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History and economic development of the sugar beet industry in the United States

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THESIS

THE HISTORY AND ECONOMIC DEVELOPMENT OF THE SUGAR BEET INDUSTRY IN THE UNITED STATES

by

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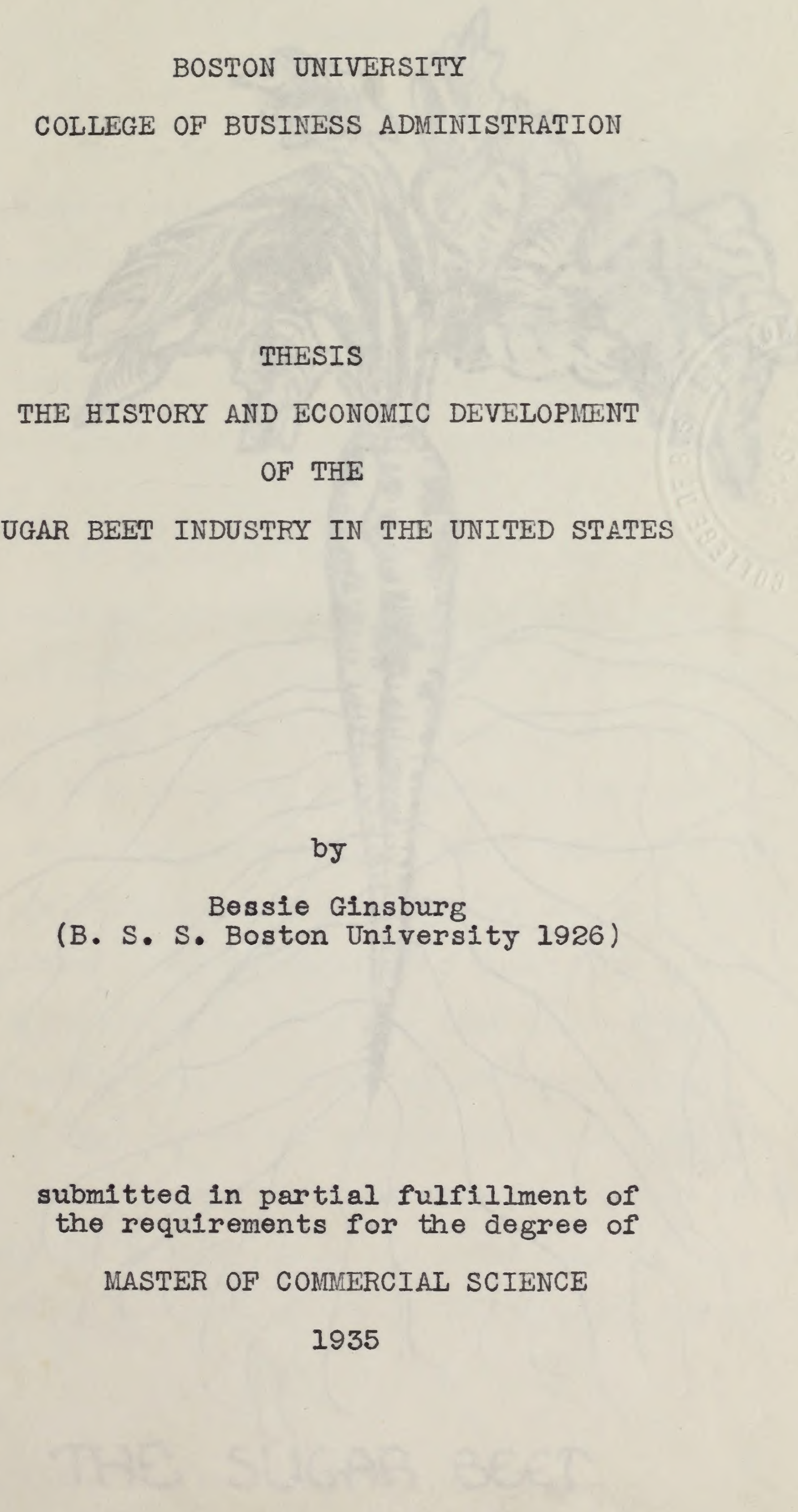

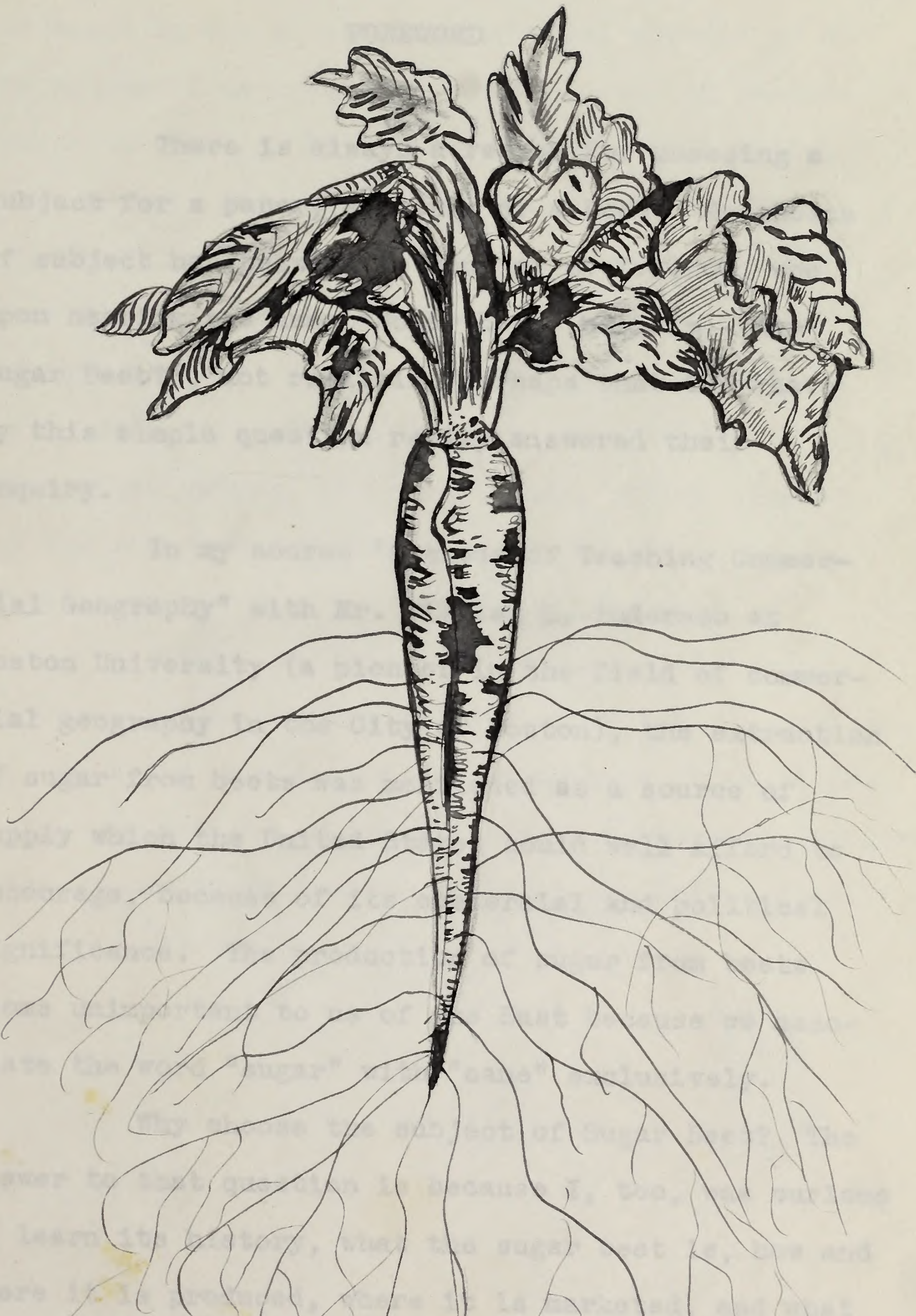

THE SUGAR BEET

FOREWORD

There is always a reason for choosing a subject for a paper, a thesis or a book. My choice of subject has puzzled so many of my friends, who upon hearing the name "Sugar Beet" exclaim, "Why Sugar Beet?", not realizing perhaps that they have by this simple question really answered their inquiry.

In my course "Methods of Teaching Commercial Geography" with Mr. William L. Anderson at Boston University (a pioneer in the field of commercial geography in the City of Boston), the extraction of sugar from beets was mentioned as a source of supply which the United States could well afford to encourage, because of its commercial and political significance. The production of sugar from beets seems unimportant to us of the East because we associate the word "sugar" with "cane" exclusively.

Why choose the subject of Sugar Beet? The answer to that question is because I, too, was curious to learn its history, what the sugar beet is, how and where it is produced, where it is marketed, and what

it means to our great United States, especially at this time of uncertainty, of stress and of political controversy. Is it a product of small individual farms? Are many people employed? Is it a seasonal industry? Does it require large capital investments? Is there a monopoly connected with its production? Is it a controlling factor in the price of sugar? Is the industry organized? Is this organization, if there is one, active locally in the interests of the industry as well as in Washington?

These and many other questions demanded answers, if not for the benefit of my curious friends, at least for me. In the following pages I shall develop the subject of the "History and Economic Development of the Sugar Beet Industry in the United States".

TABLE OF CONTENTS

Foreword Pages i-ii

Chapter I

Introduction Pages 2-7

Definition and food value--A subject of controversy both commercially and politically--Author's interest in the subject--Research material used.

Chapter II

Early History Pages 8-18

Discovery of sugar in beets--Research and experiments in Germany and France--Experiments fostered by financial assistance--Brussels International Sugar Convention in 1903.

Chapter III

History of Sugar Beet Industry in the United States Pages 19-31

Early stages marked by numerous failures and reverses--Success achieved from 1866-1888--Establishment of practical commercial enterprise--Further development through bounties, etc.--Most recent development.

Chapter IV

Sugar Beet Culture Pages 32-46

Description of sugar beet plant--Adaptability to northern climatic conditions--Cost of production vs. sugar cane--Climatic influences--Cultivation--Harvesting--Scientific research and promotion of agricultural education.

Chapter V

Chapter VI

Chapter VII

Chapter VIII

Chapter IX

Chapter X

Chapter XI

Chapter XII

Chapter XIII

THE HISTORY AND ECONOMIC DEVELOPMENT
OF THE
SUGAR BEET INDUSTRY IN THE UNITED STATES

CHAPTER I

INTRODUCTION

What is sugar? "Sugar is a sweet, crystalizable substance, colorless or white when pure, occurring in many plant juices, and forming an IMPORTANT article of human food;--called specifically 'cane sugar' and also 'saccharose' and 'sucrose'. The chief sources of sugar are the sugar cane and the SUGAR BEET, the completely refined products of which are IDENTICAL and form the loaf sugar, granulated sugar, etc. of commerce. Sugar is a food, and also serves as a condiment and preservative for other foods."(1) "It is a vital requirement of the human body; an energizer; stored-up heat."(2)

The definition of the term "sugar" is of extreme importance, especially the word "identical". It is known that there still exists among the general public as well as among many manufacturers of jam, confectionery, biscuits, condensed milk, etc., a

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(1) WEBSTER'S NEW INTERNATIONAL DICTIONARY, G. & G. Merriam Co., 1928, p. 2075

(2) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 43

prejudice against beet sugar.[1] Leading chemists, food experts, authorities in the Department of Agriculture contribute the following statements.

Dr. Carl L. Alsberg, when chief of the United States Bureau of Chemistry and Soils, was questioned relative to the comparative merits of beet and cane sugars. He said:

> "The ordinary sugar of commerce, regardless of whether it is made from beets or sugar cane, consists essentially of sucrose, and contains such extremely small amounts of substances other than sucrose that it is practically impossible to chemically differentiate cane sugar from beet sugar in such cases, especially in the case of high-grade sugars.
>
> "This Bureau has conducted certain experiments relating to the manufacture of apple and grape jelly, using commercial granulated beet sugar and commercial cane sugar under identical conditions, and no difference was found to exist in the finished products in any of their characteristics, so far as the use of cane sugar and beet sugar was concerned.
>
> "The highest grades of granulated sugar on the market reach an ideal state of purity so far as all practical purposes are concerned, and it is believed that where the highest grades of commercial granulated sugars are used there is no choice between beet and cane sugar." (2)

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(1) SCIENTIFIC DATA ON BEET SUGAR, Publicity Department of the Great Western Sugar, pp. 1-5.
(2) THE BEET SUGAR INDUSTRY OF MICHIGAN, OHIO AND INDIANA, Farmers and Manufacturers Beet Sugar Association, 1934, p. 2

Professor E. O. von Lippman, in "The Chemistry of the Sugars", states:

> "It is impossible to distinguish beet sugar and cane sugar from each other if both are in a perfectly pure form." (1)

A statement from The Report of the United States Tariff Commission to the President of the United States in 1926 is as follows:

> "The chemical composition of sugar is not changed by extraction and refining, and sugar from the beet root, when refined to the same degree as cane sugar, is identical in every respect with refined sugar from the cane plant." (2)

Dr. Edwin E. Slosson in his "Creative Chemistry" says:

> "Cane sugar and beet sugar are, when completely purified, the same substance, that is, sucrose, $C_{12}H_{22}O_{11}$." (3)

Mary Hinman Abel, author of Bulletin 535 "Sugar and Its Value as Food", of the United States Department of Agriculture, says:

> "The juice containing the sugar is extracted from the cane, beet., etc. From all these raw sugars the pure cane or sucrose as known to the chemist, can be

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(1) SCIENTIFIC DATA ON BEET SUGAR, Publicity Department of the Great Western Sugar Company, p. 5.
(2) Ibid, p. 5
(3) HOW CHEMISTS USE THE TERM "CANE" SUGAR, Publicity Department of the Great Western Sugar Company, p. 2.

> crystallized out, and in every case the sugar is identical in chemical composition, appearance, and properties.
>
> "Tests made at the California Experiment Station led to the conclusion that the two sorts of sugar were equally valuable for canning, and identical in their behavior of the same fineness of crystallization."(1)

It can be seen from the above definitions and explanations that the refined sugar from the sugar cane and from the sugar beet is identical in appearance, taste and food value. As sugar is a staple food, a source of supply is of great importance to any nation which must of necessity or desire become self-sufficient. We cannot produce sugar cane in quantity in the United States, but we can produce the sugar beet. Therefore, if we cultivate the sugar beet, we have a strong line of national defense against a shortage of a staple food due to any interference with its importation. It is a home industry and provides a livelihood for local labor, for the employment of capital, for promotion and stimulation of allied industries. It is a source of additional income

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(1) HOW CHEMISTS USE THE TERM "CANE" SUGAR, Publicity Department of the Great Western Sugar Company, p. 2.

through tariff regulations.(1) I have enlarged on this point in Chapter IX.

Because of the depression, every industry has suffered, and the Sugar Beet Industry is not an exception. The United States Government has attempted to alleviate this condition through the enactment and appliance of the Agricultural Adjustment Act of May 12, 1933.

In addition to the depression, this industry has also been adversely affected by the most destructive drought ever to occur in the United States. This drought has caused a tremendous amount of loss and suffering this past year--the summer of 1934.

My interest in this subject has already been partly explained in the Foreword, but in addition to this it is my intention first, to determine this industry's value to this country; second, to show the necessity of fostering such an industry in the United States; third, to show that its development is a definite guard against a shortage of a necessary food in times of stress; and fourth, to show how it

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(1) See Chapter IX, p. 84.

acts through competition with the other sources of supply as a price control.

My information has been obtained from books, government publications, periodicals, pamphlets of sugar companies, and direct correspondence--a list of which will be found in the bibliography at the end of this thesis.

CHAPTER II

EARLY HISTORY

The place of origin of the sugar beet is a matter of some doubt among historians, but all agree that it was found growing wild in southern and middle Asia, and it is generally conceded that it was cultivated by the ancients in Southern Europe and northern Africa. In the writings of Herodotus, the sugar beet is mentioned as being one of the plants which was used as food by the builders of the Pyramids, and according to Voltz, the Romans first brought the sugar beet into Gaul.(1)

At a later period the sugar beet was only a sweetish little white wild root that was considered just another weed by wine growers on the shores of the Mediterranean.(2) Its sweetness was known, but not a method of extraction; nor was the desire for its development manifested.

