....	John Donner.....	Dippe's Vilmorin.....	do do	10.9	73.7	218	16
do .....	Jas. F. Heibel.....		October 24	14.0	80.0	280	8
Osakis.....	Wm. McCartney.....		do 8	10.64	78.5	212.8	
Evansville.....	R. Amonson.....		do 26	10.6	73.6	212	29
do .....	John McForlane.....	Dippe's Vilmorin Improved....	do 24	11.4	75.0	228	32

### FAIRBAULT COUNTY.

Wells.....	Jno. Penny.....	Vilmorin White Improved.....	October 10	12.0	75.0	240	24
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### FREEBORN COUNTY.

Hartland.....	Jas. Lonergan.....		October 26	11.5	77.8	230	
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### GOODHUE COUNTY.

White Rock.....	W. A. Westerson.....	Dippe's Imperial.....	November 7	13.6	79.1	272	31
Hay Creek.....	A. Burkhard.....	German.....	do 20	13.5	69.7	270	34
do do .....	A. Burkhard.....	Little Wang.....	do do	14.3	77.3	286	24
do do .....		French.....	do do	15.0	83.3	300	16
Goodhue.....	Rev. I. Finney.....	Vilmorin White Improved.....	December 19	17.8	83.6	356	18

GOODHUE COUNTY (Continued).

Town	Name of Party	Variety	Date Analyzed	Sugar per cent.	Purity per Cent.	Sugar per Ton.	Avg. weight of bds. Oz.
Red Wing	W. Hayman	Dippe's Kleinwanzleben Elite	October 17	12.1	77.6	242	19
do	J. F. Porter	do do do	November 7	14.5	83.3	290	15
do	J. F. Porter	Dippe's Vilmorin Improved	do do	16.2	85.9	324	14
do	J. F. Porter	French Vilmorin Improved	do do	16.7	85.8	334	14
do	Wm. Danforth		October 27	12.0	77.9	240	25
do	C. A. Sergeant		do 26	13.6	85.0	322	9
do	Chas. Welt	Dippe's Kleinwanzleben	do 31	13.6	78.8	272	17
do	Joshua Allyn	Vilmorin White Improved	November 7	11.5	72.8	230	26
do	do do	do do do	do do	13.2	73.9	262	36
do	E. T. Gove	do do do	December 1	16.1	82.6	322	16
do	Fred Walker	do do do	do do	15.4	75.1	308	16
Zumbrota	J. F. Mitchell		October 5	10.1	66.6	202	18
do	{ A. K. Pengilly		do 31	14.1	88.7	282	16
do	{ Post office Mazeppa		do 31	14.0	80.5	280	16
do	{ Wabasha Co.		do 31	11.9	75.8	238	29.5
do	G. M. Matcher		November 12	12.8	72.3	256	35
Dennison	H. M. Slee		October 17	16.2	86.6	324	7
Red Wing	K. B. Norswing		November 20	14.5	80.1	290	18

GRANT COUNTY.

Hereford	Nick Thies		October 27	8.9	60.8	178	18
Elbow Lake	O. P. M. Hoffman	German	do 17	9.9	74.4	198	23
do	O. P. M. Hoffman	Dippe's Vilmorin	do do	10.8	75.0	216	8
do	John Peterson	Dippe's Vilmorin White Imp'd	November 14	15.1	78.3	302	26
do	O. L. Lofsvold		October 17	9.8	73.7	196	24
Ashby	N. O. Puntches	Dippe's Vilmorin White Imp'd	November 4	14.5	80.6	290	26
do	F. Wahldieck	do do do do	October 27	11.7	75.0	234	13
do	S. J. Beebe		November 4	13.2	76.7	264	16
Norcross	Aaron Watson	Dippe's Vilmorin	October 14	9.7	73.5	194	

### HENNEPIN COUNTY.

Excelsior.....	W. B. Mason.....	Vilmorin Improved.....	November 9	13.2	78.6	264	17
Richfield.....	Wm. Ray.....	.....	October 26	14.5	79.7	290	17

### JACKSON COUNTY.

Jackson.....	Jas. Patterson.....	.....	November 9	9.9	71.2	198	23
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### KANDIYOH! COUNTY.

Willmar.....	P. P. Eddy.....	Vilmorin White Improved.....	November 14	17.7	80.2	354	16
St. Johns.....	O. D. Hong.....	.....	October 31	16.1	90.9	322	14

### KITTSO! COUNTY.

Kennedy .....	J. F. Dahlgreen.....	.....	October 28	13.0	80.7	260	21
do .....	Jno. Rice Bro.....	.....	do 17	13.3	82.1	266	13
St. Vincent.....	W. A. Adams.....	.....	November 7	11.9	75.4	238	26
do .....	Not given.....	.....	do 9	11.6	72.0	232	18
do .....	J. B. Hutchins.....	Dippe's Imperial.....	do 7	14.8	80.4	296	12
Halloek.....	Jas. Gillie.....	.....	October 26	11.1	78.8	222	14
do .....	Sam'l Jolliff.....	.....	November 4	13.1	75.8	262	20
do .....	do do.....	.....	do 9	13.2	88.0	264	10

### LAC QUI PARLE COUNTY.

Madison.....	P. Hasland.....	.....	October 27	14.9	83.2	298	10
do .....	C. H. Siljam.....	French, Very Rich.....	November 16	14.0	80.9	280	28

### LE SUEUR COUNTY.

Montgomery.....	E. A. Kauffer.....	Kleinwanzleben.....	November 7	15.8	78.2	316	16
Le Sueur.....	Wm. Weil.....	.....	do 12	15.5	80.7	310	12
do .....	Jerry Shea.....	.....	do do	12.6	72.4	252	17

LE SUEUR COUNTY. (Continued.)

Town.	Name of Party.	Variety.	Date Analyzed	Sugar per cent.....	Purity per cent.....	Sugar per Ton.....	Avg. weight of beets Oz.
Le Sueur.....	H. Cantwell.....	.....	November 3	13.9	78.6	278	24
do.....	H. T. Otting.....	.....	do 3	13.9	81.8	278	11
do.....	H. Rethwell.....	.....	do 12	14.0	76.1	280	32
do.....	Fred Prion.....	.....	do 12	14.4	74.2	288	16
Sibley.....	F. Prion.....	.....	do 3	13.5	75.9	270	16

MARSHALL COUNTY.

Warren.....	J. H. Haggard.....	.....	November 11	12.3	75.5	246	15
do.....	P. A. Peterson.....	Vil. White Improved French....	October 27	14.1	84.4	282	16
do.....	James Coler.....	Dippe's Vilmorin Improved....	November 11	14.6	83.4	292	12
Stephen.....	W. E. Calbertson.....	.....	October 31	10.0	69.0	200	24
Argyle.....	A. Johnson.....	.....	do 26	9.4	68.6	188	36

MARTIN COUNTY.

Sherburne.....	H. M. Barnes.....	.....	October 21	12.3	74.5	246	26
do.....	Swan Olson.....	.....	do 27	8.2	64.6	164	36
do.....	B. F. Meetch.....	Vilmorin White Improved....	do 26	13.8	81.7	276	21
Fairmont.....	J. E. Cansight.....	.....	do 27	10.4	71.7	208	32
Fairmont.....	Mrs. Jonah Smith.....	.....	November 4	10.2	71.8	204	16

McLEOD COUNTY.

Hutchinson.....	Wm. Tomlinson.....	.....	October 15	10.8	74.0	216	27
do.....	H. V. Bonnicoell.....	.....	do 31	12.7	76.0	254	28
do.....	B. F. Pettijohn.....	.....	do 21	11.25	76.8	225	19
do.....	W. W. Pendergast.....	.....	do 21	13.0	79.3	260	19
do.....	Jesse Pettijohn.....	.....	do 21	8.8	73.9	176	18

Hutchinson.....	L. Tomilson.....	.....	October 21	9.3	74.4	186	20
do .....	Wm. Tomilson.....	.....	do do	12.0	68.9	240	17.5
do .....	Peter Weiss.....	.....	do do	14.7	81.7	294	28
do .....	Dan'l Devitt.....	.....	do do	13.1	82.9	262	28
do .....	C. A. Wagner.....	.....	do do	11.7	77.0	234	44
do .....	L. W. Ells.....	.....	do do	11.1	75.0	222	21

MEEKER COUNTY.

Watkins.....	John Hapel.....	.....	October 13	15.65	85.3	313	
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MURRAY COUNTY.

Slayton.....	H. G. Day.....	.....	October 14	10.25	75.9	205	
do .....	J. Sharp.....	Dippes Kleinwanzeleben, French	November 3	11.6	72.0	232	17
do .....	do .....	do do German	do do	11.7	73.2	234	17
do .....	do .....	Zuckerreichste Elite.....	do do	12.2	78.2	244	18
do .....	do .....	Vilmorin White Imp., French.....	do do	12.4	76.1	248	18
do .....	do .....	Dippe's Imperial.....	do do	12.1	76.6	242	16
do .....	do .....	French, Very Rich.....	do do	10.4	73.8	208	21
do .....	do .....	Vilmorin White Improved.....	do do	12.6	75.9	252	19

NICOLLET COUNTY.

St. Peter.....	A. Nelson.....	.....	November 3	13.6	79.1	272	21
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NOBLES COUNTY.

Worthington.....	D. Foss.....	.....	October 14	12.65	77.9	253	
do .....	Allen Chancy.....	.....	November 3	14.4	77.4	288	16
do .....	do do .....	.....	do do	11.5	69.0	230	16
do .....	J. P. Madson.....	.....	October 21	10.8	75.5	216	17

### NORMAN COUNTY.

Town.	Name of Party.	Variety.	Date Analyzed	Sugar per cent.....	Purity per cent.....	Sugar per Ton.....	Avg. Weight of Beets, Oz.
Perley.....	H. O. Bergh.....	Dippe's Vilmorin Improved..	November 14	13.3	82.1	266	33
Lockhart.....	J. D. McPhee.....	.....	do 4	11.1	72.6	222	52
Lockhart.....	Aug. Menge.....	.....	do 9	13.4	76.1	268	19

### OTTER TAIL COUNTY.

Elizabeth.....	Wm. Brusewitz.....	Dippe's Vilmorin Improved...	November 14	13.8	77.5	376	38
do .....	John Fick.....	.....	do 14	11.9	76.8	238	40
do .....	Aug. Grimewald.....	.....	do 16	13.9	79.0	278	38
Dalton.....	Lars Nelson.....	.....	October 17	10.5	72.9	210	10
Carlisle.....	M. Lokken.....	.....	do 2	7.82	64.2	156.4	
do .....	M. Hexum.....	.....	do 2	10.57	73.1	201.4	
do .....	M. Lokken.....	.....	do 31	11.5	72.8	230	21

### PINE COUNTY.

Finlayson.....	F. M. Davidson.....	.....	October. 10	11.26	88.3	225.2	
Kettle River.....	Chas. Pederson.....	.....	do 14	10.25	75.2	205	
do .....	N. Halstrand.....	.....	do 14	11.8	77.1	236	
do .....	Val. Zovack.....	.....	do 14	14.1	82.4	282	
Sturgeon Lake.....	not given.....	.....	do 17	15.25	80.9	205	21
do do .....	E. L. Skogg.....	.....	November 3	12.7	74.8	254	16
do do .....	Fred Swanson.....	.....	October 8	8.32	65.5	166.4	
do do .....	John Swanson.....	.....	do 9	10.95	77.5	219	
Hinkley.....	E. A. Hogen.....	.....	do 14	12.15	77.7	243	
do .....	Michael Currie.....	.....	do 9	11.39	78.6	227.8	

### PIPESTONE COUNTY.

Edgerton.....	J. Pashbaugh.....	.....	November 4	13.8	77.5	276	24
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POLK COUNTY.

Fisher.....	A. C. Asseltine.....	.....	October 15	10.6	72.6	212	
East Grand Forks.....	Ole B. Dahl.....	.....	do 27	11.7	74.1	234	21
Crookston.....	W. H. Collins.....	Lane's Improved.....	do 21	9.65	77.5	193	34
Enclid.....	W. A. Veal.....	Dippe's Valmorin Improved..	do 27	10.0	69.9	200	19

REDWOOD COUNTY..

Lamberton.....	Chas. Porter.....	.....	November 4	13.6	76.4	272	24
do .....	Geo. Skelton.....	.....	do 12	11.2	71.5	224	16

RENVILLE COUNTY.

Renville.....	Herman Prahl.....	.....	do 9	12.5	76.3	250	18
Hector.....	F. Musil.....	.....	October 14	12.3	79.9	246	
Olivia.....	J. A. Malhoun.....	.....	November 7	13.1	73.7	262	20

RICE COUNTY.

Morristown.....	Seth H. Kennedy.....	Zuckerreichste.....	October 26	10.6	66.6	318	21
Northfield.....	J. J. Humry.....	.....	November 11	15.2	80.4	304	3

STEVENS COUNTY.

Donnelly.....	Gus. E. Anderson.....	Dippe's Imperial.....	November 4	15.3	83.6	306	12
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TODD COUNTY.

Eagle Bend.....	Alex Kap.....	Bultean Desprez.....	October 14	14.0	85.4	280	
Long Prairie.....	C. Horkins.....	.....	do 27	12.0	77.9	240	24
do do .....	A. T. Nely.....	.....	November 4	10.5	70.0	210	40



WABASHA COUNTY.

Town.	Name of Party.	Variety.	Date Analyzed	Sugar per cent.....	Purity per cent.....	Sugar per Ton.....	Ave. weight of beets Oz.
Mazeppa.....	H. L. Pengilly.....	.....	October 31	13.0	76.9	260	21
do .....	do .....	.....	do do	14.0	80.5	280	16
do .....	do .....	.....	do do	14.1	88.7	282	18

WADENA COUNTY

Verndale.....	J. E. Anderson.....	.....	October 24	12.0	78.9	240	17.5
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WATONWAN COUNTY.

St. James.....	D. Sharp.....	Dippe's Imperial.....	November 20	13.0	80.8	260	20
do .....	Q. C. Rutherford.....	French, Very Rich.....	October 23	9.05	75.1	181	34
do .....	Swan Potwanson.....	Dippe's Vilmorin Improved.....	do 26	11.0	72.8	220	24

WRIGHT COUNTY.

St. Michaels.....	Peter Dehew.....	.....	October 15	14.75	81.8	163.6	
do .....	G. D. Heuring.....	Dippe's Imperial.....	do 17	13.9	80.8	278	12.5
do .....	K. Hewring.....	do do .....	do 26	12.5	80.1	250	17
Howard Lake.....	W. J. Schimming.....	.....	do 15	10.75	71.5	215	
do .....	.....	.....		12	78.4	240	
do .....	.....	.....		11.4	75	228	
do do .....	.....	.....		10.65	86.7	213	
Howard Lake.....	.....	.....		12	74.5	240	
do do .....	.....	.....		12	75	240	18
Not given.....	Wm. Ricck.....	.....	October 21	12	75	240	
Cokato.....	Frank Griffith.....	.....	September 28	14.21	81.1	284.2	
do .....	B. Griffith.....	.....	October 2	12.52	76.3	250.4	
do .....	John Eklof.....	Dippe's Kleinwanzleben.....	do 26	9.8	70	196	32
Clear Water.....	John Mitchell.....	French, Very Rich.....	do 28	12.9	79.7	258	19
do .....	O. Longworth.....	.....	do 27	13	78.8	260	16

do	W. F. Rigby		November	4	13.6	81	272	16
Monticello	Jos. Perkins		October	28	12.65	74.7	253	17
do	E. D. Washburn		November	4	11.9	71.3	238	19
do	E. E. Walden		October	23	13.3	81.1	266	17
do	Jos. Bauman		October	27	11	78	220	21
do	Jos. Bauman		do	27	8.7	66	174	35
Delano	P. F. Chancellor		November	3	12.4	78.5	248	21
do	Olof Peterson	Kleinwanzleben	October	27	13.6	83.4	272	17
do	John Pomploon		do	27	9.4	67.6	188	30
do	John Sherry		do	27	12	75.9	240	26
do	C. Freckman	Dippe's Imperial	do	27	10.3	74.7	206	32
do	C. A. Rieder		do	27	12.4	76.1	248	26

**YELLOW MEDICINE COUNTY.**

Canby	C. G. Nelson		October	27	12.1	79.1	242	18
Granite Falls	H. M. Purdy		November	14	15.4	84.6	308	32

## BEETS ON THE STATION FARM.

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The analysis of beets raised upon the State farm recorded below were made from samples selected as follows:

On Sept. 26th, 28th and Oct. 1st, 5th, 7th, 9th and 13th, a lot of beets of each variety were pulled and mixed indiscriminately and averaged, leaving from three to five for analysis. Parts of each of these were rasped, the juice expressed under heavy pressure and analyzed.