It was again heard of in 1605, but little was done with this knowledge as the sugar content was very

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 11
(2) SUGAR SCIENCE SIDELIGHTS SIMPLY TOLD, Great Western Sugar Co., p. 1

low and the method of extraction crude. This discovery was regarded as just another unpractical bit of information and was, therefore, not encouraged. In spite of this lack of utilization there followed almost two centuries of research and experiments, but with little success.(1)

Andreas Sigumund Marggraf, a Prussian chemist and physicist in the Royal Academy of Science and Literature of Berlin, is now credited with the discovery in 1747 of the existence of sugar in the beet root. He also demonstrated that sugar, containing the identical properties of cane sugar could be extracted from beets,(2) but he was able to extract only about 3% of the sugar content from the beet.(3)

Others, such as Jules Hélot, an eminent French authority, and Olivery de Serres, the great French agronomist, have been credited with its practical discovery, but authorities today credit Marggraf as the real pioneer.(4) Unfortunately the cost

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(1) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Co., p. 2

(2) THE ENCYCLOPAEDIA BRITANNICA, Volume 14, p. 879

(3) G. T. Surface, THE STORY OF SUGAR, p. 110

(4) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 3

of production was too high even though new sources of sugar supply were then essential to the European countries and in spite of the fact that various governments encouraged new experiments in this field.

Little was accomplished until 1784, when Franz Carl Achard, son of a French refugee in Prussia, who had been a pupil of Marggraf and later his successor in the Royal Academy of Science and Literature, obtained encouragement from Frederick the Great of Prussia. He invented a process of extracting sugar from the beet root on a larger scale than had ever before been possible,(1) and thus turned into practical account Marggraf's discovery. But, unfortunately, experiments with his theory and process by the French Institute in its two factories at St. Ouen and Chelles, France showed that the cost of production for commercial purposes was still prohibitive and he was ridiculed.

Nevertheless, he did not become discouraged and with additional financial aid from Frederick William III erected the first real beet sugar factory in the world at Cunern, in Silesia 1799-1801 where the

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 3

extraction of sugar from the beet root on a commercial basis was begun in 1802.(1) In addition to this factory, the king granted funds for the erection of similar factories in Brandenburg, Silesia, and Pomerania, but a number of technical difficulties were encountered.

It is possible that at this time, because interest in sugar beets was waning, the industry might have failed, but for the fact that it was markedly stimulated by the Napoleonic Wars (1805).(2) As a result of commercial restrictions, the supply was cut off from the West Indies and the price of sugar became prohibitive. Between 1807 and 1815 the price of sugar was about 30 cents a pound.(3) As this particular article of food was by this time no longer considered a luxury but a necessity, great hardships resulted among the people of Europe.

In the meantime Jules Delessert established a factory at Passy, near Paris, in 1801,(4) but not being satisfied with results from his work, abandoned

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(1) ENCYCLOPAEDIA BRITANNICA, Volume 1, p. 120
(2) Staples and York, ECONOMIC GEOGRAPHY, p. 199
(3) SUGAR INDUSTRY, Poor's Publishing Company, p. 12
(4) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 4

his efforts and experimented with methods of clarifying the juice, as it was his belief that he could improve upon Achard's method. After seven years he again opened his factory and, though he had many set-backs, he finally achieved some form of success.

Early in March, 1811, the Society for the Encouragement of National Industry submitted a report to Napoleon in favor of establishing factories in France for the production of sugar from sugar beet roots. Napoleon was greatly impressed and on March 25, 1811, issued the famous decree which resulted in the establishment of the French beet sugar industry.(1)

> "This decree directed that 79,040 acres of land in the various departments of the empire be devoted to sugar beet culture within a period of not more than two years. In addition the decree prohibited the further importation of sugar from the Indies after January 1, 1913, and appropriated one million francs for the establishment of six experimental schools in which pupils could be instructed in beet sugar factory operation, and provided for courses of lectures, for land owners and farmers, on subjects pertaining to sugar beet culture."(2)

Napoleon also visited Jules Delessert and, upon noting the success which had been achieved, ordered him to build ten new factories for the production

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 4
(2) Ibid, p. 4

of sugar from beet roots.(1) Napoleon encouraged this industry both financially and through legislative acts. His purpose was to make France self-sufficient to prevent any further sugar shortage, to substantially reduce the price of sugar, and at the same time, to encourage another home industry. He encouraged the growing of beets, the erection of factories, further study of technical problems involved in increasing the sugar content, and the extraction of sugar from the beets. As a result there were about forty factories in France by 1812.(2)

Napoleon's policy was copied by practically every Continental nation as well as by the United States, and his arguments favoring its support by the government are used even to this day by American sugar beet growers.(3)

Germany, meanwhile, continued her efforts to develop this industry and with the financial aid of the king, a school and model sugar beet factory was erected in January, 1812, to which students came from

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 4
(2) SUGAR INDUSTRY, Poor's Publishing Company, p. 12
(3) Ibid, p. 12

all parts of Europe.(1) They, in turn, upon their return to their native lands, helped spread this rudimentary skill in the production of sugar throughout the Continent of Europe.

After the downfall of Napoleon, his policies were discarded, and imported sugar was again admitted on the continent.(2) This almost proved disastrous to the sugar beet industry in France as only one factory survived. With the reign of Louis Philippe these factories were re-established and by 1837 there were five hundred and forty-two sugar beet factories in France.(3)

The industry was now again in full swing and the newest scientific methods were adopted, both as to culture and manufacture. The amount of sugar content in the beet had been steadily increased by seed selection, improved cultivation, and enlarged geographical distribution. Now beets from which less than 12% sugar could be extracted were not considered as a profitable source for manufacture.

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 4
(2) THE WORLD'S SUGAR SUPPLY: ITS SOURCES AND DISTRIBUTION, National Bank of Commerce of New York, p. 17
(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 4

The industry in Germany was also practically destroyed when the embargo against the importation of sugar was removed, which resulted in an influx of cane sugar. The sugar beet industry in Germany was revived in 1835 through the efforts of Krause of Austria and Schubath of Prussia.(1) By 1836 Germany had 122 sugar beet factories.(2)

Another factor which added impetus to the sugar beet industry was the world-wide emancipation of slaves which began in 1833 in the British Colonies and continued through succeeding decades.(3)

The arguments put forth by Napoleon for the encouragement, fostering, and protection of the sugar beet industry again prevailed, and the Continental countries enacted protective duties and granted direct and indirect bounties on the exportation of beet sugar.(4) France held the lead in production until 1880, at which time she was surpassed by Germany, who has held her foremost position ever since.(5)

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 5
(2) G. T. Surface, THE STORY OF SUGAR, p. 112
(3) Ibid, p. 28
(4) THE WORLD'S SUGAR SUPPLY: ITS SOURCES AND DISTRIBUTION, National Bank of Commerce in New York, p. 17.
(5) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 5

The production of beet sugar in proportion to the total sugar production of the world grew from 4% in 1840,(1) 15% in 1850,(2) 34% in 1870, 50% in 1889, to 55% in 1903.(3) It can easily be seen that with this increase in production, reduction in prices, and increasing exportations, the ruin of the sugar cane industry was again threatened as in the Napoleonic era. Many international conferences were held and finally an adjustment was reached by the Brussels International Sugar Convention which was put in force September 1, 1903.(4) This date is a landmark in the history of sugar.

All the principal countries of Europe except Russia were represented and Russia came in on special terms in 1907.(5) The convention did accomplish its purpose of equalizing the conditions existing between competitive countries by the abolition of direct and indirect bounties on the production and

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(1) THE WORLD'S SUGAR SUPPLY: ITS SOURCES AND DISTRIBUTION, National Bank of Commerce in New York, p. 17
(2) V. D. Reed, PRINCIPLES OF ECONOMIC GEOGRAPHY, p. 205
(3) THE WORLD'S SUGAR SUPPLY: ITS SOURCES AND DISTRIBUTION, National Bank of Commerce in New York, p. 17
(4) Ibid, p. 17
(5) Ibid, p. 18

the exportation of sugar. It also restricted the rate of import duty. This latter feature "led to the dissolution of the cartels, and coupled with a reduction of the excise tax in most of the important European countries signatory to the convention, except Austria-Hungary, brought about a reduction in domestic prices of sugar, and a rise in export prices."(1)

By 1911 the sugar beet industry had passed the older cane sugar industry in supplying the world's sugar needs, the production of cane being 9,432,118 tons, and of beet 9,587,588 tons.(2) The establishment at the Brussels Convention of a fairer competitive basis did not curtail sugar beet production which had steadily increased until the outbreak of the World War, but it did give the sugar cane industry the opportunity to develop. With the destructiveness of the war, the production of the sugar beet industry in Europe steadily declined until it now constitutes about 33% of the total production of sugar in the

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(1) THE WORLD'S SUGAR SUPPLY: ITS SOURCES AND DISTRIBUTION, National Bank of Commerce in New York, p. 17
(2) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, p. 2

world; from July, 1932 to July, 1933 the estimated beet sugar production in the world was 8,695,000 short tons as against a total estimated world production of sugar of 26,860,000 short tons.(1)

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(1) Staples and York, ECONOMIC GEOGRAPHY, p. 634

CHAPTER III

THE HISTORY OF THE SUGAR BEET INDUSTRY IN THE UNITED STATES

Over one hundred years ago, the sugar beet industry, which is so important today, was being established in the United States. Immigrants from Europe recognized the possibilities of raising their own beets for the extraction of sugar. They did not realize, however, that geographic locations, soil conditions, weather conditions, hazards of the new country, lack of finance, and lack of government subsidies were all bound together to defeat their aim. In Europe, from whence these farmers came, the cultivation of beets and the manufacturing of sugar developed to some magnitude and it was their desire to duplicate this success.

The necessity for a source of sugar is shown by the knowledge that during the Colonial days, the wealthy families who could afford to buy sugar, locked up their sugar bowls to prevent the servants from stealing the sugar.(1)

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(1) Staples and York, ECONOMIC GEOGRAPHY, p. 198

As a result of many drawbacks, the early stages of the development of the sugar industry were marked by numerous failures and reverses. The first effort to establish a factory was made in 1830 by Vaugh and Ronaldson in Philadelphia, but it did not survive and thus the sugar beet industry in the State of Pennsylvania ended.(1) In 1838 David Lee Child erected his factory at Northampton, Massachusetts, but shortly after abandoned it.(2)

In addition to the drawbacks mentioned there were other factors contributing to these failures, such as:

1. The indifference of the farmers to cooperate in the development of beet culture.
2. The lack of proper methods of farming.
3. The poor choice of location of sugar beet factories.
4. The lack of practical experience in operating a factory.
5. The high cost of production because of inadequate factories.(3)

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 5
(2) G. T. Surface, THE STORY OF SUGAR, p. 114
(3) Ibid, p. 116

It was about this time, 1838, that the Committee of Agriculture, which was under the jurisdiction of the United States Commissioner of Patents, issued a report, part of which stated:

> "From all the information which the committee have been able to obtain, they are induced to believe that no country in the world is better adapted for the production of sugar beets than most parts of the United States, whether we consider the soil, the climate or the people."(1)

Guadalupe Mirana and Carlos Beauboin, in a petition filed January 8, 1841, asked Governor Manuel Armijo, of the Province of New Mexico, for what, in later years, became known as the Maxwell Land Grant. One of the purposes for which this land was to be used was the raising of sugar beets. The Petition said:

> "We ask that your excellency have the kindness to give us a piece of land, with the intention of improving it, without damage to the Third Party (public), particularly for the purpose of cultivating the sugar beet, which we believe will grow well and abundantly."(2)

In 1851, John Taylor, later President of the Mormon Church, made an unsuccessful attempt to

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 5
(2) HISTORY AND DEVELOPMENT OF SUGAR BEET, Great Western Sugar Company, p. 3

establish the beet sugar industry in Utah.(1) The next known establishment of a factory was in 1863 by the Gennert Brothers of Illinois. This factory was moved several times to different sections of Illinois, then to Wisconsin, and finally it was dismantled and the machinery removed to California.(2)

As one reads of these tales of persistent failures, it is indeed surprising that any of the farmers continued to feel the desire to try and try again. They, however, had visions of a great industry, of success, of fine cities growing up in these backwoods countries.

Peter Magnes and L. K. Perrin of Colorado, and Otto and Bonesteel of Wisconsin were men of such vision.(3) While others were showing their preferences by seeking gold and precious minerals in the surrounding country, these men looked ahead and knew that a greater amount of wealth was stored in the ground and could be obtained, but only with hard work.

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 6
(2) Ibid, p. 6
(3) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, p. 1

This was indeed a prophecy, as during the first twenty-five years of mining in Colorado (1868-82) the production of gold, silver, copper and lead was valued at $194,989,802 whereas in the first twenty-five years of its incorporated history, one sugar beet company alone paid to the intermountain beet growers the sum of $378,442,259--nearly twice the mining figure.(1)

> "Had Peter Magnes been living in the decade, 1920-1930, he would have noted that Colorado's gold production ranged from 7 to 9 million dollars per annum, while Great Western cash payments to beet growers annually fell between 20 and 30 million dollars, of which two-thirds each year was paid in Colorado. Truly a prophecy come true."(2)

R. H. Dyer and C. S. Hutchinson organized a company in California and in 1869 persuaded Otto and Bonesteel, who had achieved some success in Wisconsin, to move their factory to California and there combine interests. After this organization was effected they began operations in 1870 of the first real successful sugar beet factory in the United States.(3)

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(1) A SILVER ANNIVERSARY WRITTEN IN GOLD, Great Western Sugar Company, pp. 2-3

(2) Ibid, p. 3

(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 6

With the fact established that sugar beets could be grown in the United States, and that factories could be successfully operated, the next problem to be solved was: How can the sugar content in the beet be increased? This involved a method of ascertaining the sugar content which was possible only through experimentation and laboratory tests. The first laboratory examination was made in Colorado by Professor Jacob F. L. Schirmer, metallurgist and chemist, who conducted an assay office in Denver.(1) He migrated with other scientists to Colorado in search of gold, but he felt that there were greater lasting possibilities in agriculture. He had obtained his knowledge in Germany where the industry had reached a high stage of development. He knew something of sugar beet culture and factory problems and he was, therefore, an invaluable aid to these ambitious pioneer farmers.

In a published letter of December 8, 1869 in which Professor Schirmer discussed the culture and manufacture of beet sugar, he prophesied the following:

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(1) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, p. 2

> "In conclusion I will say that our climate and soil are well adapted for the culture of the beet and that it is my honest belief that no other country on the face of the globe has equal advantages if a proper system of irrigation is inaugurated. The construction of ditches is only a small item compared with the country of Louisiana. Our coal is equally as good and perhaps better for evaporating purposes than Bituminous coal or Anthracite. In short, there is nothing to hinder Colorado from becoming the greatest sugar producing state in the world."(1)

Other states were trying to achieve similar success but to no avail, until the second successful factory was established in California by Claus Spreckels, the Hawaiian sugar king, in 1888.(2) In this same year a real impetus was given to the sugar beet industry as a commercial enterprise by the success achieved in a factory erected in Nebraska by the Oxnard Brothers. Later they built two more factories, one in Nebraska and the other in California. During this time Thomas E. Cutler and his associates established a factory in Utah.(3)

Now the farmers of the Eastern section of the Rocky Mountains were not to be laggards. They

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(1) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, p. 4
(2) G. T. Surface, THE STORY OF SUGAR, p. 116
(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 6

had established this industry in 1898 through the efforts of an organization called the Michigan Sugar Company. This company combined in 1903 with the Bay City Sugar Company, and it is now known as the Michigan Sugar Company.(1)

During the time that Colorado still had a territorial form of government, a Bounty Bill was introduced in the territorial legislature (1872) offering a bonus of $10,000 for the first corporation, person or persons:

> "who shall erect a manufactory and refinery for the purpose of manufacturing sugar from beets at a cost of not less than $50,000, and with a capacity of producing two thousand pounds of sugar per day, and shall manufacture from beets grown within the limits of this territory at least two hundred barrels of good merchantable sugar."(2)

The measure was defeated by one vote. Today there is hardly a factory that is valued at less than a million dollars. This defeat, however, did not discourage the sugar beet enthusiasts.