The last fifteen samples on Oct. 13th and the samples of Dec. 2nd were taken from piles where all the beets had been placed by varieties.

The beets showed rapid improvement from the 26th until the 1st of October. On the 4th rain set in lasting several days resulting in a lowering of the percentage of sugar and purity, yet the averages still remained high.

The results are as follows:

DATE.	VARIETY.	SUCROSE.	PURITY.
Sept. 26.	.....	16.89	86.6
"	.....	16.77	88.3
"	.....	16.04	82.2
"	.....	16.87	80.3
"	.....	15.92	77.6
"	.....	17.11	81.5
"	.....	17.98	85.6
"	.....	15.18	77.8
"	.....	16.32	85.9
"	.....	15.80	79.
"	Knauer's Imperial.....	13.24	66.2
"	Zuckerreichste Elite.....	15.37	75.1
"	Vilmorin White Improved.....	16.22	85.4
"	Kleinwanzleben.....	16.94	84.7
"	Knauer's Imperial.....	15.50	77.5
	Average.....	16.14	80.9

DATE.	VARIETY.	SUCROSE.	PURITY.
Sept. 28.	.....	13.92	73.3
"	.....	16.36	81.8
"	.....	14.08	74.1
"	.....	17.09	87.7
"	.....	14.21	81.1
"	.....	16.58	80.9
"	.....	17.61	83.9
"	.....	17.99	85.7
"	.....	17.40	82.9
"	.....	15.92	81.6
"	Knauer's Imperial.....	15.64	78.2
"	Zuckerreichste.....	16.58	80.9
"	Vilmorin White Improved.....	15.33	80.7
"	Kleinwanzleben.....	16.33	81.7
"	Knauer's Imperial.....	16.58	82.9
	Average.....	16.11	81.1
Oct. 1.	Vilmorin White Improved.....	16.58	82.9
"	Kleinwanzleben.....	18.49	84.
"	".....	17.67	84.1
"	".....	17.34	82.6
"	Dippe's Improved.....	16.99	85.
"	Vilmorin White Improved.....	17.36	82.7
"	Dippe's Kleinwanzleben.....	16.54	84.5
"	Vilmorin White Improved.....	16.67	83.4
"	Kleinwanzleben.....	17.98	92.2
"	".....	15.67	84.7
"	Kleinwanzleben Elite.....	16.42	82.1
"	Kleinwanzleben.....	17.83	84.9
"	".....	17.67	86.2
"	".....	17.52	87.6
"	".....	15.12	88.8
"	Zuckerreichste.....	16.77	88.3
"	Dippe's Kleinwanzleben.....	16.67	83.4
"	Kleinwanzleben.....	18.37	89.6
"	".....	19.15	89.
"	Dippe's Kleinwanzleben.....	17.09	85.5
"	French, Very Rich.....	16.94	84.7
	Average.....	17.18	85.5

DATE.	VARIETY.	SUCROSE.	PURITY.
Oct. 7.	.....	13.51	84.4
"	.....	13.29	83.1
"	.....	14.33	89.6
"	.....	14.39	87.2
"	.....	16.11	94.8
"	.....	15.24	87.1
"	.....	14.23	79.1
"	.....	12.45	75.4
"	Kleinwanzleben Elite .....	13.54	79.6
"	Zuckerreichste Elite.....	14.71	86.2
"	Knauer's Imperial.....	13.29	83.1
"	Kleinwanzleben.....	13.26	78.
Oct. 9.	" .....	11.64	75.1
"	" .....	15.64	84.5
"	Zuckerreichste .....	14.23	81.3
"	Kleinwanzleben.....	15.58	82.
"	Vilmorin White Improved.....	16.90	84.5
"	Kleinwanzleben.....	16.90	84.5
"	" .....	16.58	85.1
"	" .....	17.09	89.9
"	Dippe's Kleinwanzleben .....	15.79	83.1
"	Kleinwanzleben.....	15.96	84.
"	Vilmorin White Improved.....	16.21	87.6
"	" " " .....	16.52	91.8
"	Dippe's Kleinwanzleben .....	13.90	81.8
"	Kleinwanzleben.....	16.90	84.5
"	French, Very Rich .....	14.58	83.3
"	Kleinwanzleben.....	14.86	84.9
"	Dippe's Improved.....	16.11	87.1
"	Kleinwanzleben.....	13.27	78.1
"	" .....	15.08	83.8
"	Kleinwanzleben Elite .....	14.39	83.7
"	Knauer's Imperial.....	13.60	82.4
"	Kleinwanzleben.....	14.23	82.2
	Average.....	14.82	83.9
Oct. 13.	.....	15.45	83.5
"	.....	15.85	86.6
"	.....	16.6	95.4

DATE.	VARIETY.	SUCROSE.	PURITY.
Oct. 13.	.....	15.85	86.1
"	.....	15.8	82.7
"	.....	14.95	85.4
"	.....	16.6	86.
"	.....	16.0	84.2
"	.....	15.7	82.2
"	.....	16.35	86.1
"	.....	12.25	79.5
"	.....	12.7	77.4
"	.....	15.1	84.3
"	.....	16.4	85.4
"	.....	14.55	82.2
"	.....	14.6	84.9
"	.....	14.75	86.2
"	.....	14.2	83.5
"	.....	15.55	96.6
"	.....	15.1	86.8
"	Knauer's Imperial, .....	12.8	79.5
"	.....	15.3	84.1
"	.....	15.65	85.9
"	Zuckerreichste, .....	17.25	82.6
"	.....	16.75	85.5
"	Kleinwanzleben Elite, .....	14.65	81.4
"	Kleinwanzleben, .....	13.5	77.
"	Vilmorin White Improved, .....	16.75	82.1
"	.....	14.6	80.2
"	.....	15.15	83.7
	Average.....	15.2	84.2
Dec. 2.	.....	19.2	83.1
"	.....	18.9	87.5
"	.....	18.0	85.7
"	.....	19.2	86.1
"	.....	17.5	85.4
"	.....	18.7	89.
"	.....	16.5	84.6
"	.....	18.5	84.1
"	.....	18.0	82.5
"	.....	15.5	84.7

DATE.	VARIETY.	SUCROSE.	PURITY.
"	.....	18.5	84.8
"	.....	18.1	84.2
"	.....	20.4	89.9
"	.....	20.4	88.7
"	.....	19.3	86.5
"	.....	16.8	80.8
"	.....	16.4	82.8
"	.....	20.0	85.1
Average.....		17.7	85.3

The above results show that in many parts of the state the production of sugar beets can be made successful in so far as quality is concerned. The seed was distributed in such quantity as would make it possible to get reliable results as to the yield of roots. Few farmers, however, were able to make the experiment complete, owing largely to the exceptional returns of other crops last year. The reports returned show the yield of beets to vary from six to forty-eight tons per acre. The most reliable estimates place the average yield about twenty tons per acre where the requirements of cultivation were observed. While not as full and complete as it was anticipated the results would be, we can nevertheless say unhesitatingly that all agricultural requirements for the production of good beets are successfully met in Minnesota.

But beyond the necessity of having suitable soil, favorable climatic conditions, unexcelled transportation facilities, we must have what is yet lacking on the part of the farmers, namely: A knowledge of the cultural requirements more generally diffused and a willingness to produce beets. Without a plentiful supply of beets, the best factory, ever so perfect, can only fail.

It is generally known that the manufacture of sugar from sugar beets is, under the provisions of the McKinley bill passed by the last Congress, sufficiently remunerative to induce capital to erect factories wherever good beets in sufficient quantity will be raised.

I am informed the jobbing and confectionery trade of the Twin Cities used last year about 175 tons of sugar per day.

To supply this quantity of sugar would require 25 to 30 factories. As our results have shown we can produce our own sugar.

But the returns from beet raising have not proved satisfactory in many places where factories are now in existence. Inasmuch as it is likely another season may witness the inauguration of the industry in Minnesota it may be well to point out the interdependence of the farmer and manufacturer and the causes which have contributed elsewhere to unsatisfied expectations.

The interest of the farmer and manufacturer are mutual, probably more dependent the one upon the other than in any other industry. A factory costs complete, exclusive of the site, and including ample running capital, nearly a half a million dollars. Such a factory should have 25,000 to 40,000 tons of beets to work into sugar. Inasmuch as the fixed charges including interest, taxes, insurance, etc., must be very large on that amount of investment, and the season for using the beet sugar plant quite short, it is readily seen that inability to secure ample supply of the beets must cause failure. With a bountiful supply of beets any factory could afford to pay higher prices than if the supply were short, so that over-production of beets is not likely to occur. On the manufacturers' side the supply of beets as regards quantity and quality is almost the only question to be solved.

On the farmers' side, however, almost everything remains to be demonstrated. After having proved that good beets can be raised he has yet to demonstrate the yield and cost; but fortunately these conditions are largely controlled by the farmer himself.

The crop, in order to be profitable to the farmer, must show results as follows:

- 1st. A beet rich in sugar.
- 2d. A sufficiently large yield per acre.
- 3d. A not extravagant cost of production.
- 4th. A sure market at good price.

These requirements can be met by the farmer if he will intelligently and faithfully practice the proper methods of cultivation. These are well determined and no other agricultural



product has had more careful study bestowed upon it, and none is capable of more scientific production.

The four points, enumerated, which it is necessary for the farmer to take into his calculations if he contemplates raising beets, can be settled as follows :

To raise rich sugar beets in good quantity, at the minimum expense the farmer must plant and cultivate them as follows and for the reasons assigned :

1. The seed must be planted thickly, our results show 20 pounds per acre to be best for our conditions, in close rows, say 18 inches apart. By planting thickly a multitude of plants grow from which selection can be made of the most thrifty. Within reasonable limits the more seed planted the less damage can result from poor germination. An acre if shaped forty rods long by four rods wide and using 20 pounds of seed in rows 18 inches apart would require deposited in each row one half pound of seed. That is from three to four times the amount used in seeding for stock beets.

2. The beets must be thinned out early, when they are three to five inches high, and cultivated at that time and frequently thereafter. Direct experiments have repeatedly shown that the amount of sugar in the beets as well as the tonnage yielded is in direct proportion to the amount of cultivation given.

3. The selection of land must be made by reason of its being old and clean, well and deeply plowed and free from manures. If weedy land is used more expense is caused by the greater amount of cultivation needed and it will almost invariably happen that the cultivation must be delayed.

So that by planting thickly, thinning out early and carefully giving frequent cultivation, and making proper selection of soil, the cost of production is minimized, the quality is improved and the yield increased. Furthermore, by this means the maturity of the beet is hastened and made uniform, and the size of single roots decreased and made regular.

Stock beets are usually planted in three feet rows and thin in the rows. In our state phenomenal yields of large

beets are of usual occurrence. A beet for sugar production must not exceed three pounds and is better to weigh only one. When the requirement is stated that beets must be small, one thinks this must decrease the total yield, while on the contrary it increases it. With an acre field forty rods long by four rods wide, there would be forty-four forty rod rows if the same were 18 inches apart. Our soils are so rich that to secure small beets the plants must stand close in the row. If they are let grow four inches apart there would be on one acre 87,120 roots. If each beet weighed but one pound that would represent over forty-three and a half tons. If six inches apart in the rows there could be 58,080 plants, which yielding one pound each would be over 29 tons. If eight inches apart in the rows there could be 43,560 plants, which weighing one pound each would be over 21.75 tons. But to keep the beets from exceeding one pound in our soil it will be necessary to let a great number grow, say one plant every four to six inches, so that the probable yield is large. As high as forty-eight tons per acre were reported last year.

But results worked out on paper always vary from actual experiences and so it has happened with the production of sugar beets. In California the yield has reached as high as sixty-one tons per acre, while in Nebraska the average during the past two years has been under ten tons per acre and as low as three or four tons. An excessive drought was experienced there in 1890 which cut down the yield materially. Except along the western border of our state such droughts do not occur and cannot affect our results. Furthermore the raising of beets in Nebraska has been done mainly upon a large scale by syndicates of business men, not farmers. As beets require a vast amount of work and at certain times, the chances are largely against success when their production is attempted on a large scale; no farmer should attempt to produce more than ten acres of beets and few should raise more than five.

While our results indicate success, farmers should be conservative in raising beets, as the cost of production is much greater than for other crops, and the requirements more exacting.

The premiums offered by the State Fair for the best fifteen samples of beets, where the station should analyze the beets, were to be rated as those having the highest ratio, of both the amount of sugar and the purity of the beets.

This report was submitted to the secretary of the State Fair and has been published by him. It was required that the beets competing for these prizes should reach the Experiment Station not after Nov. 20th. The best beets reaching the Station by that time are as follows, and the prizes have been awarded to the first fifteen samples named:

	Sug. %	Pur. %	Ratio.
O. G. Hoeg, St. Johns, Kandiyohi County .....	16.1	90.9	190.96
*J. F. Porter, Red Wing, Goodhue County .....	16.7	85.8	188.75
*P. P. Eddy, Willmar, Kandiyohi County .....	17.7	80.2	188.23
†H. M. Slee, Dennison, Goodhue County.....	16.2	86.6	186.80
†J. F. Porter, Red Wing, " " .....	16.2	85.9	186.03
H. Metz, Randolph, Dakota County .....	15.2	88.9	183.68
H. Clarke, St. Paul & Duluth Railroad .....	16.1	83.9	183.26
J. Cappell, Watkins, Meeker County .....	15.65	85.3	182.26
*H. M. Purdy, Granite Falls, Yellow Medicine County	15.4	84.6	180.08
*P. Klippbein, New Ulm, Brown County .....	16.4	79.2	179.69
August Loggrew, Chisago, Chisago County .....	14.3	88.9	178.59
†P. C. Anderson, Donnelly, Stevens County .....	15.3	83.6	178.41
R. A. Johnson, .....	16.1	78.2	176.99
*A. Burkhard, Hay Creek, Goodhue County.....	15.	83.3	176.39
G. R. Rovel, Sabin, Clay County.....	14.9	83.7	176.26
H. L. Peully, Mazeppa, Goodhue County.....	14.1	88.7	176.24
P. S. Hasbird, Madison, Lac qui Parle County.....	14.9	83.2	175.71
J. Sjöhlme, N. Branch, Chisago County.....	13.9	88.3	175.67
A. Kaufer, Montgomery, Le Sueur County.....	15.8	78.2	175.30
J. Murphy, Barnum, Carlton County.....	14.8	83.1	175.21
H. Clarke, Sturgeon Lake, Pine County, .....	15.25	80.9	175.16
W. A. Patten, Le Sueur, Le Sueur County .....	14.8	88.2	174.05
∞J. F. Porter, Red Wing, Goodhue County .....	14.5	83.3	173.56
††P. Dehew, St. Michaels, Wright County.....	14.75	81.8	173.31
†A. Kop, Eagle Bend, Todd County .....	14.	85.4	173.05
P. Weiss, Hutchinson, McLeod County .....	14.7	81.7	172.93
Jesse Moore, Stacy, Chisago County .....	13.33	88.7	172.89
J. Hanenstein, New Ulm, Brown County .....	15.	79.8	172.53
R. A. Peterson, Warren, Marshall County.....	14.1	84.4	172.51
J. M. Schlehr, Frazee City, Becker County .....	14.4	82.7	172.34
L. C. Moore, .....	14.8	80.4	172.06
*J. Peterson, Elbow Lake, Grant County .....	15.1	78.3	171.45
C. Jobs, Carver, Carver County .....	14.6	80.7	171.25