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 6
(2) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, p. 4

The next definite step was the formation of the first promotion company in Denver, Colorado, on February 23, 1872 for the purpose of building a beet sugar factory.(1)

In order to stimulate the growing of beets, prizes were offered as incentives at the fairs and special papers were read by sugar beet cultivators and scientists who had been experimenting and improving the appearance, size, and sugar content of the beet. That there was an active interest in these pursuits, is attested by the fact that in 1879 when the Colorado State Agricultural College was founded, in addition to its chief objectives of imparting general and agricultural knowledge to students, the testing of crops, particularly beets, was undertaken. In 1888 this research work was turned over to the Colorado Experiment Station which had been established in connection with this college.(2) The farmers in the Arkansas Valley, in the San Luis Valley, and on the western slope of the Rocky Mountains were acquainting themselves with the problems of the sugar crop through the efforts of these scientific researches.

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(1) HISTORY AND DEVELOPMENT OF SUGAR BEET, Great Western Sugar Company, p. 5
(2) Ibid, p. 5

Independent of these efforts, the residents of Grant Junction were making headway with their own factory. About this time Charles M. Cox, a promoter, became interested, particularly in view of an offer made by the commissioner of Mesa County of "a bonus of one per cent of the capital invested in a sugar beet factory in that country, provided the cost of same should not be less than $350,000."(1) This offer was later increased to three per cent. Mr. Cox obtained the necessary pledges from the owners of beet acreage and he also interested capital in a project for factory construction. After years of agitation and discussion Charles Boettcher and his associates built and operated a factory at Grand Junction.(2) In 1899 it sliced 6656 tons of beets which produced 6600 sacks of sugar. From that time on the progress of this industry in Colorado alone is a remarkable record of promotion and accomplishment.

Invaluable aid was given by Henry Havemeyer of New York who had tremendous financial interests in cane sugar refining. Instead of throttling this

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(1) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, p. 5

(2) A SILVER ANNIVERSARY WRITTEN IN GOLD, Great Western Sugar Company, p. 4

new competitive industry which was threatening his cane investments, he lént financial and technical assistance and may be thus also credited with being a pioneer in its large scale production development. He was the first president of the Great Western Sugar Company, an office to which he was elected on January 31, 1905.(1) This company has grown to such proportions that in recent years it has produced annually over half of the beet sugar output of the entire United States.(2)

More recent developments show that from 1896 to 1901 forty-one sugar factories were erected in the United States, seventeen of which failed later.(3) During the next thirty years this industry grew, sometimes to falter, but nevertheless steadily on until now there are about one hundred factories in the United States, and over 1,000,000 acres of land devoted to the production of sugar beets annually. The sugar extracted from sugar beets amounts to from 20% to 25% of all the sugar consumed in the United States.(4)

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(1) A SILVER ANNIVERSARY WRITTEN IN GOLD, Great Western Sugar Company, p. 5
(2) Ibid, p. 5
(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 6
(4) Ibid, p. 6

In addition to the development of the beet, its cultivation, manufacture, and the increase of sugar content, there has been intensive scientific research toward the utilization of its by-products, which have provided farmers with extra revenue and feed for their live-stock.(1) Newer methods, better machinery, and large scale production were all incorporated in this industry's growth.

Of course, it must be kept in mind that the industry could not have survived against competition without protective tariffs imposed by the government.

These and other important factors, including the Sugar Section of the Agricultural Adjustment Act approved May 12, 1933 and its amendments, are discussed in later chapters under their respective headings.

In connection with the history of this industry in the United States, it is interesting to note, first, the size to which it has grown; second, the number of plants established in the different states; and third, the daily slicing capacity of each factory. The following is a brief resumé:(2)

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(1) HISTORY AND DEVELOPMENT OF SUGAR BEET, Great Western Sugar Company, pp. 7-8

(2) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, pp. 7,8,9

LOCATION OF BEET SUGAR FACTORIES(1) IN THE UNITED STATES, 1933

TOTAL NUMBER OF PLANTS, 100

DAILY SLICING CAPACITY, 132,900 tons of beets

	Total Number Of Plants	Daily Slicing Capacity
California	8	15,600 tons
Colorado	18	31,050
Idaho	9	9,650
Indiana	1	1,100
Iowa	3	3,000
Kansas	1	1,000
Michigan	16	18,200
Minnesota	2	2,200
Montana	4	6,550
Nebraska	7	11,975
Nevada	1	500
Ohio	5	5,550
South Dakota	1	1,000
Utah	15	14,625
Washington	1	1,000
Wisconsin	3	2,100
Wyoming	5	7,800
Total	100 plants	132,900 tons

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, pp. 7,8,9

CHAPTER IV

SUGAR BEET CULTURE

What is a sugar beet? I have found that many people have a vague idea of the appearance of a sugar beet. The sugar beet is a long tapering white root, resembling a turnip, rather than the plump, red vegetable it is often thought to be. The size, shape and color of the beet is the result of a century of scientific research.[1]

The following description seems to me to be the clearest I have been able to find and I am, therefore, giving it below:

> "The sugar beet, known botanically as 'Beta vulgaris', is the most important member of the Chenopdiaceae family.
>
> "The 'beet' itself is, for the most part, an enlarged tap root, white in color, which extends almost straight downward, to a depth of from two to six feet, gradually diminishing in diameter until it becomes thread-like in size. The first six inches of the root are almost free of side roots. Below this point, however, an extensive and elaborate system of lateral roots and rootlets is developed. The upper lateral roots extend, almost horizontally, to a distance of from two to three feet.

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(1) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933.

> "The foliage has a rich, brilliant green color and grows to a height of about fourteen inches. The oldest leaves are on the outside, the youngest toward the center. Each leaf has prominent veins and a long petiole which broadens out at the base; the blade is large and roughly triangular in shape at the base, and longer than broad."(1)

I was interested to read in a local newspaper that a farmer in Hastings, Nebraska, raised a beet measuring twenty-two inches in circumference.(2) Size is not synonymous with quality, but is an unusual news item.

Originally the sugar beet was grown in southern latitudes and was an annual. When it was found that the beet would adapt itself to climatic conditions, it was gradually brought further north and became a biennial. Other things being equal the further north the beet can be brought the higher the sugar content. As a biennial it produces a thick fleshy tap root during the first year and in the following season a tall branched, leafy, flowering stem which bears seeds.(3) This change from an annual to

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 11
(2) UNUSUAL BEET, Boston Globe, November 12, 1934
(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 11

a biennial is a very important economic factor, as the beet is removed and harvested during the first year of growth when the sugar content is at its highest.(1)

Through scientific research the sugar beet was converted from a product of the sub-tropical zone to a product of the temperate zone. With the greatest part of the United States in the temperate zone, it must follow that with our large areas of land adaptable to the sugar beet, a substantial expansion would be practicable.(2)

The cost of production naturally fluctuates under the different conditions in the different areas. There can be no question, however, that the cost of producing a pound of sugar from beets is greater than the cost of producing an exactly similar pound from cane. This is primarily due to the intensive cultivation necessary and the large amount of manual labor required in the growing of sugar beets. This is, therefore, one of the reasons that the sugar industry must be protected through tariff against imported sugars if it is to survive.

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(1) ENCYCLOPAEDIA BRITANNICA, Volume 3, p. 316
(2) ENCYCLOPAEDIA BRITANNICA, Volume 9, p. 465

From the standpoint of sugar-beet production, the United States may be divided into three fairly distinct areas because of differences in the climatic or cultural conditions. These distinct areas are:

1. The humid area, located in the North Central States, producing 30% of the total crop.
2. The Mountain States area, producing 60% of the total crop.
3. The Pacific Coast area, producing 10% of the total crop.(1)

Sugar company publications, association magazines, and newspapers are filled with weather reports which are eagerly scanned by the sugar beet interests. Changes in weather may make the difference between success or failure of a crop. In order to prevent a complete collapse of the sugar industry in any one area or state through adverse weather conditions, a policy of geographical diversification was adopted early.(2)

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(1) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 2
(2) SUGAR BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 4

This policy proved wise, as it assured a company of a supply of beets for refining from several sources and prevented a financial failure. If, for example, a factory did not operate in Colorado, because of a crop failure, another plant of this same company situated in California or Utah would perhaps have had an exceptionally large crop and by this method of distribution of sources and factories, an output would be approximately maintained.(1)

The growing season of the beet is about six months, with an average temperature of 70°(2) for the three months and only a slightly lower average for spring and fall. The best quality of beets would result from their cultivation under the following conditions.

> "An abundant winter rainfall.
> An average spring rainfall distributed in local showers, with a large percentage of days of sunshine.
> An average rainfall during June and July, interspersed with hot sunshine.
> Drier conditions in August and September.
> Dry and cool weather during October and November."(3)

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(1) SUGAR BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 4
(2) Ibid, p. 2
(3) G. T. Surface, THE STORY OF SUGAR, p. 99

Because of the difficulty in attaining the ideal conditions mentioned on the previous page, the best results are obtained by irrigating the large areas of arid and semi-arid lands which are suitable for beet raising.

There are still two other factors which must be given serious consideration: winds and hail storms. It is necessary to harrow the beet fields immediately after rain in order to prevent injury by wind. The redeeming point in favor of this industry is the ability of the beet to recover after wind or hail storms have damaged the crop.(1)

In the actual cultivation, the soil should have good depth, a fairly high organic content, adequate drainage, and high moisture-holding capacity.(2) The ground must be systematically plowed deep, not only for the purpose of stirring the soil to make available a large supply of plant food, but also for the preparation of an adequate root bed in which the plant can develop without hindrance.(3) The fertilizer must

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(1) SUGAR BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 4
(2) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 4
(3) G. T. Surface, THE STORY OF SUGAR, p. 103

be spread and worked down to a smooth seed bed by disking, harrowing, leveling, dragging, and rolling.

Advantage must be taken of the general and prevalent rain conditions as the ground must be moist enough to germinate the seed. If the rain is insufficient, then the beets should be watered by means of irrigation from two to five times a season, depending upon local needs.(1)

The sugar beet seeds are usually imported from Germany(2) by the sugar companies, who in turn sell them to the farmers. This is important as it is to the companies' advantage to procure and supply the farmers with the seeds best adapted to their needs, if they are to grow beets with the highest possible sugar content.

The seed of the sugar beet which is sold commercially is really a "seedball" containing a number of germs,(3) and is planted in April and May in the Central and Rocky Mountain States, and in February and March in California. For the best results

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p. 24
(2) Packard, Sinnott, and Overton, THE NATIONS AT WORK, p. 89
(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart At End Of Book

it is believed that the soil reaction should be slightly alkaline. The light and intermediate loams are best adapted to sugar-beet culture, as they are more easily handled, are least subject to serious crusting, and furthermore, these soils usually produce better crop yields than other types.

An ideal beet field is one having a good depth of a fertile soil underlaid by a subsoil of medium structure. Such soils permit slow and ample drainage of excess water, sufficient root penetration, and an ample depth of feeding area for the plants.(1)

Science and engineering here work hand in hand. The soil is scientifically conditioned. A trained expert is assigned by the factory, which supplies the seed and to which the grown beet will be delivered, to give advice to the beet farmer long before planting begins. Samples of the soil are tested and the deficiencies are noted and corrected as soon as possible. The factory expert is expected to call at the farm three times a week the year round and in this way guard and advise the farmer for the farmer's

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(1) SUGAR-BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 5

benefit as well as for the ultimate profit to the factory.(1) It is to his advantage that the farmer be successful and it is to this end that all concerned must and do cooperate.

The seed is drilled in continuous rows sixteen to twenty-four inches apart with one or more seedlings every two inches in the row. In general, the sugar companies recommend from fifteen to twenty pounds of seed per acre, depending upon the climate, soil conditions, and spacing of rows.(2)

A few weeks after planting seedlings appear in solid rows and thorough cultivation begins--usually horse-drawn cultivators are drawn between the rows. When the fourth seedling leaf appears, the rows are bunched or blocked with a hoe by chopping out some of the plants, so that small clusters of two or more seedlings are left about ten to twelve inches apart.(3)

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(1) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 42

(2) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 16

(3) SUGAR INDUSTRY, Poor's Publishing Company, pp. 23 and 24, and
THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart At End Of Book

The next operation necessitates a great deal of hand labor. It is the thinning process, where men moving down the rows on hands and knees leave single beets in the ground every 10 inches in the row.(1)

The beet is a crop which requires constant cultivation during the early part of the growing season to conserve the moisture and kill out the weeds and grasses.(2) Hand hoeing is necessary to keep these beet fields free from weeds. The number of cultivations given following thinning is determined by the rainfall and the weeds that start.(3) Cultivation is continued until the leaves cover the ground between the rows, during which time the sugar beet has developed an elaborate and extensive root system. The growing season averages about one hundred and seventy days.(4)

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(1) SUGAR INDUSTRY, Poor's Publishing Company, pp. 23 and 24, and
THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart At End Of Book
(2) G. T. Surface, THE STORY OF SUGAR, p. 103
(3) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 16
(4) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart

Harvest time arrives. The beginning of the harvest is determined by the purchasing company's announcement of readiness to receive the beets. The date is governed by the ripeness of the crop as determined by samples which have been sent to the factory.(1) Many factors such as the following have to be taken into consideration:

1. To get the maximum amount of sugar (at least 12%) from the beet;
2. To prevent new growth in case of further rainfall causing the sugar content to spoil;
3. To keep the factory running steadily by as continuous a supply for as long a time as possible.(2)

Some factories refine cane sugar during the time when beet sugar factories are usually idle, but very few avail themselves of this method of keeping busy.(3)

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p. 24
(2) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 23
(3) G. T. Surface, THE STORY OF SUGAR, p. 132

The beets are loosened from the lateral root system and lifted by means of horse-drawn or tractor-drawn beet lifters. They are then pulled by hand and the adhering dirt is knocked off. Care must be taken not to break the ends and leave them in the ground. Science has evolved the size and the shape, but care must be taken in harvesting the beet to take advantage of these improvements if the best results are desired.(1)

In the next step the tops and crowns are severed from the tap root at the base of the leaves and either fed directly to cattle on the fields or siloed and fed to the livestock elsewhere. The topped beets are then thrown into piles from which they are moved by trucks or railroad to the sugar factory yards. If the topped beets are left on the fields waiting to be transported to the factory, there is a distinct loss in weight depending upon the weather. This shrinkage is partially prevented by carefully covering the beets with a liberal supply of beet tops or soil.(2)

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart at end of book.

(2) SUGAR-BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, pp. 30-31

An important feature is the large amount of manual labor required as the culture of sugar beets has resisted to a great degree mechanization.(1) Recent improvements in the design for harvesting and topping machines indicate that the outlook is encouraging for the development of practical mechanical devices.(2) Even by employing Mexicans and other poorly paid laborers, farmers need the tariff barrier to foster profitable operations. In spite of employing cheap labor, the United States stands out conspicuously, among the countries of the world, for the high scale of wages maintained.(3)

Because of scientific research and promotion of agricultural education as has been previously pointed out, the farmers employ a policy of plowing back earnings for sound expansion.(4) They are all cooperating to the ultimate aim of procuring the best grade of beets, which will be uniform in size and have the highest possible sugar content per beet with

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p. 24
(2) SUGAR-BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 31
(3) G. T. Surface, THE STORY OF SUGAR, p. 108
(4) A SILVER ANNIVERSARY WRITTEN IN GOLD, Great Western Sugar Company, p. 6

the greatest yield per acre. To this end the system of rotation with other crops is employed. This method is for the purpose of restoring fertility to the soil. The sugar beet is not "hard upon the soil"(1) as one would think. It cannot be expected that every soil will indefinitely continue to successfully grow the same crop without supplying some kind of fertilizer through a method of rotation which will supply the inevitable deficiency. As a matter of fact, the long tap roots left in the ground play their part toward conditioning the ground.(2)

The manure of cattle grazing on the beet tops provides essential fertilizer for restoring fertility to the soil. This practice has been the means of developing tremendous livestock feeding operations which furnish an additional source of income to the farmers.

The chief purpose of rotation is to add organic matter to the soil by the proper selection of substitute plants. Experience, research, and experiments have shown which are suitable for this purpose.

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(1) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 11
(2) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 66

There are other main reasons as enumerated below:

> "Proper rotation permits the economical utilization of the condition of the soil as left by the preceding crop.
>
> "Proper rotation increases the profits by an elimination of work.
>
> "Proper rotation protects the crop to a very considerable extent against insect pests, weeds, and plant diseases."(1)
>
> "Rotation of crops, that sequence in which the pull of each succeeding crop is mainly on different elements of fertility and at different soil levels is the ideal desired."(2)

Of the various green-manuring crops, red clover, sweetclover, alfalfa, barley, oats, corn, beans, potatoes, and wheat are used. A properly planned rotation gives ample time between removal of one crop and the planting of the next for thorough preparation of the soil.(3) Since the profit of the beet crops of the future depends, to a large measure, on the conservation of soil fertility, the importance of scientific rotation is evident.