	Sug. %	Pur. %	Ratio.
W. Heineeke, Mankato, Blue Earth County .....	14.5	81.	171.02
J. F. Kahring, Barnum, Carlton County.....	14.	83.3	170.74
*A. S. Printchers, Ashby, Grant County .....	14.5	80.6	170.58
C. A. Sargent, Red Wing, Goodhue County.....	13.6	85.	170.35
Vae Lovack, Kettle River, Pine County .....	14.1	82.4	170.31
K. B. Norswing, Dennison, Goodhue County .....	14.5	80.1	170.03
A. Becker, New Ulm, Brown County.....	14.3	80.8	169.67
F. Griffith, Cokato, Wright County .....	14.21	81.1	169.59
J. Atkinson, Montana, Carlton County.....	13.54	84.4	169.35
C. Andrews, Centre City, Chisago County .....	13.4	85.1	169.33
O. Peterson, Delano, Wright County.....	13.6	83.4	168.59
H. Lent, Stacy, Chisago County .....	13.9	81.8	
H. F. Otling, LeSueur, LeSueur County .....	13.9	81.8	168.51
C. H. Siljan, Madison, Lac qui Parle County.....	14.	80.9	168.09
C. H. Goodrich, Mankato, Blue Earth County .....	13.6	82.9	168.04
J. Berg, Rush City, Chisago County.....	13.9	81.3	167.96
H. L. Penjilly, Mazeppa, Goodhue County .....	14.	80.5	167.65
B. F. Meetch, Sherburne, Martin County .....	13.75	81.7	167.55
†D. G. Henring, St. Michaels, Wright County .....	13.9	80.8	167.41
H. C. Clarke, St. Paul & Duluth Railway.....	13.8	81.2	167.29
J. F. Hibel, Alexandria, Douglas County.....	14.	80.	167.10
W. Wallmarek, Lindstrom, Chisago County .....	13.6	81.9	166.93
J. Edstrom, Chisago City, Chisago County.....	13.3	83.1	166.52
W. F. Rigby, Clearwater, Wright County.....	13.6	81.	165.94
T. Asmundson, Willmar, Kandiyohi County.....	12.8	84.8	165.61
W. D. Japs, Carver, Carver County.....	13.7	80.1	165.51
J. D. Buckingham, Glyndon, Clay County .....	12.6	85.7	165.47
J. Rice, Kennedy, Kittson County.....	13.3	82.1	
*H. O. Bergh, Berley, Norman County.....	13.3	82.1	165.42

\* Vilmorin White Improved variety.

† Dippes Imperial variety.

◊ Kleinwanzleben variety.

†† Bulteau Desprez Richest variety.

The above table gives the analysis of the best sixty samples received up to the 20th of November. Some beets better than these were received after that time, and as late as the 19th of December, when the last lot was analyzed. Beets received since that time have not been analyzed. A number of samples that were shipped previous to that time were received too late for analysis.

## COST OF GROWING SUGAR BEETS.

W. M. HAYS.

To determine the cost per ton of raising sugar beets a quantity of seed of the Knauer's Improved variety was planted at the rate of 20 pounds per acre on a rather weedy field that had been manured in 1889 and had subsequently borne two crops, one of corn and one of oats. The seed was planted with a newly invented four-row horse beet seed planter kindly sent us for trial by the Moline, Milburn, Stoddard Co., of Minneapolis. The land after having been plowed eight inches deep was made thoroughly fine by the use of a Tower's pulverizer. The beet seed planter did excellent work although owing to the unusual softness of the seed bed the beet seeds were carried down too far below the general surface by the press drills. The season immediately after planting was unusually wet, preventing cultivation at the proper time and allowing the weeds to get a good start requiring extra expense in weeding. It is, however, to be expected in growing beets that the weeding and thinning will be pretty expensive especially if the weather is rainy at the critical time before the beets are four or five inches high. The plot containing  $1\frac{2}{3}$  acres was planted in rows 36 rods long and 18 inches apart, and yielded 34,785 pounds of beets or 10.4 tons per acre. One and one-half hours with man and team were required to plant an acre, 72 hours cultivating and 110 hours in harvesting. Calling man and team three hours planting, we have the total labor 184 hours per acre. On a clean field which had borne three good crops of corn and kept very clean of weeds the same variety of beets was planted; the amount of seed, and the method of planting, cultivating etc., were the same as in the weedy plot. This plot contained 32 rows 14 rods long or  $\frac{1}{4}$  acre, and yielded 7,275 pounds of beets or  $14\frac{1}{2}$  tons per acre.

One and one-half hours work with man and team was required to plant an acre, 52 hours to cultivate and about the same time as in the other field to harvest. Counting the work of the team equal to the work of a man and one horse as half a team we have the total number of hours expended in planting, cultivating and harvesting the beets on this cleaner land, 171 hours per acre. Counting the rent of the land at \$3 per acre, plowing deeply and harrowing \$2, the seed 20 cents per pound and the labor \$1.25 per day of ten hours we have the cost in the case of the weedy land \$30.38 per acre. Reduced to cost per ton of beets we have a greater difference in favor of the clean land. The beets on the weedy land cost \$3.25 per ton, while on the cleaner land but \$2.09. The latter sum represents the cost of a ton of beets in heaps in the field covered with straw and dirt. To get them to the factory the labor of hauling should be added and would depend greatly upon the distance.

#### AMOUNT OF SUGAR BEET SEED PER ACRE.

Four plots, each containing eight rows, eighteen inches apart and fourteen rods long, were planted with the Moline, Milburn & Stoddard beet seeder to test different amounts of seed per acre. On planting the first plot on this land, spring plowed eight or nine inches deep, it was found that the press wheels sank down so deep that it was necessary to roll the remainder before planting. The variety used was Kleinwanzleben, planted May 29, 1891. The amount of seed the yield of beets and of sugar, appears as follows:

Plot No.	Pounds of seed per plot.	Pounds of seed per acre.	Yield of beets per plot.	Yield per acre. Tons.
1	13 oz.	12.75	1,345	10.6
2	11 oz.	10.75	1,575	12.7
3	21 oz.	20.50	1,840	14.8
4	24 oz.	23.50	1,895	14.9

The table shows that with this way of planting, twenty pounds are needed, thus confirming the practice of other countries.

## DEPTH OF PLANTING.

Three plots were planted to Kleinwanzleben sugar beets to test the depth to run this machine. Twenty and one-half pounds of seed per acre were planted. As mentioned elsewhere all were carried down below the surface too far. Depth here means the distance the seed was planted below the bottom of the press wheel track. These results hardly

Plot No.	Depth Planted	Yield of Beets.	Tons Per Acre.
1	$\frac{1}{2}$ inch	830	13.1
2	$\frac{3}{4}$ inch	905	15.6
3	1 inch	850	13.3

apply to depths for planting with garden drills, in which case there is far less pressure on the wheels. The fact that one inch seemed too deep is, however, significant.

The yield in one trial of rows sixteen and eighteen inches apart gave identical results in yields of beets per acre on plots of eight rows each fourteen rods long.

## VARIETY TESTS OF SUGAR BEETS.

The table below shows the yields per acre of beets in tons of several varieties, as grown at the Experiment Station in 1891. Those in field A were planted with a two-horse beet planter and those in field B with a Mathews' garden drill, using on all plots twenty pounds of seed per acre, and covering one-half to three-fourths inch deep.

	Source of Seed.	Field A Tons Beets per Acre.	Field B Tons Beets per Acre.
Vilmorin White improved .....	France ..	14.6	
Dippe's Kleinwanzleben .....	" ..	16.	
French, Very Rich .....	" ..	16.9	
Dippe's Kleinwanzleben .....	Germany..	12.2	
Vilmorin's White Improved .....	" ..	12.1	
Dippe's Imperial .....	" ..	12.2	
Kleinwanzleben Elite .....	.....	13.	11.9
Zuckerreichste Elite .....	.....	14.3	10.4
Vilmorin's White Improved .....	Utah .....	13.3	8.8
Dippe's Kleinwanzleben .....	Utah .....	15.4	8.5
Knauer's Imperial .....	Utah .....	19.5	13.2

All the varieties tried have the habit of growing entirely under the ground on land deeply plowed.

## PREPARING SUGAR BEET LAND.

To test a few ways of preparing land for sugar beets several plots were plowed and subsoiled to various depths with results as tabulated below :

	Depth Plowed Inches.	Depth Subsoiled Inches	Yield Per Acre
Plot 1 .....	9		17.6
Plot 2 .....	6		11.2
Plot 3 .....	12		14.2
Plot 4 .....	9	14	13.9

Plowing rich loamy soils to the depth of 8 to 10 inches seems to be the most economical and effective way of plowing land for beets.

The investigations in regard to sugar beets, both as to the possibilities of growing roots rich in sugar and also the economic side of the question, will be continued during the present and following years.



## SORGHUM AND SYRUP.

D. N. HARPER.

Over a large portion of the state sorghum is grown and made into syrup. This is used almost entirely in the localities where it is produced, and but little of it finds its way into the general market, so that although the sales are large, the wholesale grocers and the mixing houses in the state are obliged to rely upon other states for a supply of sorghum syrup. One local firm writes that they could sell 1000 barrels of good sorghum syrup yearly if they could get the goods, but the supply does not equal the demand and the quality is too variable. The wide production of sorghum and the large demand for the syrup, together with the absence of any data upon the quality of the cane, its cost of production etc., led me to make certain investigations during the years 1889 and 1890. By these I hoped to secure reliable information, (1) as to the methods of cultivation, (2) the yield and cost of production, (3) the quality of the cane, (4) the methods and cost of manufacture and (5) the quality of the product. But I have found it possible to get such information only upon the quality of the cane and its products and the methods of manufacture. Cultivation is not specially directed to the production of a sugar crop and the methods are in general the same as those for corn. There is no special selection of the plot and no measurement of its size, no record taken of the yield etc. It is therefore impossible to closely estimate the cost of the crop and the profits arising from it. The most reliable estimates show that the syrup costs from 20 to 35 cents per gallon. This has ready sale at home at from 50 to 60 cents per gallon, or saves an outlay for other syrups costing from 60 to 80 cents. The quality of the syrup is quite variable and depends as well upon the character of the cane and the manner of handling it as upon the methods of manufacture. The charge for manufacture at Cannon Falls and Red Wing is 15 cents per gallon and

this yields a reasonable profit; but the actual cost of manufacture varies with the cane. That which has been grown upon suitable land, after the proper manner and harvested and handled carefully yields a good syrup, the largest quantity with the least expense, but some lots of cane at the charge of 15 cents, as stated, are manufactured at a loss.

The quality of the cane is more important to us, and last year this called for our chief attention. For the last season's work I arranged a temporary laboratory in the factory of Mr. J. F. Porter, at Red Wing, and kept chemical control over the manufacture of the syrup and from time to time made analyses of canes selected from Mr. Porter's fields. Four different varieties of cane had been grown, namely: Early Orange, Folger's Early, Early Amber and Kenney's Early Amber. The seed of the first two varieties was received from the U. S. Department of Agriculture, and was the seed-heads of selected canes grown during the previous year, at Sterling, Kansas. The Early Amber seed was native grown and Kenney's Early Amber seed was obtained from Hon. S. H. Kenney, of Morrystown, Minn. It is a variation of Early Amber which originated with him. The Early Orange grew on rather the heaviest land and produced the largest stalks, but was quite green when frost killed it on September 27th. Folger's Early grew on black sandy loam produced large stalks and was within a week of being ripe when frost occurred. The Early Amber grew upon moderately light sandy loam at an elevation considerably above the other plots. The stalks were tall and slender and would have ripened within a few days when frost killed it on the 27th of September. Kenney's Early was grown upon the lightest soil and produced short, heavy stalks, none exceeding a height of six feet. It ripened about the 23d of September.

The canes from the selected Kansas seed produced very few suckers, but those from domestic seed suckered badly. All the seed was planted in rows  $3\frac{1}{2}$  feet apart and about 12 inches in the rows. Owing to the season the cultivation given was defective.

In the following tables I give the results of the analyses of selected canes and for purpose of comparison the results obtained at \*Sterling and †Fort Scott, Kansas, two places considered especially favorable to the production of sorghum.

In making comparison it must be borne in mind that the seed which produced the canes analyzed in Kansas had been especially selected according to scientific principles during three years previous, while the Early Amber seed with us had not been previously selected in any way.

To show how intelligent selection had affected their crop, I quote the record of results at Sterling, Kansas. The seed for the crop of 1888 was from canes, the seeds for which had not been previously specially selected, but the crops of 1889 and 1890 were from selected seed:

## \*FOLGER'S EARLY.

	Solids.	Sucrose.	Glucose.	Purity.
1888	15.62	10.66	1.88	68.24
1889	18.39	14.08	2.03	76.56
1890	18.85	14.28	1.19	76.89

## EARLY AMBER.

	Solids.	Sucrose.	Glucose.	Purity.
1888	15.00	9.50	2.35	63.34
1889	15.81	11.69	1.25	73.94
1890*	18.08	12.84	1.50	71.02

\*Unselected.

These results show the gradual and persistent improvement in the cane by the selection of the seed. But the seed for the Early Amber crop of 1890 was not specially selected and its improvement did not keep pace with that of Folger's Early where seed selection had continued.

\*Dr. Wiley's Report for 1890. Bulletin.  
 †29, Division of Chemistry, U. S. Department of Agriculture.

EARLY AMBER.

Date.	Lab'y No.	Solids.	Sucrose.	Reducing Sugars.	N-10 Alkali	Purity.
		Per cent.	Per cent.	Per cent.		Per cent.
September 15...	1204	15.20	9.21	3.14		60.59
" 16...	1220	14.70	9.20			62.58
" 17...	1236	18.40	11.81	2.27	.7	64.18
" 22...	1286	17.65	12.61	2.52	1.2	71.44
" 22...	1287	16.96	12.49	2.25	1.4	73.64
" 22...	1288	16.88	12.80	2.40	1.8	75.83
" 22...	1294	18.55	13.93	2.16		75.09
" 24...	1310	20.70	15.28	2.92		73.81
" 24...	1311	19.25	14.04	2.44	1.6	72.93
" 24...	1312	15.98	10.74	1.81	1.6	67.20
" 24...	1313	18.00	13.35	1.88	1.7	74.17
" 24...	1314	16.90	12.31	1.70	1.9	72.84
" 24...	1316	15.50	9.51	3.03	.9	61.35
" 24...	1317	13.78	7.47	4.12	.7	54.20
" 24...	1318	17.33	11.11	2.87	.8	64.10
October 1...	1318½	17.14	12.03	4.67	1.7	70.18
" 24...	1319	14.98	8.50	3.05	1.0	58.70
" 24...	1321	16.42	11.60	2.57	1.1	70.64
" 26...	1336	18.98	15.11	2.44	1.5	79.08
" 26...	1337	20.22	14.61	2.75	1.3	72.25
" 26...	1338	15.20	9.36	2.69	1.7	61.57
" 26...	1339	19.88	15.06	1.76	2.2	75.75
" 26...	1340	19.82	14.22	2.49	1.5	71.74
" 26...	1341	20.32	15.33	1.88	1.8	75.44
" 27...	1356	16.60	11.29	2.64	1.5	68.01
" 27...	1357	17.92	12.14	2.91	1.3	67.80
" 27...	1358	17.85	12.27	2.27	2.0	68.74
" 27...	1359	16.30	11.00	2.93	1.2	67.24
" 27...	1361	18.55	11.63	2.95	1.4	62.69
" 27...	1364	18.40	12.42	2.38	2.6	67.60
" 29...	1369	15.56	10.42	2.61	1.4	66.96
" 1...	1385	15.62	10.42	2.44	2.0	66.71
" 1...	1386	13.58	8.34	2.37	1.0	61.41
" 1...	1387	17.38	12.87	1.94	2.5	73.88
" 1...	1388	16.45	11.66	2.34	2.2	70.28
" 2...	1392	16.32	10.88	2.08	1.6	66.66
" 2...	1393	15.54	9.99	2.41	1.5	64.29
" 2...	1394	15.60	10.42	2.61	1.6	66.79
" 2...	1396	15.68	11.33	1.91	2.5	72.26
" 2...	1397	16.78	11.59	2.17	1.6	69.07

AVERAGES.

Date.	Lab'y No.	Solids.	Sucrose.	Reduc'g Sugar.	N-10 Alkali.	Purity.	Solids Not Sugar.
Sept. 5 to Oct. 2		17.01	11.76	2.42		66.99	
" 22 to Sept. 26		17.62	11.49	2.60		70.10	
Greatest.....		20.70	15.33	3.13		79.08	
Least.....		13.58	8.34	1.70		54.20	

AT STERLING, KANSAS.

Average .....		18.08	12.84	1.50		70.02	3.74
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AT FORT SCOTT, KANSAS.