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(1) SUGAR-BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 7
(2) SUGAR SCIENCE SIDELIGHTS SIMPLY TOLD, Great Western Sugar Company, p. 7
(3) SUGAR-BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, pp. 7-8

CHAPTER V

FACTORY PROCESS AND REFINING

Sugar beet factories are of necessity located near large producing areas. One very important reason for this is that the cost of the transportation of beet bulk would preclude any possibility of earning profits.(1) It is less expensive to pay transportation on the packed, refined sugar. Another reason is to avoid a loss in sugar content which occurs when beets are stored for any length of time after harvesting. Factories must be designed in such a manner as to handle an entire crop in a single season.(2) In order to keep the factories busy as long as possible, the better plan is to stagger the cultivation and harvesting seasons.

The cost of erecting a factory varies greatly, but it is estimated that it may be built for a cost of from $750,000 up to several million dollars.(3)

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p. 24
(2) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 41
(3) BEET SUGAR: A BRIEF DESCRIPTION OF THE PROCESS OF MANUFACTURE, Bureau of Plant Industry, p. 1

The location of a factory site depends upon a steady supply of beets, an abundant supply of pure water, an adequate supply of cheap fuel, and sufficient supply of lime rock. An available supply of cheap labor is of great consequence in this seasonal industry. More specific details of the labor problems will be developed in Chapter VIII under "Labor Problems".

The erection of factories has naturally involved intensive scientific research. This research was necessary for sound expansion, otherwise factories would have been built which might have proved inadequate or, on the other hand, they might have been expanded to such a size as to make it unprofitable to operate them because of an insufficient supply of beets. A factory must operate at maximum capacity for a continuous period of not less than one hundred days.(1)

Another essential of the industry is the extraction of all the sugar possible from the beets. After this has been completed, the residue is utilized for by-products. It is with this end in view that extensive research work has been and is being carried

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(1) BEET SUGAR: A BRIEF DESCRIPTION OF THE PROCESS OF MANUFACTURE, Bureau of Plant Industry, p. 1

on in factories, both here and abroad, and in the research departments of many colleges and government divisions. The United States has made remarkable strides in the right direction as is witnessed by the construction of the great Johnstown plant which is considered by technologists as one of the "wonders of the world's sugar industry".(1)

During the brief stay of the sugar beet in the factory, some of the most remarkable examples of human ingenuity and efficiency have come into play as sugar refining calls for skill, scientific and technical control, in order to extract the greatest quantity of pure sugar.(2)

We will now pick up the thread left near the end of the previous chapter when the beets, having been severed from their roots, pulled up by hand from the ground, topped, roughly cleaned, and placed in large stacks on the fields, were conveyed by trucks or by railroad to the sugar beet factory yard. Here they are weighed and stored in enormous piles. As the beets are needed, they are washed of such foreign

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(1) HISTORY AND DEVELOPMENT OF SUGAR BEET, Great Western Sugar Company, p. 8
(2) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 40

matter as earth, sand, small stones. This is accomplished through the use of automatic trash, sand, weed, and stone catchers in a header flume.(1)

A beet wheel lifts the sugar beets from the flume and discharges them into the beet washer which is a horizontal, semi-cylindrical tank with rotating paddles which keep the beets moving and washed through constantly changing clean water. These beets are then discharged on a picking table and cleaned by hand of any clinging dirt.(2) This is the last time that human hands touch the beet until it is bagged as sugar or discharged as residue.

The cleaned beets are automatically weighed on large scales which are capable of handling one thousand pounds of sugar beets at one time.(3) They are then dropped into slicers with V-shaped knives which cut the beets into thin V-shaped strips, several inches in length and known as "cossettes". These cossettes are carried by endless belts to the diffusion battery, which consists of a series of eight to fourteen

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(1) BEET SUGAR: A BRIEF DESCRIPTION OF THE PROCESS OF MANUFACTURE, Bureau of Plant Industry, p. 1
(2) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart
(3) Ibid, Chart at end of book

large cylindrical iron vessels with connecting heaters. These units can each hold from three to five tons.(1) The slices move from one cylinder to another while clean warm water flows continuously through them. With a temperature beginning at 45° in the first unit, it is raised to a maximum of 80° to 85° in the last.(2) During this time the cossettes are broken down and the sugar is extracted. The remaining pulp is dropped from the last unit into tanks, either for further reprossessing through special methods or for utilization as by-products. Meanwhile, fresh beet slices are dropped into the first cylinder in order to assure the steady operation of the machines.(3)

The juice containing the sugar is drawn off and pumped into a measuring tank.(4) It is now ready for the refining process in which the sugar is separated from the so-called impurities. Otherwise the crystallization of the sugar would be impossible.(5)

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(1) SCIENTIFIC DATA ON BEET SUGAR, Great Western Sugar Company, p. 3
(2) STAPLES AND YORK, ECONOMIC GEOGRAPHY, p. 206
(3) BEET SUGAR: A BRIEF DESCRIPTION OF THE PROCESS OF MANUFACTURE, Bureau of Plant Industry, p. 1
(4) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Sugar Beet Association, Chart at end of book.
(5) SUGAR SCIENCE SIDELIGHTS SIMPLY TOLD, Great Western Sugar Company, p. 3

The purification of the juice is considered by the refiners to be the most interesting process of sugar manufacturing, as it is estimated that the juice contains over four hundred organic and inorganic compounds in addition to the pure sugar.(1) This juice is passed through alternating tanks and filter presses to which milk of lime, carbon dioxide gas, carbon dioxide gas again, and sulphur gas are introduced in order. Meanwhile the heat has been raised from 85° to almost the boiling point.

The juice is then heated again and pumped into great evaporators which are commonly known as "effects" or "multiple effects".(2) In these evaporators the juice is boiled down to a heavy syrup containing from 50% to 60% of sugar. It is estimated that in an average factory over 2,400 tons of water are evaporated during the refining process.(3)

In the next refining step the thick juice is pumped into another tank where it undergoes a further treatment with sulphur dioxide gas and then

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart

(2) BEET SUGAR: A BRIEF DESCRIPTION OF THE PROCESS OF MANUFACTURE, Bureau of Plant Industry, p. 2

(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart

passes through another filter press into the thick juice storage tank. From here it is pumped to the vacuum pan where the clean juice is evaporated under reduced pressure until a mass of sugar crystals has been formed. As the operation is carried on, the crystals become larger in the pan. This step is conducted under the expert supervision of sugar boilers who can at this time regulate the size, evenness, and hardness of the grain of the resulting sugar.(1)

The sugar is carefully examined under a special blue tint lamp and each pan is sampled, numbered and graded. Any sugar grading under the factory's fixed high standard is remelted and reprocessed.(2) When the maximum amount of sugar has been realized, the crystals and remaining juice are sent through the centrifugals which contain machinery for keeping the contents constantly stirring. The separation of the crystals from the syrup is accomplished in these centrifugal machines.

The centrifugal machines whirl the crystals at a tremendous rate of speed (one thousand revolutions

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(1) SCIENTIFIC DATA ON BEET SUGAR, Great Western Sugar Company, p. 3

(2) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, Inside Advertising Flyer

per minute) against a screen which filters out the syrup and holds back the pure white sugar.(1) The crystals are again washed by spraying water in the basket while the basket is revolving. From here the moist sugar goes to the dryers where the sugar is simultaneously tossed over and over while hot, dry air is drawn through the granulator.(2) This makes the sugar emerge perfectly dry, and in granular condition, ready for the storage bin, from which it automatically drops through scales into containers or bags moving along on conveyers. As the bags are filled, they are quickly sewed with special machines and removed to the storage warehouse, ready for marketing.(3) It is important to repeat here that a careful study of this brief description of the manufacure of sugar will confirm the fact that once the beet enters the slicing machine until the sugar is sealed in the bags, it is not touched by human hands. Cleanliness must and does prevail in the refining plants.(4)

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(1) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart

(2) BEET SUGAR: A BRIEF DESCRIPTION OF THE PROCESS OF MANUFACTURE, Bureau of Plant Industry, p. 2

(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart

(4) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, Inside Advertising Flyer

Now to return to the point where the waste syrup is spun off from the centrifugals. This syrup is now known as beet molasses. It is reprocessed and additional sugar is recovered.(1) The syrup remaining is the molasses known as a by-product and is discussed in Chapter VI, "By-products and Their Utilization".

Great strides have been made in the development of molasses desugarizing refineries, which have made it possible to secure a superior quality of white granulated sugar from molasses which heretofore was fed only to livestock. This was an unnecessary loss as this molasses contained 50% of sugar, and a large percentage of this sugar was capable of being separated from the highly concentrated impurities in the molasses.(2)

The Steffin process, in use for decades, was developed abroad and was designed to recover some of the sugar in molasses. Recently tests have made possible the erection of the Johnstown plant at Colorado where an improved process is used. Sugar experts from the entire world have come to Colorado to study this process.(3)

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(1) SUGAR SCIENCE SIDELIGHTS SIMPLY TOLD, Great Western Sugar Company, p. 4

(2) HISTORY AND DEVELOPMENT OF SUGAR BEET, Great Western Sugar Company, p. 8

(3) SUGAR SCIENCE SIDELIGHTS SIMPLY TOLD, Great Western Sugar Company, p. 6

CHAPTER VI

BY-PRODUCTS AND THEIR UTILIZATION

The sugar beet crop is a remarkable crop as there is no waste; everything is utilized. There is, therefore, additional revenue from the use or sale of its by-products as fattening feed for livestock, conditioning of the soil, and various commercial uses which will be explained later in the chapter. As has been pointed out, this industry is primarily a result of intensive scientific research and development.

The first by-product of the sugar beet, feed for livestock, has already been mentioned. This by-product, considered the most important of all,(1) is the forage supplied by the leaves and crowns, known as the tops, which are cut from the beets and left on the fields when the crop is harvested and removed to the sugar refining plants. The livestock are allowed to pasture at will for a definite period of time. This is the least expensive method of feeding as it

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(1) SUGAR-BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 29

saves the cost and labor of handling, curing and siloing the tops.(1) The drawbacks to this method are:

1. A great deal of feeding value is lost because of the amount of tops trampled into the ground.(2)
2. There is a loss of feeding value through changes in the weather and shattering of the leaves.(3)
3. Loss is also incurred by snows which cover and spoil the tops.(4)
4. Hard packing by the livestock in rainy seasons injures the soil.(5)

Whether the green tops are trampled into the ground or plowed under, the beet is, in this way, completing the circle by going back into the soil from whence it came. Tops have considerable value as green manure.(6)

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(1) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 42
(2) IMPORTANT SUGAR BEET BY-PRODUCTS AND THEIR UTILIZATION, Farmers' Bulletin #1718, p. 4
(3) Ibid, p. 4
(4) Ibid, p. 4
(5) Ibid, p. 4
(6) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 40

Of course, the tops should never be hauled from disease-infected areas. This would retard the control and cure of such lands and would be a cause for the spread of plant disease.

If, instead of allowing the animals to pasture at will, the farmer wishes to preserve the tops for future use, one method by which he may do this is to dry and stack the beet tops in feed racks. It is true that there are additional labor charges and a loss in weight, but greater food value is obtained.(1) The beet top has the same food value as that of grain if fed in properly-balanced rations.(2)

Still another method of treatment is to place the tops in a silo. Precautions must be taken to allow as little dirt and sand as possible to adhere to the plants, for this may be the cause of digestive trouble in the livestock. To prevent spoilage the plants should not be too moist.(3) The safest method is to pack the tops with alternating layers of straw and finally to cover them with a layer of earth.(4)

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(1) SUGAR-BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 32
(2) IMPORTANT SUGAR BEET BY-PRODUCTS AND THEIR UTILIZATION, Farmers' Bulletin #1718, inside front cover
(3) SUGAR-BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 32
(4) SUGAR-BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 30

As far as food value is concerned, good beet silage is nearly equal to maize silage and as such has proved itself of great importance to this industry. The advantages of preserving beet tops in silos are:

1. "It saves all of the forage in edible form.
2. The loss both in preserving and feeding is much smaller than dry fodder.
3. It is not dependent upon favourable weather conditions.
4. It requires less space for storage than the equivalent amount of hay or fodder.
5. The cost of the ration is materially reduced by feeding ensilage to all classes of livestock.
6. It is more palatable than dry fodder and animals will eat a larger quantity."(1)

It has been pointed out that inasmuch as the crowns contain salts that are very laxative, pasturing time should be limited and the livestock should not be fed in large quantities.(2) Another recommendation

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(1) ENCYCLOPAEDIA BRITANNICA, 14th Edition, Volume 8, p. 618
(2) SUGAR-BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 30

of importance is that feeding should be done after the milking of the dairy cows is completed, for there is a tendency for the milk to absorb a peculiar flavor.(1)

It is estimated that "from three to eight tons of green tops, suitable for forage, are produced from an acre of beets. The amount varies with locality, season, method of cultivation, closeness of beet topping, and the method used in preserving the suitable feed forage".(2)

Beet pulp is another by-product which remains after the sugar has been extracted from the cossettes. This pulp is sometimes sold as is, but because of the weight and expensive and difficult transportation, it is usually allowed to partially dry in special pulp driers at the factory.(3) While it is the custom to feed the green pulp to dairy cows, it is better practice to partially dry it first. It is then easier to handle and store and also has the added advantage of not imparting any disagreeable odors to the milk, as mentioned above.(4)

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(1) SUGAR BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 32
(2) IMPORTANT SUGAR BEET BY-PRODUCTS AND THEIR UTILIZATION, Farmers' Bulletin #1718, p. 2
(3) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, Chart
(4) G. T. Surface, THE STORY OF SUGAR, pp. 194-195

This by-product is an additional source of revenue to the refiners of sugar beet, for not only do the farmers buy this dried pulp at low cost but also the manufacturers of stock feed.

We now come to another valuable by-product which is known as molasses, the residue from the vacuum pan which remains after all crystallizable sugar has been removed.(1) This syrup is filtered out and drawn into tanks for reprocessing and marketing.

Beet molasses is used widely in the manufacture of alcohol. Through fermentation it takes 2½ gallons of molasses to produce 1 gallon of 95% alcohol.(2) Molasses is also used in the manufacture of yeast both for human and animal consumption.(3) Nevertheless, its most important function is in livestock feeding. The common method of feeding molasses to cattle is to mix it with ground alfalfa hay or beet pulp. Care should be taken not to feed this in large quantities as it contains approximately 5% of potash salts and may prove harmful.(4)

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(1) Supra, p. 53
(2) G. T. Surface, THE STORY OF SUGAR, p. 198
(3) IMPORTANT SUGAR BEET BY-PRODUCTS AND THEIR UTILIZATION, Farmers' Bulletin #1718, p. 21
(4) SUGAR-BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 32

Another use for molasses is as a bait in sweetening poison-bran used to control some insect pests. This method is very successful.(1) In addition to the major by-products already enumerated, there is also the utilization of the mother beet roots, the beet tails, and the lime cake, as is explained in the following paragraphs.

The "mother beet roots" refers to the lateral root system from which the tap root has been severed and lifted (see Chapter IV). These roots have considerable food value, as the sugar content ranges from 5% to 8% or more.(2)

The "beet tails" refers to the root ends which are broken from the tap roots while they are being pulled, piled in heaps, conveyed to the factories and stored. In addition to these tails, some beet tops also are caught in the flumes during the cleaning process. It is estimated that from two to four tons of this supposed waste is recovered from a factory each day. The amount accumulated depends upon the cleaning and slicing of beets accomplished during a working day.(3)

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(1) G. T. Surface, THE STORY OF SUGAR, p. 198
(2) IMPORTANT SUGAR BEET BY-PRODUCTS AND THEIR UTILIZATION, Farmers' Bulletin #1718, p. 24
(3) Ibid, p. 25

The first step in the purification process of the heated juice is the addition of milk of lime for the purpose of reaction against some of the impurities present in the juice.(1) The lime is then pumped into pans where it is allowed to accumulate. It is later heaped in piles to facilitate drainage and drying, after which it is ready for local use. This lime cake compares favorably with ground limestone sold on the market.(2) The lime cakes are finely ground and, by correct application to the soil, have successfully lessened acidity and have helped to loosen the soil. This remedial addition to the soil also prevents the rapid evaporation of moisture, and helps to check certain diseases. This all results in increased tonnage yield(3)--more income to the refiners and to the industry.