Average .....		17.3	13.2			76.3	
Greatest .....		18.5	14.1			80.6	
Least.....		16.0	11.7			71.0	

## KENNEY'S EARLY.

Date.	Lab'y No.	Solids.	Sucrose.	Reducing Sugar.	Purity.	Solids not Sugar.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
September 22	1290	17.7	13.67	2.05	77.23	1.98
" 22	1291	18.42	14.09	1.78	76.49	2.55
" 22	1292	17.63	12.76	1.83	72.38	
" 22	1293	16.55	12.52	1.33	75.74	
" 24	1205	17.75	12.18	1.89	68.62	
" 24	1306	15.60	9.92	2.47	63.59	
" 24	1307	19.05	13.39	1.33	70.28	
" 24	1308	18.80	13.46	2.29	71.59	
" 24	1309	19.16	14.02	1.71	73.17	
" 26	1346	18.38	12.73	2.73	69.26	
Average.....		17.90	12.87	1.94	71.84	
Greatest.....		19.16	14.09	2.73	77.23	
Least.....		15.06	9.22	1.33	63.59	

## FOLGER'S EARLY.

September 16	1222	14.24	7.64		53.65	
" 16	1223	17.00	13.25		77.94	
" 27	1351	19.38	12.68	2.37	65.42	
" 27	1352	18.15	11.22	2.91	61.81	
" 27	1353	18.38	11.72	3.10	63.76	
" 26	1354	18.58	12.84	2.41	69.09	
Average.....		15.95	11.52	2.69	65.28	
Greatest.....		19.38	13.25	3.1	77.94	
Least.....		14.24	7.64	2.37	53.65	

## AT FORT SCOTT, KANSAS.

Average.....		18.40	13.5		73.40	
Greatest.....		19.40	15.6		80.40	
Least.....		15.80	10.7		67.70	

## AT STERLING, KANSAS.

Average.....		18.85	14.12	1.76	74.69	2.97
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Our analyses show that we produced sorghum the quality of which compares favorably with that produced in the localities considered naturally better adapted to sorghum. From seed which had never been specially selected we produced Early Amber of nearly as high average quality as that produced in Kansas from selected seed and the best of our cane was better than the best of theirs. In Kansas the production of sorghum is for the manufacture of sugar but with us it must be confined to the manufacture of syrup, with the production of sugar incidental. The manufacture of sugar from the sorghum has not yet proved entirely suc-

cessful anywhere and it will not be profitable for us to endeavor to make it prove so here. In addition to the causes which have operated infavorably elsewhere, our short season for working up the cane has been considered fatal to sugar manufacture here, but our results seem to indicate that this feature may not be a fault. Hard frosts occurred on the 27th, 28th and 29th days of September before any of Mr. Porter's cane had been cut. On the 29th the Early Amber was stripped and harvested and made into an excellent syrup. To study the effects of frost upon standing cane some rows were not cut down at all and analyses were made of sample canes from day to day. The averages of the daily analyses are arranged in the followeng tables:

## EARLY AMBER.

## BEFORE FROST.

Date.	Solid. Per cent.	Sucrose. Per cent.	Glucose. Per cent.	Purity. Per cent.	N-10 Alkali. c. c.	Solids not Sugar. Per cent.
September 22	17.51	12.98	2.33	74.00	1.5	2.20
Ratio.....	7.5	5.6	1.			
September 24	18.17	13.14	2.15	74.19	1.6	2.88
Ratio.....	8.5	6.1	1.			
September 26	18.80	13.49	2.21	71.13	1.9	3.10
Ratio.....	8.5	6.1	1.			

## AFTER FROST.

September 27	17.51	11.70	2.77	64.83	1.5	3.04
Ratio.....	6.3	4.2	1.			
September 29	15.56	10.42	2.61	66.96	1.4	2.53*
Ratio.....	6.	4.	1.			
October 1	17.42	12.27	2.14	72.08	2.3	3.01
Ratio.....	8.	5.7	1.			
October 2	16.23	11.46	2.04	70.66	2.	2.73
Ratio.....	8.	5.6	1.			
October 4	14.30		1.99			
Ratio.....	7.2		1.			
October 10	12.04		2.34		1.2	
Ratio.....	5.1		1.			

\*One cane.

Naturally a general decrease in the density of the juice occurred after frost, but that there was so little inversion of the cane sugar seemed quite remarkable. This may be explained from the fact that the temperature did not at any time after frost rise sufficiently high to permit of much fermentation.

By a comparison of the daily maximum temperatures after frosts for the past few years it is seen that this low temperature is not unusual. Through the kindness of Prof. O. Whiteman I have arranged the following table of maximum temperatures observed by him at Red Wing during the past six years:

Date.	1885	1886	1887	1888	1889	1890	1885	1886	1887	1888	1889	1890
September 18												35.6
" 19												
" 20												
" 21												
" 22												
" 23												
" 24												
" 25												
" 26												33.2
" 27					4.55							32.1
" 28					65.							32.2
" 29					67.2	49.4				28.2		
" 30				71.3	60.	55.2						
October 1					69.5	58.		31.4				
" 2		63.3			48.9	57.3		32.				
" 3		70.9			66.	58.6						
" 4		67.9			56.9	63.5	26.3					
" 5	42.8	71.4	59.1		63.	53.9	26.6		34.9			
" 6	50.1	72.2	64.		43.6	51.8	31.8					
" 7	52.8	77.5	68.9		41.	55.6						
" 8	51.2	77.	72.		48.	54.5	31.					
" 9	68.	73.	53.1		59.	59.4						
" 10	76.	75.5	48.4		50.	53.						
" 11	69.	75.5	46.		61.8	51.5						
" 12	58.9	67.7	59.		66.2	50.2						
" 13	53.1	76.	49.3		52.	62.						

Frost has not appeared to cause much injury to ripe cane in the vicinity of Red Wing, but no analyses have hitherto been made to show its effects. Many farmers have a practice of cutting their cane before it is ripe to save it from being frosted. In this way cane was cut last year while still quite upripe, as much as two weeks before frost occurred. As the greatest improvement in the quality of the cane occurs during the short period of ripening, a great loss is sustained by harvesting it while green.



Our results would show that the proper practice is to allow the cane to grow until it matures and not cut it while yet unripe in apprehension of frost. If, however, frost should occur, let it be cut, tied in small bundles, and piled in the shade in such a way that air can have free circulation throughout the piles. It should then be made up into syrup as quickly as possible. That this was the proper practice last year was shown by the results of Mr. Porter's own cane and lots from other parties. The best canes received last Fall were those which came in last and they made the best syrup, while the canes which were harvested while green made poor syrup and that with great difficulty.

#### STRIPPING CANE.

Many farmers have concurred that some improvement occurs by allowing cane to stand after being stripped, but such treatment really injures it. Cane should be harvested as soon as it is stripped and made into syrup immediately afterwards. Through a misunderstanding a number of rows of Mr. Porter's Early Amber were stripped on the 24th of September. To learn how this cane would compare with that not stripped, analyses were made of similar canes of both kinds. The average result of daily analyses of stripped cane follow, for comparison with canes not stripped refer to to the table on page 104.

## STRIPPED CANES.

## BEFORE FROST.

Date	Solids Per cent.	Sucrose Per cent.	Glucose. Per cent	Purity. Per cent.	N-10 Alkali c. c.	Solids not Sugar. Per cent.
September 24	15.94	10.03	3.67	62.46		2.24
Ratio.....	4.3	3.8	1.			
September 26	19.60	14.86	2.58	75.67	1.4	2.16
Ratio.....	7.6	5.7	1.			

## AFTER FROST.

September 27	18.4	12.42	2.38	67.60.	2.6	3.60*
Ratio.....	7.8	4.4	1.			
October 1	14.60	9.38	2.40	64.06	1.5	2.82
Ratio.....	6.	3.9	1.			
October 2	15.82	10.10	2.33	65.91	1.6	3.39
Ratio.....	6.8	4.3	1.			
October 4	13.54		2.88			
Ratio.....	4.7		1.			
October 10	13.87		3.23			
Ratio.....	4.3		1.			

\*One cane.

More glucose, less sucrose and lower purity resulted in the stripped canes and frost caused more damage to them than canes in their natural condition. But the effects of stripping cane were quite marked in the working of it in the factory. Cane which had been stripped was much more difficult to work up than the other, and this showed itself particularly in the evaporation of the juice to syrup. So that for all reasons it proved to be a wrong practice to let stripped cane stand.

#### RIPE STALKS AND SUCKERS.

Last season was very peculiar and one not favorable to the development of a sugar producing crop. Drought during the early part of the summer prematurely advanced the cane and a subsequent excess of moisture prevented perfect maturity and favored the growth of suckers. The great majority of the Early Amber canes had from one to six suckers, which, owing to the season, ripened but little later than the main stalk. Analyses of individual stalks and suckers growing from these showed there was not so great a difference in them as ordinarily. Analyses were made of other canes having no suckers and the results are compared in the following table:

	Solids. Per cent.	Sucrose. Per cent.	Glucose. Per cent.	Purity. Per cent.	Solids not Sugar Per cent.
1 Main Stalks.....	14.48	8.50	3.05	58.70	2.93
1 Suckers of same.....	13.78	7.10	3.94	51.52	2.74
1 Main stalk.....	16.42	11.60	2.57	70.64	2.25
1 Suckers of the same.....	18.02	12.62		70.03	
1 Main stalk.....	15.60	10.42	2.61	66.79	2.57
1 Suckers of same.....	14.00	7.71	2.96	55.07	3.33
Stalk. No suckers.....	20.22	14.61	2.75	72.25	2.86
" " " ".....	20.32	15.33	1.88	75.44	3.11

Few canes grew without suckers but when they did grow so they matured earliest and all analyses showed them to be the best. From conversation with many farmers I learned that the opinion prevails that canes with suckers are as good if not better than those not producing suckers, so that of course but few farmers suckered their cane.

All investigations upon this matter hitherto have shown that canes with suckers do not ripen uniformly nor as early as canes without suckers, and the quality of canes with

suckers is not as good. Our analyses gave the same results. Therefore instead of encouraging or permitting the growth of suckers they should be prevented.

#### VARIABILITY OF THE CANE.

Besides the analyses already recorded others were made of the cane of various farmers. They show the greatest variation in the composition of the juice and are quoted further on. This extreme variability of sorghum has been noticed everywhere. If it is hoped to make sorghum uniform in its quality and growth, care must be exercised first of all in selection of seed. With us this selection should be made early to secure (1) early ripening cane and (2) cane of high quality.

All experience shows that Early Amber is best adapted to our conditions and selections should be made from this variety. The earliest ripening canes which are of the highest quality can be secured best with the aid of analyses of the canes, but at Attica, Kansas, last year it was observed that certain external appearances indicate quite closely the ripeness and quality of individual canes. This is reported as follows:

\*"Special attention was given to studying the characteristics of the cane, showing that certain physical properties are associated with high percentage of sugar. By studying these properties carefully, it is possible for every farmer to go into his field and be able to determine with certainty whether his cane is ripe or not. The most striking of these properties is found in the last joint of the cane bearing the seed head. By stripping the cane of its covering a yellow coloration will be observed extending more or less along the length of the joint as the cane nears maturity. By the extent of this coloration one is able to select the very best or the very poorest canes in the field almost as accurately as though tested by a polariscope. *It is found that the cane which has the highest sucrose, lowest glucose, and highest purity has coloration extending one-half the length of the joint.* Should it be found to extend the full length it

\*Bulletin No. 29 Division of Chemistry, U. S. Department of Agriculture, 1890 page 24.

shows the cane has already commenced to deteriorate. On the other hand should no coloration be visible it shows that the cane is not yet matured. These observations have extended over one season of rather remarkable characteristics and hence they may not prove equally applicable to a crop grown in a season with the ordinary rainfall."

It has been observed as regards quality and ripeness that as a rule those canes having the smallest seed heads are of the best quality and reach maturity when the seed grains become hard and glistening. In the case of Early Amber the seed becomes black.

In selecting seed therefore choose canes which are free from suckers, ripen earliest, have the smallest seed heads and show by the coloration of the seed-head joint that they contain the most sugar and highest purity.

For the successful manufacture of syrup, to which we confine ourselves, it is as necessary to have good cane as for the manufacture of sugar.

As a commencement in the improvement of the Early Amber cane the seed of those canes which were the best last year have been planted this spring and selections of the canes for seed will be continued.

For the improvement of the cane it is necessary that better methods of cultivation should be obtained; but very little has been accomplished in this direction and it will not be necessary to discuss any methods of cultivation at present.

#### THE MANUFACTURE OF SYRUP.

During a few days at the end of the season of 1889 at Cannon Falls, I kept chemical control of the operations in the manufacture of syrup. Analyses were made (1) of the juice as it came from the mill, (2) after defecation, and as it enters the evaporator, (3) of the juice after it had passed one-fourth, one-half and three-fourths of the evaporator and (4) of the finished syrups.

The analyses showed great differences in the quality of the cane and of the syrup. Special attention was paid to the defecation of the juice and the working of the evaporator.

Defecation was not properly conducted but this was promptly corrected.

Many analyses showed that no inversion of the sugar occurred during the process of evaporation to syrup; the evaporator works well and with great rapidity. The records of three analyses were consumed with the Experiment Station building so that only a general statement of the results can be given.

In 1890 the investigation was continued in the factory of J. F. Porter, at Red Wing, but special attention was given to the cane itself. The results of the seasons work show that the chief cause for the variability of sorghum syrup is in the variable character of the cane. While not perfect, the mechanical features in the production of sorghum syrup, are far in advance of the agricultural ones. Improvement needs to be made in the nectary of the cane to secure a greater yield of the juice, in the defecation and filtering of the juice to make the quality of the syrup more uniform. But uniformity of the syrup now depends chiefly upon the character of the cane, its cultivation and subsequent treatment before arriving at the factory.

To show the variable character of the cane I quote the average results of the analyses of forty-four lots of cane raised by as many different farmers and the analyses of the best and poorest lots. This wide difference in the cane must be corrected before uniformity of syrup can be obtained. Some of the means to secure uniformly good cane have been suggested.

MILL JUICES.

	Solids. Per cent.	Sucrose. Per cent.	Glucose. Per cent.	Purity. Per cent.	Solids not Sugar. Per cent.	Lab'y No.
Average.....	15.10	8.52	8.74	56.54	2.84	
Best canes.....	15.86	10.87	2.38	68.53	2.61	12301
	16.00	10.62	2.72	66.37	2.66	1269
	15.68	10.53	2.46	67.15	2.69	1390
	15.42	10.51	2.73	68.15	2.18	1378
	17.15	11.93		68.48		1208
Poorest canes.....	14.70	10.77		73.26		1207
	16.22	4.05	6.95	24.97	5.22	1323
	15.40	6.19	5.25	40.19	3.96	1325
	16.48	7.17	3.90	43.50	5.41	1266
	9.25	4.84	4.10	52.32	.31	1398

The large amount of glucose in these canes is due partly to the unripe condition of the cane and partly to the cane having for some time stood in piles in such a way that fermentation and inversion occurred. When cane stands after being cut the piles should be made so that the air can have access and thus keep the temperature low. If the cane is kept at a temperature below 68° Fahrenheit so fermentation will take place. But for all reasons cane should stand as short a time as possible after being cut.

It was found necessary several times to leave the juice stand over night before being defecated. To learn what effect this might have upon the sugar some analyses were made the results of which follow:

	Sucrose. Per cent.	Glucose. Per cent.	Increase of Glucose.
No. 1288. ....	12.80	2.40	
After standing exposed 36 hours .....	12.19	2.59	.19
No. 1290. ....	13.67	2.05	
After 36 hours .....		2.09	.04
No. 1292. ....	12.76	1.83	
After 36 hours .....		1.92	.09
No. 1294. ....	13.93	2.16	
After 36 hours .....		2.22	.06
No. 1309. ....	13.02	1.71	
After 48 hours .....	13.80	2.64	.93
No. 1311. ....	14.04	2.44	
After 48 hours .....	13.99	2.44	
No. 1313. ....	13.35	1.88	
After 48 hours .....		3.58	1.70
Average increase of glucose after 36 hours.....		.095	
After 48 hours .....		.88	

These results showed that the juice suffered no injury by standing over night. It was therefore subsequently the practice to have the tanks full of juice in the morning. This saved a great deal of time in the morning following. But frequently it was necessary to run both day and night.

The fact that no appreciable inversion took place on allowing juice to stand exposed for 36 hours is of special importance to us should sugar production be undertaken. A large part of the loss in sugar making in more southern states results from the inversion of the cane sugar after the juice has been secured and during the process of manufacture. No such loss occurs with us. But for syrup production it is not especially important since the crystallization of sugar is not desired.