It has been found that the use for waste lime is more prevalent in the humid areas of the United States than in the other areas, as practically all of

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(1) Supra, p. 52
(2) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, p. 31
(3) G. T. Surface, THE STORY OF SUGAR, p. 201

the soils in the irrigated sections are not lacking in lime.(1)

The Department of Agriculture has printed pamphlets which are available to anyone interested enough to send for them. These pamphlets contain valuable information of the results found from the latest researches and experiments, as well as scientific suggestions for the balanced rations of wet pulp, beet molasses, cottonseed cake or meal, alfalfa hay, ground barley, corn, oats, pressed pulp, dried pulp, dried molasses pulp, and wheat bran to feed to livestock. The purposes of the different feedings are explained, whether for fattening or roughage. The rations also depend upon the age of the livestock.(2) This is all carefully explained and should prove of great assistance to owners and keepers of livestock.

The by-products of an acre of sugar beets will produce 300 pounds of dressed meat.(3) In a territory served by one company alone, 2,000,000 sheep and several hundred thousand cattle are being fattened.(4)

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(1) SUGAR BEET GROWING UNDER IRRIGATION, Farmers' Bulletin #1645, p. 32

(2) IMPORTANT SUGAR BEET BY-PRODUCTS AND THEIR UTILIZATION, Farmers' Bulletin #1718, pp. 27, 28, 29

(3) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 45

(4) HISTORY AND DEVELOPMENT OF SUGAR BEET, Great Western Sugar Company, p. 7

These figures, as nothing else, show the tremendous size to which a "by-product" has grown. This feeding of livestock has become an industry in itself.

During the World War, when the price of potash soared, a number of beet sugar factories engaged in the extraction of potash from their waste waters. After the war, with the collapse of the market, this additional sideline was discontinued.(1) It was no longer profitable to extract the potash, but it did show that we could obtain our own potash, if necessary, during times of war or other events which might stop our source of supply.

The latest available figures I have been able to procure are based on the 1933 publication of 1931 production, at which time it was estimated that the value of the beet pulp for that year was approximately $3,000,000; the yield of beet tops for feeding purposes, about $3,000,000; the yield of beet molasses, about $400,000. In addition, it is interesting to note that three or four of the principal lamb-feeding sections in Colorado correspond to the principal beet-producing

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(1) WHAT YOU SHOULD KNOW ABOUT SUGAR, Great Western Sugar Company, p. 6

sections.(1) This cannot be entirely a coincidence. It is rather the result of an economical method of properly feeding livestock, using balanced rations, and prevention of waste.

Everything possible is done to prevent any waste in this industry--it is truly scientifically developed. It is the opinion of A. W. Skuderna, principal agronomist, Division of Sugar Plant Investigations, Bureau of Plant Industry, and E. W. Sheets, principal animal husbandman, Animal Husbandry Division, Bureau of Animal Industry, that:

> "In the United States the value of these by-products has not as yet been fully realized, and in some localities full advantage has not been taken of these available feeds. A more general recognition of the true worth of the by-products of the sugar beet is necessary for their effective utilization."(2)

If the advice of these men is taken, the by-products revenue as noted on the previous pages will no doubt be substantially increased.

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(1) IMPORTANT SUGAR BEET BY-PRODUCTS AND THEIR UTILIZATION, Farmers' Bulletin #1718, pp. 1-2
(2) Ibid, p. 1

CHAPTER VII

DISEASES(1)

The beet crop is subject to a number of enemies, the most important of which are the leaf spot, seedling diseases and root rot, cutworms, white grubs, wire-worms, flea beetles, grasshoppers, and curly-top. Some of these enemies feed upon the roots, while others feed upon the tops. Another characteristic is that while some are peculiar to the humid area, others are more destructive in the irrigated regions.

The first one which has caused considerable loss and trouble is the leaf spot. This disease attacks the foliage in the humid area and lives over the winter in tops and roots left from the preceding beet crop. One method of control suggests itself here--the advisability of rotating the beet crop with other crops immune to this fungus. This is the reason that

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(1) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, pp. 26 to 29, and
CURLY-TOP RESISTANCE IN SUGAR BEETS AND TESTS OF THE RESISTANT VARIETY, U.S. No. 1, Technical Bulletin No. 360, Bureau of Plant Industry, May 1933, pp. 1, 2, 3, 4, 59, 64, 65, 67

it has already been stated that infected tops should not be stored in silos, nor should they be moved to other sections of the land. Care must be taken, as leaf spot spreads quickly and is difficult to arrest.

Leaf spot makes its first appearance after the warm weather starts as warmth and high humidity favor its development. As the disease progresses it spreads to the newer leaves. Nature has her own method of battling this fungus. She grows new foliage just as fast as she can to take the place of the leaves which have been destroyed. The effect of nature battling in behalf of the beet is to increase the size and height of the crown of the sugar beet in order to support the unnecessary additional foliage. There is a loss in tonnage because of the increased size of the tops and the decrease in size of the roots, with the resultant loss of sugar content.

It can be seen from the foregoing that the leaf spot has the upper hand, once it establishes itself in a crop, and causes considerable, if not a total, loss to the farmer for that one season at least.

The second type of disease causing tremendous losses in the humid area are the seedling diseases

and the accompanying root rot. These organisms are present in practically all soils in the humid area and attack the roots of the sugar beet. The roots are weakened and oftentimes killed by the attack.

There is one item of importance in its disfavor and that is that conditions essential to the successful growing of the sugar beet are detrimental to the development of the disease. Good drainage and good soil aeration are necessary for sugar beet culture and are in direct opposition to the conditions favorable to this disease, which are poor drainage and poor soil aeration. It is, therefore, obvious that proper soil cultivation should be practiced to circumvent its development. Crust should not be allowed to form over the soil, and if it does, it should be immediately broken up and in this manner give aeration to surface soil early in the season while the plants are small and fighting for life. Another recommendation is to alternate the sugar beet crop with other crops which are not affected by the seedling diseases.

The sugar beet in the humid area is not widely affected by insects or their larvae, but considerable damage is done locally. Where one field may be

infested, another may escape with little injury. The insects referred to are the cutworms, white grubs, wireworms, flea beetles and the grasshoppers.

The cutworms feed at night on any available vegetation and hibernate during the day. They usually are present in fields which have not been cultivated for a season and are, therefore, ready to attack and destroy young seedlings. Cutworms can be controlled and destroyed through the use of poisoned-bran bait composed of dry bran, white arsenic or Paris green, syrup or molasses, and water. This bran is sowed by hand along the rows late in the evening and it may require two or three applications at two-day intervals to rid the fields of the pest. The important point here is that they can be exterminated before too much damage has been accomplished.

The white grubs live in grasslands and require three years for full development. The best method to save a sugar beet crop is not to plant it on grassland which is known to be infested, unless it has been under cultivation for at least two years. Fall plowing is also suggested as a possible advantage for the beet crop against the white grubs.

Wireworms are equally destructive and favor low, wet, and sour lands. Areas should be well drained to prevent its spread. Clover and buckwheat are not particularly susceptible to damage by these worms and for this reason it would be a better plan to put off the growing of sugar beet until after these two crops have been cultivated.

Then there is the flea beetle which does its part to make the farmer lose his crop and livelihood. These fleas are most active during the middle of the day when the plants are partly wilted. The best method to fight these pests is to crush them by rolling the fields during the middle of the day, as in this manner many of the beetles are killed while the plants are little affected. Another method is to spread lime directly on the foliage of the plants, but care must be taken that every bit of surface is covered, as the flea beetles will attack any uncovered portions.

Then there are the grasshoppers which sometimes cause damage to the sugar beet crops in the irrigated regions of the west. They can be controlled through the use of the same poison bait used in combating the cutworms. The poison-bran bait should be

likewise scattered over the fields when it is suspected that an attack of grasshoppers is likely to occur.(1)

The scientists and supervisors provided by the refiners are constantly on the fields and keep close watch. They are willing and competent to give advice and help toward preventing and controlling these sugar beet diseases.

The last, but surely not the least important, of all diseases afflicting the sugar beet is the curly-top, a most destructive and costly handicap to this industry. It is prevalent in practically all the sugar beet areas east of the Rocky Mountains. It was first recognized as a disease of major economic importance in 1899, in California.(2) It has been found that it is transmitted by the beet leaf hopper which is harbored in weeds on abandoned farms and desert areas surrounding cultivated sugar beet fields. The thing to do is to destroy such weeds whenever possible.

Another method of control is to time the planting in order to get the crop well advanced before the beet leaf hopper arrives and is able to do too much damage.

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(1) SUGAR BEET CULTURE IN THE HUMID AREA OF THE UNITED STATES, Farmers' Bulletin #1637, pp. 26 to 29

(2) Curly-TOP RESISTANCE IN SUGAR BEETS AND TESTS OF THE RESISTANT VARIETY, Technical Bulletin #360, Bureau of Plant Industry, p. 1

The very best solution advocated by the government after years of continuous experimenting and testing in Idaho, Utah, California, New Mexico and Colorado is to use the curly-top-resistant variety U. S. No.1 seeds. It is known that this resistant variety is not as yet a finished product, but it is a vast improvement over the seeds which grow plants susceptible to the curly-top. The destructiveness of this disease has caused the abandonment of many otherwise profitable beet lands; therefore, it is of economic importance either to destroy the transmitters, the hopper (a seeming impossibility), or to develop a resistant variety. That is what is being done through constant research in which all interested agencies are cooperating for their mutual benefit. As has been suggested, the use of the U. S. No. 1 seeds is fairly satisfactory, but further improvement is desirable and is being made.(1)

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(1) CURLY-TOP RESISTANCE IN SUGAR BEETS AND TESTS OF THE RESISTANT VARIETY, Technical Bulletin #360, Bureau of Plant Industry, pp. 2, 3, 4, 59, 64, 65, 67

This industry must be protected as it is not only a cash crop, but also of importance because of its revenue from its by-products, and the fostering of the dairying and stock-feeding industries. It is too closely allied with other industries and it is a means of livelihood to too many people to permit its destruction through diseases.

CHAPTER VIII

THE LABOR PROBLEM

A great problem which continually faces the beet growers of this country is the obtaining of an adequate supply of labor, since the cost of production depends chiefly upon its efficiency and cost. This is a seasonal industry and, therefore, provides employment only for a limited time each year. For this reason it is necessary that the laborers earn enough during the working months to support themselves during the non-working months. A laborer is entitled to live comfortably and have the means to educate his family if he so desires. This, I am sorry to say, has not been true in the sugar beet industry, especially in so far as the field workers are concerned.

The working season is from about the middle of April to the first of November, depending upon the locality. During the busy seasons the workers are in the fields from ten to fourteen hours a day. Because such great numbers of laborers are required for about one-half year, low-paid workers

the fall work is completed. In some sections of the country, where this is the common practice, attempts have been made to adapt the school periods to conform with slack seasons in order that beet sugar child workers may attend school for a continuous period.(1)

In this seasonal work a considerable amount of hand labor is required at certain stages of the beet's growth. It has been pointed out that low-salaried, usually unskilled, labor is employed. Cultivation must be done carefully under the supervision of trained men placed in the fields either by the farmers or the refiners who contract to purchase the harvested beets.(2)

On the other hand, the factories with their complicated machinery require skilled labor. In the busy season refiners must draw upon towns and cities for extra labor. In Europe, the owners of beet farms do not have to contend with this problem as the laborers live in the surrounding villages or

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(1) COSTS OF PRODUCING SUGAR BEETS, Part X, U. S. Government Printing Office, Washington-1926, p. 18
(2) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, 1933, p. 41

on the estates growing beets the whole year round.(1) In the United States this question of a sufficient supply of labor in the busy seasons has always been a matter of speculation. The sugar refiners, who contract with the sugar farmers to purchase their entire beet crop, assist by procuring laborers for the growers. Nevertheless it is with the farmers that the laborers contract in regard to wages, acreage to be planted, hours of work, and living quarters during their stay.

Until the inception of the Agricultural Adjustment Administration, conditions have been very bad. The hours of work were long, wages were low, children were kept out of school to work the same long hours as their parents. In the summer of 1933, children under 16 numbered 14,743. This amount can be contrasted with a total of 110,354 contract workers for this same year.(2)

The Agricultural Adjustment Act, which was approved May 12, 1933 by the President of the United

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(1) Related by an eye-witness who is willing to confirm this statement at any time.
(2) THE MONTHLY LABOR REVIEW, Industrial and Labor Conditions, 1934, p.57

States, Franklin D. Roosevelt, proposed to improve the lot of the laborer and his family both financially and sociologically.(1)

On September 18, 1934, when the following terms were proposed, public hearings on the labor provisions of the sugar beet benefit contract were immediately scheduled in many states. The terms proposed were:

"a) The prohibition of the labor of children, other than the children of the grower, under the age of fourteen and the regulation of the labor of children, other than the children of the grower, under the age of sixteen in the cultivation and--or harvesting of sugar beets;

b) Agreement by the grower that he will abide by the decision of the Secretary of Agriculture with respect to a minimum wage for workers employed by growers for the seasons of 1935 and 1936, such decision of the Secretary to be rendered after due notice of an opportunity to be heard at a public hearing;

c) Agreement by the grower that he will abide by the decision of the Secretary of Agriculture with respect to any labor dispute involving the grower in connection with the cultivation or harvesting of sugar beets of the grower when any such dispute has been presented to the Secretary by the grower or any other party and the secretary has determined to adjudicate such dispute; and

> d) Proper provision to be made for the payment by the grower to workers of any compensation bona fidely due to workers in connection with the cultivation or harvesting of sugar beets in 1934." (1)

The important point in connection with the above provisions is that in order to receive benefit payments, the growers must comply with the terms of the written contracts with the workers.

The producers of sugar beets were particularly cautioned to secure signed receipts from the laborers for work performed on the 1934 crop. The importance of this procedure is for the purpose of preventing any possibility of disputes regarding wage claims and disputes. Before the final 1934 payment is made next spring, the growers will be required to furnish a certificate to the effect that they have complied with all the terms of the contract including labor provisions.(2)

Where the sugar beet producers and the laborers cannot come to a satisfactory arrangement or where there is dissatisfaction, the Secretary of Agriculture may establish minimum wages for a factory

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(1) SUGAR BEET LABOR HEARINGS FOR MICHIGAN, COLORADO Information for the Press, U. S. Department of Agriculture, Washington, September 18, 1934, pp. 1-2

(2) NEWS DIGEST, Agricultural Adjustment Administration, December 15, 1934, p. 2

district after due notice has been given for a public hearing at a place accessible to all parties concerned.(1)

A committee appointed by the Secretary of Labor to study the economic conditions in the sugar beet industry found that the laborers were underpaid and sometimes not paid at all. It is this committee's estimate that each family of 3.5 workers, taking care of 7 acres, should have an income of at least $525 a year in order to maintain a minimum standard of living. This does not include house rent which they usually get free and only allows $5 a year for medical attention and $1.80 for recreation. It was the decision of the committee that the growers could now pay between $525 and $600 to an average family as shown above and still have a larger profit than formerly because of the benefits they will receive under the Agricultural Adjustment Act.(2)

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(1) NEWS DIGEST, Agricultural Adjustment Administration, January 5, 1935, p. 3
(2) THE MONTHLY LABOR REVIEW, pp. 59-60

It is to be hoped that with these new arrangements the laborers will be able to earn enough to live comfortably the year round, and at the same time be forced to keep their children in school for a longer period. It takes time to make such drastic changes, but every effort is being made, especially by the growers who do not want to lose the benefit payments which the government promised them if they abide by all the provisions of the Agricultural Adjustment Act.

In order to get a clearer view of the amount of labor involved the following is interesting to notice. One large sugar company has announced that it has increased its permanent organization of approximately 1,500 employees to about 7,000 to operate the mills and receiving stations during the 1934-1935 season.(1)

The beet sugar industry of Michigan, Ohio and Indiana claims to give employment to more than 58,000 workers, utilizing a total of 38,500,000 man hours of American Labor annually.(2)

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(1) THE SUGAR PRESS, Published by Great Western Sugar Company, Denver, Colorado, October, 1934, p. 3
(2) THE BEET SUGAR INDUSTRY OF MICHIGAN, OHIO AND INDIANA, Farmers and Manufacturers Beet Sugar Association, Saginaw, Michigan, 1934--Bulletin

Figures are not available to show all the unskilled and skilled beet sugar workers employed, but the few figures given above are some indication of the employment capacity of this important industry to the United States.

CHAPTER IX

TARIFF ACTS AND RELATIONSHIP OF CANE SUGAR

The principal countries producing sugar beets are Russia, United States, Germany, France, Czechoslovakia, Poland, United Kingdom, Italy, and Spain. Russia has increased her acreage about 400% over her average of 1921-1925.(1)

The principal countries producing sugar cane are Cuba, Hawaii, Puerto Rico, India, Java, Philippine Islands, and Brazil.(2)

In addition to the above countries producing sugar, almost every country in Europe produces some sugar for domestic use. Every producing country is not an exporting country. On the contrary, the United States, one of the chief sugar producing countries, produces only about 20% of her needs. She must import the other 80% and, at the same time, protect her own source of supply against an influx of sugar at such low prices as to cause the collapse

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(1) STATISTICS OF COTTON, SUGAR, AND TOBACCO, U. S. Department of Agriculture, No. 1347, p. 485
(2) Ibid, p. 491

of her own industry. What is true of the United States is true of other countries which do not produce enough to supply their demand.

The principal exporting countries are Cuba, Dutch East Indies, Czechoslovakia, Philippine Islands, Hawaii and Puerto Rico. The principal importing countries are the United States, United Kingdom, British India, China, Canada, France and Japan.(1)

It has not been my intention to give the impression that the sugar beet is the only source of domestic supply for sugar which the United States has. It is the main source and yields the greatest amount; nevertheless, the cane sugar industry of Louisiana is of major importance to that state. In 1932 she produced 231,000 short tons of sugar and 15,660,000 gallons of molasses.(2)

From the foregoing it can be seen that the United States, or any other country similarly situated, cannot be criticized for trying to become as self-sufficient as possible in order to minimize her

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(1) STATISTICS OF COTTON, SUGAR, AND TOBACCO, U. S. Department of Agriculture, No. 1347, p. 492
(2) Ibid, p. 487

dependence upon outside sources of supply for such a necessary food item as sugar. It has been pointed out that in times of stress, in times of a possible cutting-off of our source of supply, it is best to be prepared. The United States should cultivate and produce her own sugar, especially as it has been proved that her geographic location is ideal and her soil is capable of good results.

At the same time the development of the sugar beet industry gives employment to home labor, and with our large population it is necessary that we foster an industry which gives employment to our people. By encouraging this industry, other allied industries are kept busy turning their wheels, giving work and a livelihood to many United States workers.

Governments early showed their interest in this industry. From the Napoleonic times on, the sugar beet industry has been assisted by the aid of tariff barriers against imported sugar; through grants, subsidies and liberal export bounties. It was the encouragement of the rulers of France and Germany which gave this new supply of sugar the opportunity

to experiment, to build, and to develop.(1) It is questionable whether the industry could have survived without the financial and legislative support of these rulers. It was Napoleon's intention to overcome the sugar shortage, to reduce the prevailing price of sugar, and at the same time to make his country independent. His policy has been copied by practically every sugar producing country in the world.

During the latter part of the nineteenth century the European situation became chaotic. Each country sought to improve her own position through prohibitive tariffs upon imports, while she subsidized her own industry. Each country evolved schemes for further encouragement by levying export bounties. The consumers were taxed heavily in order that export prices should be lower than domestic prices. Everything was carried to ridiculous extremes and hardships were imposed. The cane sugar industry practically disappeared and the beet sugar industry grew rapidly.(2) There was such confusion that attempts were made to come to some mutual agreement.

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(1) G. T. Surface, THE STORY OF SUGAR, p. 116
(2) SUGAR INDUSTRY, Poor's Publishing Company, p. 24

It was not until the Brussels International Sugar Convention of 1903, as has been related in the second chapter of this thesis, that some order was established in the sugar industry. Export bounties were eliminated and subsidies and tariffs were modified. As a result of these changes and also many technical improvements the cane sugar industry rapidly regained some of its prestige lost from 1860 to 1900.

Raw sugar entering the United States has paid duty since 1789 except for four years from 1890 to 1894.(1) Cuba has been given a preferential rate since 1903. At first the tariffs were imposed to assure the United States an additional source of revenue. Now, however, because it has been found that it is cheaper to import cane sugar than to produce domestic beet sugar, the tariff serves a double purpose; namely, as an additional source of revenue and also as a protective measure.

The earliest most significant legislative act was the Sugar Bounty Act of 1890 which provided

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p. 24.

for a bounty of two cents per pound on domestic beet sugar. It was to be enforced for a period of fifteen years from 1890 to 1905. This act was soon repealed and the Wilson Act of 1894 which was supposed to take its place was passed, but it did not give adequate protection to the new sugar beet industry.(1) It was not until the Dingley Act of 1897 that there was a rapid expansion of the beet sugar refineries. By the terms of the Dingley Act imported sugars were taxed as follows:

Refined sugar	$1.95 per 100 pounds
96° sugar	1.68 per 100 pounds
For each degree below 96°	.035 reduction
For each degree above 96°	.035 increase (2)

Previous to the Dingley Act there were less than ten factories operating in the United States. The following chart will give some idea of the rapid development since that time in the number of establishments, number of wage earners, value of products, and value added by manufacture.

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(1) G. T. Surface, THE STORY OF SUGAR, p. 117
(2) Ibid, p. 117

NUMBER AND SIZE OF BEET SUGAR FACTORIES

1899-1933

Dollar Totals in Thousands

Year	Number of Establishments	Number of Wage Earners	Value of Products	Value Added by Manufacture
1899	30	1,970	$ 7,324	$ 2,520
1904	51	3,963	24,394	9,907
1914	60	7,997	62,605	21,206
1919	85	11,781	149,256	62,127
1921	92	13,602	139,110	17,241
1925	89	8,872	132,339	45,301
1929	82	7,496	108,553	37,592 (1)
1933	84	10,656	127,133	51,006 (2)

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p. 22
(2) THE STORY OF BEET SUGAR FROM THE SEED TO THE SACK, Farmers and Manufacturers Beet Sugar Association, p. 7

As a result of the depression, surplus production, decreased demand, and last year's drought, which ruined many acres of planted beets, there was a general curtailment of the industry. In 1934 there were 100 factories of which 20 were idle.(1)

In 1898 the United States acquired Puerto Rico and the Philippines, and established close relations with Cuba. The tariff for which the beet sugar producers fought, now, unfortunately for the sugar beet interests, stimulated production in these islands. If necessary, these islands could supply all the sugar required to satisfy the demands of the United States.

By the Reciprocity Treaty with Cuba after the Spanish-American War, the tariff authorities adjusted the rates to give Cuba a 20% advantage over other imported sugar.(2)

Conditions continued in this manner until the World War at which time there was a period of sugar shortage and high prices. After the war, however, the European sugar producing countries naturally revived and

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(1) CENSUS OF MANUFACTURES 1933--BEET SUGAR, United States Department of Commerce Bureau of the Census, p. 1
(2) SUGAR INDUSTRY, Poor's Publishing Company, p. 25

expanded their industries and their demand for imported sugar greatly decreased. Cuba, the Philippines and other similar producers did not stop to think that there would come a time when, because of excess production, they would be in a disastrous economic condition. Instead, their domestic industries went through an intensive period of development aided by subsidies, tariffs and embargoes. Because of this, Cuba has suffered greatly.(1)

The Hawley-Smoot Sugar Tariff Act, approved June 17, 1930, gave additional advantage to the island refiners. Previous to this tariff, it was the policy of all countries to give greater protection to refined sugar than to raw sugar, but now this order was reversed. To net 100 pounds of refined sugar, 107 pounds of raw sugar are required. Therefore, by sending into the United States refined sugar instead of raw sugar, the islanders paid a duty of $2.12 for 100 pounds of refined sugar instead of $2.14 for 107 pounds of raw sugar from which 100 pounds of refined sugar would be manufactured. When one considers the amount of sugar

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(1) V. D. Reed, THE PRINCIPLES OF ECONOMIC GEOGRAPHY, p.210

which the United States imports, the enormity of this saving to the island interests of $0.02 for each 100 pounds is obvious. The domestic refiners protested vigorously, but to no avail. The following chart illustrates a section of the provisions of this act:

THE HAWLEY-SMOOT SUGAR TARIFF RATES
COMPARED WITH PREVIOUS RATES

Unit: cents per pound

Sugar--	Present Rate	Previous Rate
96° Raws (full rate).............	$.0250	$.022060
96° Raws (from Cuba)............	.0200	.017648
Refined (full rate)..............	.0265	.023900
Refined (from Cuba)..............	.0212	.019100 (1)

It would appear that the cane sugar industry of Cuba operated at such advantages as to lead the world in financial success. But in the face of such advantages, her surplus had accumulated to such a degree, competition had grown, demand had decreased, and prices had dropped to such an extent as to result in a sharp curtailment and strict control measures by Cuba.

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p.25

The latest move under the Agricultural Adjustment Act is to restrict imports of sugar from the Territory of Hawaii, the insular possessions, and foreign countries by establishing quotas which will give each section its share of the American market and prevent any excess sugar from entering this country.

The sugar program is to be financed through a processing tax of \$.005 a pound. This is not an additional tax which would result in an increase in cost to the consumer. Instead, the tariff on sugar was lowered from \$.025 a pound to \$.01875 a pound and a processing tax of \$.005 a pound was levied.(1) The price to the consumer is, therefore, not affected by the change.

The beet sugar interests in the United States are strongly organized and as a political support are of particular importance to the present Administration. It is for this reason that actual abolishment of the sugar tariff or even a substantial reduction in this tariff is impossible.

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(1) ADJUSTMENT FOR SUGAR BEETS, United States Department of Agriculture, October 18, 1934, p.5

CHAPTER X

AGRICULTURAL ADJUSTMENT ADMINISTRATION CONTROL

President Roosevelt put his own sugar program before Congress on February 8, 1934 in a special message which asked that the "politically explosive commodity be given preferred treatment under the Agricultural Adjustment Act and that the Secretary of Agriculture divide among producing areas the amount they might furnish for domestic consumption."(1) In this speech he stated that it would be impossible to put sugar on the free list, suggested that the tariff be cut to equal a processing tax of about half-a-cent, and that the allotments be based on the production of the past three years. The President also suggested the following preliminary and temporary quotas:

	Raw value short tons
Continental beets.........	1,450,000
Louisiana and Florida.....	260,000
Hawaii....................	935,000
Puerto Rico...............	821,000
Philippine Islands........	1,037,000
Cuba......................	1,944,000
Virgin Islands............	5,000
Total	6,452,000 (2)

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(1) PRESIDENT ASKS FOR SUGAR QUOTA, The Boston Globe, February 8, 1934
(2) Ibid.

In an order signed by the Secretary of Agriculture as authorized by the Jones-Costigan Act made effective January 5, 1935, the quotas for the calendar year 1935 were established as follows:

		Raw value
Continental beets.........	1,550,000.00	short tons
Louisiana and Florida.....	260,000.00	
Hawaii....................	894,992.38	
Puerto Rico...............	783,958.88	
Philippine Islands........	991,307.93	
Cuba......................	1,857,021.85	
Virgin Islands............	5,341.16	
Foreign countries other than Cuba...........	16,638.80	
Total	6,359,261.00	(1)

It is interesting to note that the figures, as shown in the President's temporary quota, do not differ materially from the final figures adopted by H. A. Wallace, Secretary of Agriculture. The Secretary may revise his estimate if future conditions so warrant.

The Agricultural Adjustment Act as amended by the Jones-Costigan Act, May 9, 1934, gives the sugar beet growers approximately 24 percent of the national market for sugar in 1934.(2) The constitutionality of this act was upheld by the District of Columbia Supreme Court.(3) This act sets up a direct relationship between the government and the farmer. The farmer

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(1) RELATING TO CONSUMPTION REQUIREMENTS AND QUOTAS, United States Government of Agriculture, January 8, 1935, p.2

(2) AN ACT, PUBLIC, No. 213, 73d Congress, May 9, 1934, Agricultural Adjustment Administration.

(3) The Boston Traveler, November 3, 1934

enters into an agreement with the government under which he receives certain benefit payments in return for controlling his production. The refiner is not a producer and, therefore, is not a party to this contract.

It is the opinion of "experienced men that if Philippine shipments to the United States had been checked in time, there would have been little need for subsequent sugar legislation."(1) The tariff acted as a subsidy for the Philippine sugar producers and consequently, the Phillipine Islands developed an enormous sugar production.

The program for sugar beets to run over a period of three years affects approximately 100,000 growers in the following nineteen states: California, Colorado, Idaho, Ohio, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Utah, Washington, Wisconsin, and Wyoming.(2) The contract provides for a parity return to the growers on their beet production for 1935 and 1936. Where it is shown to the satisfaction of the

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(1) THE SUGAR PRESS, Great Western Sugar Company, October 1934, p.4

(2) NEWS DIGEST, Agricultural Adjustment Administration, February 2, 1935, p.4

Secretary that a loss is suffered because of the payment of the processing tax on unsold beet sugar for a previous year, the grower will receive a rebate provided he has signed the benefit contract.(1)

In addition to the parity payments on actual production this contract also provides for partial crop insurance in the event that acreage has to be abandoned because of frost, storms, drought or for any other reason beyond the control of the growers. In this manner the growers will receive over $15,000,000 more for their 1934 crop than if they had to sell their crop in the open market without protection of the Agricultural Adjustment program. Despite the fact that the drought and other factors have reduced production more than 30 percent, actual loss in income to the farmers will be a little more than 5 percent.(2)

For administrative purposes, the program is based on the factory district as a unit. The acreage allotment for the individual grower is to be worked out on his average past production and his percentage share of the allotment set aside for the entire district.

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(1) ADJUSTMENT FOR SUGAR BEETS, United States Department of Agriculture, October 18, 1934, p.2

(2) UNITED STATES BEET SUGAR PROGRAM ANNOUNCED AND REGIONAL MEETINGS IN SUGAR AREAS, News Digest, October 6, 1934, Agricultural Adjustment Administration, p.3

Local associations made up of representatives of the local producers will act for the Secretary in all such matters.(1) Final figures must be sent to Washington for approval. Regional meetings in the principal sugar beet producing areas are called in order to acquaint the workers, producers, processors, and others interested in the sugar beet program.(2)

At first thought it might seem that the establishment of allotments would be a very difficult undertaking. Because of complete records of past production and acreage for all growers in each factory district, this work is fairly easy. The allotment is based first on the establishment of an estimated quota of 1,550,000 short tons of sugar to be produced from beets raised in the United States. This basic figure is divided proportionately, based on past established figures, among the districts and then again sub-divided among the growers.

Under the contract which the farmer signs, he agrees to plant only his alloted share, the amount of which is based on any of four options (listed below), in return for benefit payments. This allotment for

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(1) ADJUSTMENT FOR SUGAR BEETS, Division of Information, Agricultural Adjustment Administration, October 18, 1934, p.3

(2) UNITED STATES BEET SUGAR PROGRAM ANNOUNCED AND REGIONAL MEETINGS IN SUGAR AREAS, News Digest, October 6, 1934, Agricultural Adjustment Administration, p.3

each district will vary from 90 to 100 percent of the 1933 acreage. There may be some difference in these percentages for the individual growers, but the total must not exceed the total allotment.(1)

The grower has four options from which to choose.

"1. Five-Year Average: Average planted acreage for 1930, 1931, 1932, 1933 and 1934, if beets were planted in 1933 and/or 1934.

2. Four-Year Average: Average planted acreage for 1931, 1932, 1933, and 1934, if beets were planted in 1933 and/or 1934.

3. Three-Year Average: Average planted acreage for 1932, 1933, and 1934, if beets were planted in 1933 and/or 1934.

4. Two-Year Average: Average planted acreage in 1933 and 1934."(2)

After each grower selects the option which he thinks will be to his best advantage, the total acreage for all growers is added and compared to the allotment available for the entire district. If there is a difference, the individual grower's figures are proportionately adjusted.

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(1) SUGAR BEET PRODUCTION ADJUSTMENT CONTRACT, Form Sugar 3, October 16, 1934, p.1

(2) ADJUSTMENT FOR SUGAR BEETS, Division of Information, Agricultural Adjustment Administration, October 18, 1934, p.3

On November 17, 1934, allotments to beet sugar processors of the entire 1934 beet sugar marketing quota of 1,556,166 were announced.(1)

Any person or persons desiring to participate in the sugar allotment during 1934 and 1935 must obtain the consent of the Secretary of Agriculture and an opportunity may be offered to such a party if all the allotments for that particular district have not been exhausted and other conditions are favorable.(2)

An example of this was the petition of the California Sugar Growers Association seeking a marketing allotment for 1935 of 300,000 one-hundred pound bags of refined sugar. The sugar was to be processed at a sugar beet factory at Hamilton City, California. The Secretary of Agriculture denied the petition on the grounds that "the petitioner has not at any time manufactured or marketed beet sugar and that the plant which the association proposes to operate has been in operation only during the years 1908 to 1913, 1918, and 1925, and the operation has not been successful nor profitable, and that the association has failed to show that it can or is now prepared to operate the plant."(3)

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(1) NEWS DIGEST, Agricultural Adjustment Administration, November 17, 1934.
(2) SUGAR BEET PRODUCTION ADJUSTMENT CONTRACT, October 16, 1934, p.2
(3) NEWS DIGEST, Agricultural Adjustment Administration, February 16, 1935, p.2

Sugar beet growers who sign the production adjustment contract will receive an advance payment of $1 per ton on their normal yield per acre multiplied by the number of their acres planted in 1934, as well as a final payment of not less than 25 cents per ton to be made about July 1, 1935.(1)

The following table indicates an estimate of the total income to the sugar beet producers of the United States for years 1933--1934:

"Estimated refund payments on processing or floor-stocks tax	$ 2,639,698
Estimated 1934 benefit payments	13,096,782
Estimated returns from 1934 crop	39,885,780
Estimated total income from 1934 crop and payments	$55,622,260
Estimated 1933 income from beets	58,651,000"(2)

As stated earlier in this chapter the loss of about $3,000,000 as shown above represents an actual loss in income to the farmers of a little more than 5 percent.

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(1) UNITED STATES BEET SUGAR PROGRAM ANNOUNCED AND REGIONAL MEETINGS IN SUGAR AREAS, News Digest, Agricultural Adjustment Administration, October 6, 1934, p.3

(2) ADJUSTMENT FOR SUGAR BEETS, Division of Information, Agricultural Adjustment Administration, October 18, 1934, p.5

With the establishment of quotas which limit the American market to the Territory of Hawaii, the insular possessions, and foreign countries, each source of supply will have its fair share based on past experience. The sugar program, with its refunds and benefits, will be financed by the levying of a $.005 processing tax on each pound of sugar entering the United States.

Another important part of the sugar program concerns itself with the labor conditions in the beet fields. The employment of children under 14 years of age is prohibited and children from 14 to 16 are enjoined from working more than 8 hours a day. Minimum wages and improved housing conditions are discussed in Chapter VIII, "The Labor Problem."

In order to facilitate the payment of benefits, disbursing offices have been established. The establishment of such disbursing offices depends upon the time the farmers sign their contracts. February 16, 1935 was the closing date set for the signing of the beet production adjustment contracts.(1) The establishment of these offices will greatly reduce the time elapsing between the forwarding of the contracts and the payment

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(1) NEWS DIGEST, Agricultural Adjustment Administration, February 2, 1935, p.4

of the benefits. The Denver office will handle payments for the western sugar beet states, while the East Lansing office will take care of the eastern sugar beet states.(1)

Other offices established are the New Orleans office which will handle the work on sugar cane adjustment contracts, and the San Juan office which will handle the Puerto Rican contracts.(2)

Farmers, who have already signed their contracts and have had them certified, received their first check about Christmas time. The first sugar beet adjustment checks, amounting to $8,972, were sent to 100 producers in the vicinity of Ogden, Utah. If these producers comply with their contracts they will receive their second installment during the 1935 season.(3) By February 16, 1935, checks amounting to $990,833 have been mailed to United States farmers cooperating in the sugar beet adjustment program.(4)

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(1) ESTABLISH SUGAR PLAN DISBURSING OFFICES, News Digest, Agricultural Adjustment Administration, October 27, 1934, p.3
(2) Ibid.
(3) NEWS DIGEST, Agricultural Adjustment Administration, December 29, 1934
(4) NEWS DIGEST, Agricultural Adjustment Administration, February 16, 1935

In conjunction with the proper function of this act many forms must be filled out, signed and returned to Washington, The following are but a few:

Form Sugar 3 --Sugar Beet Production Adjustment Contract

Form Sugar 6 --Bond of Treasurer of Sugar Beet Production Control Association

Form Sugar 7 --Sugar Beet Production Adjustment Contract Supplement No. 1

Form Sugar 8 --Sugar Beet Production Adjustment Contract Supplement No. 2

Form Sugar 12--Certificate of Organization Meeting of the Board of Directors of the Sugar Beet Production Control Association

Form Sugar 13--Certification By County Agent

Form Sugar 17--1933 Producers' Agreement As To Future Land

Form Sugar 18--Single-Unit Joint Compliance Agreement

Form Sugar 19--Consent to Joint Operation By Tenant

Form Sugar 22--Monthly Certificate of Expense For Personal Services

Form Sugar 24a-Monthly Certificate of Expenses For Personal Services And Travel(1)

A review of the provisions of this act seems to indicate that the beet sugar interests are now fully

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(1) Appendix--Headings of forms which I have on hand sent to me by the United States Department of Agriculture, Agricultural Adjustment Administration, Washington, D. C.

protected against natural losses and in addition are encouraged by subsidies or payments.

It is a known fact that the price of sugar in the open market is the London price. If the countries outside our controlled program continue to expand and flood the world market with surplus sugar, the prices will naturally fall. The question is, what will happen to the American market and to the domestic sugar beet industry if, after the three years pass, the control plan is discontinued? Will the industry be strong enough to survive? What will be the Cuban situation three years from now? I cannot answer these questions. Time alone can tell. This industry has, however, established its worth, as I have shown in previous chapters and will sum up in my last chapter. The sugar beet interests are strong, resourceful and aggressive in their own states as well as in Washington and can be depended upon to fight for their industry.

CHAPTER XI

MARKETING METHODS

In early days the use of sugar was considered a luxury, but with the development of large scale production of the cane and beet sugar industries, the price of sugar dropped until it came within the reach of all people. A factor which contributed to the price reductions was the keen competition among the refineries. It was now a question of the survival of the strongest, or perhaps the most daring.

A pooling agreement was formed in 1887 which resulted in the "Sugar Trust."(1) The methods which this trust used were not above question and in a very short time it gained control of 90% of the refineries. Instead of lowering the price of sugar to the public, it raised the price and the refiners reaped enormous profits. Because of government investigation on behalf of the United States and the few remaining independents, this trust was declared illegal in 1890.(2) The Sugar Trust gave little attention to the beet sugar industry of the west; nevertheless, it did influence the price of beet sugar sold on the market.

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(1) G. T. Surface, THE STORY OF SUGAR, p.207
(2) SUGAR INDUSTRY, Poor's Publishing Company, p.14

The parties involved in the dissolved Sugar Trust immediately formed the American Sugar Refining Company. They immediately resolved to obtain control of their competitor, the beet sugar industry, and put it out of business. They purchased sugar beet plants and promptly dismantled them. In 1908 the Government brought action against the American Sugar Refining Company for violation of the Sherman Anti-Trust Law and for fraud in shortweighing for customs duties.(1)

The American Sugar Refining Company immediately changed part of its policy and disposed of a large part of its investments in the beet sugar companies. Many other suits were entered against this company by private interests and it was not until 1922 that the litigations were ended.(2)

The next step in consolidation was for the purpose of combating unfair competition due to overproduction, secret rebates, and price concessions to favored large buyers. In 1928 more than fifty corporations and individuals formed The Sugar Institute, Inc. which adopted a code of ethics for all members. Before

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p.14
(2) Ibid, p. 14

this code was adopted, it was submitted to the Department of Justice for criticism and revision. By 1929 dissatisfaction was apparent and the members of this association were charged with price fixing contrary to the Sherman Anti-Trust Act. An investigation was ordered and a petition for its dissolution was brought in March, 1931.(1)

The petition for the dissolution of the Sugar Institute, Inc., members of which do a half-billion-dollar business yearly, was denied on October 9, 1934 by Federal Judge Julian W. Mack, but the injunction sought against allegedly illegal actions was granted. Judge Mack held:

> "The defendants have engaged in an unlawful combination and conspiracy, which has unduly and unreasonably restrained trade and commerce in sugar among the several States and the District of Columbia in violation of the Sherman Anti-Trust Act."(2)

In 1931 an American lawyer, Mr. Thomas L. Chadbourne of New York became Chairman of a relief committee sponsored by American Banks to aid the sugar industry. The result was an international agreement

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p.15
(2) SUGAR INSTITUTE, INC. NOT TO BE DISSOLVED, The Boston Globe, October 9, 1934

whereby surplus stocks were to be segregated and marketed over a period of five years and at the same time production was to be controlled during these five years. This Chadbourne Plan is a remarkable example of international cooperation after months of bickering. The weakness in this plan is that all sources of supply were not controlled, as for example the American beet growers' production was not reduced. Either this plan or a similar plan is necessary if the world sugar industry is to be saved from extreme international competition and over-production. The results of the Chadbourne Plan naturally affect the sugar beet industry in the United States even though the United States is not a member.(1)

At present the Agricultural Adjustment Act controls the production and marketing of sugar in the United States for a period of three years.

With the marketing allotment controlled, the actual selling to the consumer is of utmost importance. There has been a decrease in demand due largely to the diet fad which has swept the country. This fad is slowly passing, but its effects have been keenly felt

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(1) V. D. Reed, THE PRINCIPLES OF ECONOMIC GEOGRAPHY, pp.210-211

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(1) V. D. Reed, THE PRINCIPLES OF ECONOMIC GEOGRAPHY, pp.210-211

by the sugar interests. The sugar companies are now working toward increasing the demand. They have launched extensive advertising campaigns through the direct mailing of letters, folders, bulletins and pamphlets to the general public. The sugar companies also advertise in magazines, newspapers and on the air.

Over a year ago the sugar beet industry started an intensive cooperative campaign in an effort to increase its sales by encouraging a favorable attitude toward beet sugar and toward tariff protection.(1) A few of the points emphasized in this advertising campaign are:

1. All sugars are alike in taste, food value and appearance in their refined state.
2. The sugar beet industry is a necessity as a national defense against a shortage of a necessary food staple.
3. By competition with cane sugar this industry tends to keep prices down low.
4. The buying of beet sugar by the general public keeps money in circulation at home.
5. This industry gives work to American labor and the use of beet sugar is a patriotic support of American standards of living and workmanship.

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(1) SUGAR INDUSTRY, Poor's Publishing Company

6. Sugar from beets is refined in up-to-date American factories.
7. Beets are grown on American farms by American farmers.
8. Sugar from American beets costs no more than imported sugar.(1)

One folder which I have before me is headed, "What You Should Know About Sugar" and another, "Use Beet Sugar. Help Bring Agricultural and Industrial Prosperity Back to the United States by Using Beet Sugar Grown by American Farmers on American Farms and Processed in American Factories by American Labor." These folders are attractively designed in colors for emphasis.

In addition to advertising, the appearance of the sugar package was greatly improved. The purpose of this is to appeal to the consumers through its attractiveness and at the same time impress upon the consumers the cleanliness and convenience of packed sugar.

A broker or commission agent holds an important position in the marketing phase of the sugar industry. He negotiates sales to groceries, wholesalers and specialized distributors.(2)

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(1) Advertising data issued by The Great Western Sugar Company, Denver, Colorado and by the Farmers and Manufacturers Beet Sugar Association, Saginaw, Michigan.
(2) SUGAR INDUSTRY, Poor's Publishing Company, p.25

The beet sugar interests have long realized that their greatest market is in the West, near their source. The reason for this is that the cost of transportation by rail is too expensive to permit beet sugar to compete with cane sugar in the East.

In addition to large producers attempting to control the sources of supply, large users of sugar in other industries, such as the Wm. Wrigley, Jr. Company, also control their own sugar source. This has not been found to be very successful since the World War as it is more profitable to purchase such enormous requirements in the open market.(1)

I have touched upon some of the influences which affect the price situation of beet sugar. There are the serious epidemics of root rot and curly top. There is also the great fluctuation of acreage devoted to sugar beets caused by competing crops. Then the sugar beet crop is a cash crop and while this has the advantage of a quick turn-over of cash, there is some uncertainty as to price.(2) Great strides have been taken in the control of serious epidemics and the

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p.25
(2) ROOT AND TUBER CROPS--UTAH, The Chamber of Commerce and Commercial Club, Information Department of Salt Lake City, Utah, 1934, p.2

Agricultural Adjustment Act is assisting the sugar beet industry in its competition with imported sugar. The domestic price of sugar is also influenced by the world price as determined by the supply and demand outside our boundaries. Nevertheless, the important point is to increase the demand and in this the sugar interests are tireless.

CHAPTER XII

FINANCIAL DEVELOPMENT

The financial arrangements between the farmers and the refineries are closely interwoven from the time the contracts are signed. These contracts are signed before the farmers plant their acres of land, as the refineries are actively interested from the time of the selection of the seeds, through the planting of the seed, the harvesting of the beets to the refining and marketing of the finished product--sugar.

Previous to 1933 the refineries contracted to pay the farmers a definite amount for the harvested beets plus a percentage of the price realized in the market above a stated figure. The refineries took the risk of falling prices. This was the only way in which the farmers would sign; otherwise they would plant a different crop. But now, with the low prices received from possible competing crops, the farmers are now signing contracts with the refineries which give the farmer a percentage of the price the refinery receives from the sale of the sugar. The risk is now partially transferred to the farmers and is a distinct financial relief

to the refineries. If, in later years, the price of sugar should rise, the farmers will gain and the refineries will receive proportionately lower returns.(1)

In the previous chapters I have discussed the many ways in which the refineries assist the farmers through scientific research, experiments, and actual field assistance. It is to their mutual advantage that the farmers eventually harvest a large sugar beet crop of high sugar content.

The farmers are assisted in their selection and time of crop rotation, in the control of diseases, in obtaining a sufficient labor supply, in methods of harvesting as well as in financial problems.

Under the Agricultural Adjustment Act a great many of the farmers' financial difficulties are solved through the receipt of benefit payments from the Government. The contracts which the farmers make with the Government has nothing to do with contracts which they make with the refineries. The only point of contact is that the refineries cannot contract with the farmers for more acreage than has been allotted to them in their

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(1) SUGAR INDUSTRY, Poor's Publishing Company, p.9

contracts with the Government and, therefore, the refineries cannot market more than the allotments permitted for the respective districts.

The beet sugar refineries had some profitable years, but, with the recent decrease in demand and keen competition, prices have fallen. "Based on the average earnings and average invested capital, the average rate of return between 1925--1932 on domestic beet was 3.44%."(1) This, it is true, is not a large return, but the depression had set in and it is hard to judge its possibilities.

Fixed charges have not presented a serious problem as it is the usual practice in the sugar industry to write them off the books as soon as possible. The bond issues have not been materially increased for any length of time and, therefore, are not a cause of undue uneasiness.(2)

A recent practice of the sugar beet producers to draw on their surplus because of continued poor earnings, in order to pay dividends on large issues of preferred stock, is not recommended. It is expected that

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(1) SUGAR INDUSTRY, Poor's Publishing Company, pp.26-27
(2) Ibid, pp. 26-27

with the new controlled policy in operation and with a larger market for their product some of this financial trouble will be lessened. With the continued poor earnings, some uneasiness was felt because of the funded debt, but this is not serious as the funded debt is not a large element in the sugar beet industry.

I have not cluttered up this thesis with unnecessary pictures and charts, but the following extracts from exhibits compiled by Poor's Publishing Company(1) are of interest and of valuable assistance in obtaining a clearer idea of the financial problems of this important industry.

FINANCIAL STATISTICS OF FIVE BEET SUGAR COMPANIES

ASSET ANALYSIS

Dollar Totals in Thousands

	1925	1929	1932
Total Assets	$176,192	$170,757	$143,910
Fixed Assets	87,219	100,390	80,488
% Fixed Assets to Total Assets	49.50	58.79	55.93
Current Assets	74,758	64,612	55,100
% Current Assets to Total Assets	42.43	37.84	38.29

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(1) SUGAR INDUSTRY, Poor's Publishing Company, pp.27, 28,29,30

EARNINGS AND DIVIDENDS OF FIVE BEET SUGAR COMPANIES

Dollar Totals in Thousands

	1925	1929	1932
Total Earnings Before Fixed Charges	$15,002	$8,867	$-3,051
Fixed Charges	599	1,081	798
% Fixed Charges to Earnings Before Fixed Charges	3.9	12.1	Nil
Total Earnings Available for Dividends	14,403	7,786	3,849
Dividends	8,674	6,528	1,050
% Earnings Distributed in Dividends	60.22	83.84	Nil (From)
Reinvested Earnings	5,729	1,258	4,899(Surplus)
Total Invested Capital	151,392	146,026	123,592
% Return on Investment	9.91	6.07	Nil

COMBINED CURRENT ASSETS AND CURRENT LIABILITIES OF FIVE SUGAR BEET COMPANIES

Dollar Totals in Thousands

	1925	1929	1932
Total Current Assets	$74,758	$64,612	$55,100
Cash and Equivalent	19,955	7,990	5,383
% Cash and Equivalent to Total Current Assets	26.69	12.37	9.77
Receivables	4,753	5,153	4,163
% Receivables to Total Current Assets	6.36	7.98	7.56
Inventory	43,153	46,064	39,614
% Inventory to Total Current Assets			
Total Current Liabilities	11,325	17,321	17,201
Current Ratio	6.6 to 1	3.7 to 1	3.2 to 1
Net Working Capital	63,429	47,348	37,897

FINANCIAL STATISTICS OF FIVE SELECTED SUGAR COMPANIES

CAPITAL STRUCTURE

Dollar Totals in Thousands

	1925	1929	1932
Funded Debt	$11,873	$18,061	$15,427
% Funded Debt to Total Invested Capital	7.84	12.37	12.48
Preferred Stock	31,909	31,789	31,629
% Preferred to Total Invested Capital	21.08	21.77	25.59
Common Stock	57,776	58,591	47,903
Surplus	49,834	37,585	28,633
Total Net Worth	139,519	127,965	108,165
Total Invested Capital	151,392	146,026	123,592

A study of the inventories in the financial statement will show that they are perhaps unnecessarily large, but the fiscal year of the leading sugar beet refineries ends in February and March, which is the same time that the slicing season ends and the marketing of the new crop is not yet well under way. Naturally the current liabilities, because of this fact, also appear very large.

Improved conditions, larger sales volume, and more cash are expected in the near future. Nationalism is the motto of this industry and, if the people respond, the sugar beet industry will be strongly established in the United States.

CHAPTER XIII

SUMMARY

The greatest danger in the sugar industry is over-production with its resultant low prices. The Agricultural Adjustment Act now controls and limits production. This, consequently, will check low prices.

The important problem is to increase the consumption of sugar, especially beet sugar, and with the aid of advertising it is expected that this will be possible. Though sugar is used in the preparation of many luxuries, it is a necessity in our diet. It supplies essentially the same human needs as potatoes and, measured in calories, a pound of sugar is equivalent to nearly six pounds of potatoes.(1)

A paragraph in the folder , "What You Should Know About Sugar" states:

> "In the average diet sugar costs only 6 per cent, but supplies 18 per cent of the total energy furnished by our food. Sugar is a carbohydrate, of the class of foods that produce heat and muscular energy. It is quick-acting, easily and completely digested and relieves exhaustion.
>
> "Particularly children and men doing active, hard work need sugar." (2)

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(1) WHAT YOU SHOULD KNOW ABOUT SUGAR, The Great Western Sugar Company, Inside of folder.
(2) Ibid.

The example of advertising as shown above is indicative of the efforts on the part of the beet sugar industry to increase consumption and provide additional markets for their product.

I have shown how the sugar industry of the world is interwoven with the economic, social and political policies of government. Each country is subsidizing her domestic industries through benefit payments and extreme tariffs. This is at the bottom of over-production and, powerful international control (Chadbourne Plan), as well as domestic control (Agricultural Adjustment Act), are necessary to prevent disaster due to accumulated surpluses, flooded markets and lowered prices.

Economically and geographically, the United States market enjoys a certain isolation as far as sugar is concerned. Nevertheless, the world price of sugar is the London price, and if the market is flooded, as was recently the case in the Philippines and Java, prices will drop even in the United States. The three-year control plan under the Agricultural Adjustment Administration is a constructive attempt to strengthen the sugar industry in the United States, its possessions and Cuba.

The benefits of the beet sugar industry to the United States are numerous, a brief summary of which are the following:

1. This industry fills a local need in making the United States self-sufficient.
2. It is valuable as a cash product--cash for beets, cash for silage, and cash from by-products.
3. Its nutritive by-products, tops and pulp, are valuable for feeding stock. The by-products of an average acre of sugar will produce 300 pounds of dressed beef or lard.(1)
4. It stimulates scientific farming and refining which carries over to other farming industries.
5. Crop rotation is beneficial to the fertility and productiveness of the soil.
6. The sugar beet industry stimulates other correlating industries such as cheese factories, dairy farms, feeding pens.
7. It is important in the employment of capital and labor. In 1933, the wages paid to factory wage earners, not including salaried officers and office employees, amounted to $10,969,646.(2)
8. The development of this industry furnished new markets for the use of coal, coke, petroleum, sugar bags, twine, lime rock, gas, electric to the sum of $76,127,188.(3)

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(1) Neil Kelly, BEET SUGAR COMPLETES THE CIRCLE, Progress, p.45

(2) CENSUS OF MANUFACTURES: 1933--BEET SUGAR, United States Department of Commerce, Washington, D. C., p.1

(3) CENSUS OF MANUFACTURES: JULY 24, 1934--BEET SUGAR, United States Department of Commerce, Washington, D. C.,p.1

9. This industry stimulates transportation, banking, all kinds of mercantile business throughout the community.

10. It uses refinery supplies, repair materials, machinery and equipment, chemicals. It, thus, indirectly, is important in the use of capital and labor in other industries.

11. This industry is a source of revenue to the government through taxation.

As has been emphasized before, this industry is most advantageous to the United States in that sugar can be produced entirely through the utilization of American capital, land and labor.(1)

The establishment and development of the beet sugar industry has been an uphill fight. It is true it has to be protected and assisted by the Government. That is not a reason for its abolishment. Nor is the argument that sugar can be imported for less than what it costs to produce it locally any reason that the industry should be annihilated. Its importance to American agriculture and American people exceeds its drawbacks. It is emerging a sound and efficient industry worthy of the support of the American people.

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(1) THE BEET SUGAR INDUSTRY OF MICHIGAN, OHIO AND INDIANA, Farmers and Manufacturers Beet Sugar Association

What will happen after the three years' control plan is ended I cannot foretell. It is hoped and expected that the sugar beet industry in the United States will have become very strong and very efficient. Some plan of protection against imported sugar will have to be formulated at that time, as it is unfair to expect us to compete with imported sugar produced by underpaid laborers. Will the plan be continued? Will another plan be developed? Or, will the sugar beet industry find itself unprotected? I do not believe that this can possibly happen. The industry is too important to the United States and the representatives of the industry in Washington are competent, efficient and aggressive. This industry must and will survive.

BIBLIOGRAPHY

BIBLIOGRAPHY

GOVERNMENT PUBLICATIONS

UNITED STATES DEPARTMENT OF COMMERCE:

Agriculture, Bureau of the Census, 1930, Issued 1933

Beet Sugar, Census of Manufactures, 1933, Issued 1934

Commerce Yearbook, Volume I, Bureau of Foreign and Domestic Commerce, 1932 (Latest Edition)

The Sugar Industries, Census of Manufacturers, 1931

UNITED STATES DEPARTMENT OF AGRICULTURE:

Beet Sugar: A Brief Description of the Process of Manufacture. Bureau of Plant Industry, no date.

Crops and Markets, December 1933

Curly-Top Resistance in Sugar Beets and Tests of the Resistant Variety U.S.No.1, Technical Bulletin No. 360, Bureau of Plant Industry, 1933

Important Sugar Beet By-Products and Their Utilization, Farmers' Bulletin No.1718, 1934

Statistics of Cotton, Sugar, and Tobacco, Bulletin #1347, 1933

Sugar Beet Culture in the Humid Area of the United States, Farmers' Bulletin No. 1637, 1930

Sugar Beet Growing Under Irrigation, Farmers' Bulletin No. 1645, 1931

Sugar Beet Labor Hearings Set for Michigan, Colorado -- Information for the Press, September 18, 1934

Agricultural Adjustment Administration: (According to date of publication)

An Act, Public -- No. 213 -- 73d Congress -- May 9, 1934

Marketing Allotment to the National Sugar Manufacturing Company Out of the Quota for the Continental United States Beet Sugar Producing Area, Office of the Secretary of Agriculture, August, 1934

California Beet Factory Contracts, Information for the Press, September 18, 1934

Sugar Beet Labor Hearings, Information for the Press, September 18, 1934

United States Beet Sugar Program Announced and Regional Meetings in Sugar Areas, News Digest, October 6, 1934

Establishing Separate Sugar-Processing Tax Funds, A Proclamation by the President of the United States of America, October 15, 1934

Sugar Beet Production Adjustment Contract, Form Sugar 3, October 16, 1934

Adjustment for Sugar Beets, Division of Information, Agricultural Adjustment Administration, October 18, 1934

Cuban Sugar Quota Nears Completion, News Digest, October 20, 1934

Establish Sugar Plan Disbursing Offices, News Digest, October 27, 1934

Limit Processing Over-Quota Sugars, News Digest, November 3, 1934

Benefit Payments, News Digest, November 10, 1934

News Digest
October 6, 1934
October 27, 1934
November 17, 1934
December 15, 1934
December 29, 1934
January 5, 1935

Relating to Consumption Requirements
and Quotas, January 8, 1935

News Digest, February 2, 1935
February 16, 1935

UNITED STATES GOVERNMENT PRINTING OFFICE:

Industrial and Labor Conditions, Monthly
Labor Review, 1934

Cost of Producing Sugar Beets, Part X,
1926

BIBLIOGRAPHY

PERIODICALS AND NEWSPAPERS

Beet Sugar Completes the Circle, Neil Kelly, Progress, Street and Smith Publication, Inc., New York City, New York, 1933

The President Asks for Sugar Quota, Boston Globe, February 8, 1934

Sugar Industry, Poor's Publishing Company, New York City, New York, and Wellesley, Massachusetts, 1933

Sugar Institute, Inc. Not To Be Dissolved, Boston Globe, October 9, 1934

The Sugar Press, Great Western Sugar Company, Denver, Colorado, July, 1934

Unusual Beet, Boston Globe, November 12, 1934

BIBLIOGRAPHY

TEXTS

Glover, John G. and Cornell, William B. The Development of American Industries, Prentice Hall, Inc., Boston, Massachusetts, 1932

Packard, Leonard O. and Sennott, Charles P. and Overton, Bruce, The Nations at Work, The Macmillan Company, New York, New York,1933

Reed, Vergil D., The Principles of Economic Geography, Boston University Book Stores, 1933

Schultz, Henry, Statistical Laws of Demand and Supply, University of Chicago Press, Chicago, Illinois, 1928

Staples & York, Economic Geography, South-Western Publishing Company, New York, 1934

Surface, George T., The Story of Sugar, D. Appleton and Company, New York, New York, 1910

Wright, Philip G., Sugar in Relation to the Tariff, McGraw-Hill Book Company, Inc., New York, New York, 1924

The American Yearbook, The American Yearbook Company, 1933

The Encyclopaedia Britannica, Inc., 14th Edition, 1929, Volumes 1, 3, 4, 6, 8, 9, 14, 21

The Lincoln Library of Essential Information, The Frontier Press Company, Chicago, Illinois, 1924

BIBLIOGRAPHY

COMPANY AND ORGANIZATION PUBLICATIONS

American Beet Sugar Companies, 1934-1935, U.S. Beet Sugar Association, Washington, D.C., 1934

The Beet Sugar Industry of Michigan, Ohio and Indiana, Farmers and Manufacturers Beet Sugar Association, Saginaw, Michigan, 1934

Economic Conditions, Government Finance, The National City Bank of New York, New York, 1934

Publicity Department of the Great Western Sugar Company, Denver, Colorado, How Chemists Use the Term "Cane" Sugar
History and Development of Sugar Beet
Scientific Data on Beet Sugar
The Silver Anniversary Written in Gold, 1930
Sugar Science Sidelights Simply Told
The Sugar Press, October 1934
What You Should Know About Sugar

Root and Tuber Crops -- Utah, The Chamber of Commerce and Commercial Club, Information Department of Salt Lake City, Utah, 1934

The Story of Beet Sugar from the Seed to the Sack, Farmers and Manufacturers Beet Sugar Association, Saginaw, Michigan

The Beet Sugar Industry of Michigan, Ohio and Indiana, 1934

The World's Sugar Supply, Its Sources and Distribution, National Bank of Commerce in New York, 1917.

BIBLIOGRAPHY

CORRESPONDENCE

The Chamber of Commerce and Commercial Club of Salt Lake City, Utah

Farmers & Manufacturers Beet Sugar Association, Saginaw, Michigan

Funk & Wagnalls Company, New York City, New York

The Great Western Sugar Company, Denver, Colorado

The National City Financial Library, New York City, New York

Poor's Publishing Company, New York City, New York

Time, New York City, New York

United States Beet Sugar Association, Washington, D.C.

United States Department of Agriculture
    Agricultural Adjustment Administration
    Bureau of Agricultural Economics
    Bureau of Plant Industry
    Bureau of Foreign and Domestic Commerce
    Department of the Interior
    Government Printing Office

Willett & Gray

APPENDIX

SUGAR BEETS: ACREAGE, PRODUCTION, and VALUE (1)

United States, 1911--1932

	1911	1915	1920	1925	1930	(2) 1933
Acreage harvested 1,000 acres	474	611	872	647	775	984
Yield per acre short tons	10.7	10.7	9.8	11.4	11.9	11.3
Production 1,000 short tons	5,062	6,511	8,538	7,381	9,199	11,085
Average price per ton received by producers for crop-marketing season	$5.50	$5.67	$11.63	$6.39	$7.14	$5.32
Farm value, basis average price for crop-marketing season	$27,841	$36,950	$99,324	$47,147	$65,697	$58,988

(1) STATISTICS OF COTTON, SUGAR, AND TOBACCO--U. S. Dept. of Agriculture Bulletin #1347-- Superintendent of Documents, Washington, D. C. 1933 p.484

(2) CROPS & MARKETS--U. S. Dept. of Agriculture, Washington, D. C. December, 1933. p.468

PRODUCTS, BY KIND, QUANTITY, AND VALUE: 1933 AND 1931(*)

	1933	1931
Aggregate value	$127,133,272	$85,672,749
Sugar:		
Total tons (2,000 pounds)	1,625,880	1,165,027
Total value	$121,171,347	$81,812,489
Granulated--		
Tons	1,615,372	1,155,712
Value	$120,811,768	$81,474,167
Unfinished--		
Tons	10,508	9,315
Value	$359,579	$338,322
Molasses:		
Total tons (2,000 pounds)	175,134	86,457
Total value	$877,383	$393,551
Discarded from dêsugarization process (exclusive of that used for molasses beet pulp)--		
Tons	136,744	69,059
Value	$617,721	$314,136
Other, for purposes other than desugarization--		
Tons	38,390	17,398
Value	$259,662	$79,415
Beet pulp:		
Total tons (2,000 pounds)	2,098,294	1,376,080
Total value	$4,219,118	$2,832,946
Dried pulp, exclusive of molases pulp--		
Tons	244,069	83,785
Value	$1,837,370	$984,241
Moist pulp--		
Tons	1,724,427(1)	1,207,104(1)
Value	$865,316(1)	$903,794(1)
Molasses pulp--		
Tons	129,798	85,191
Value	$1,516,432	$944,911
Other products, value	$865,424(2)	$633,763(2)

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(1) Includes data for a small quantity of pressed beet pulp, the tonnage and value of which can not be shown without disclosing the production of individual establishments.

(2) Includes value of molasses sold or transferred to other factories for desugarization, as follows: For 1933, $732,433, value of 177,681 tons; for 1931, $617,246, value of 153,429 tons.

(*) CENSUS OF MANUFACTURES: 1933, U. S. Department of Commerce Bureau of Census, Washington, D. C., Published July 24, 1934, p. 2

Ginsburg

Sugar beet industry

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2.35	Edwin Shea
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