

BEET SUGAR

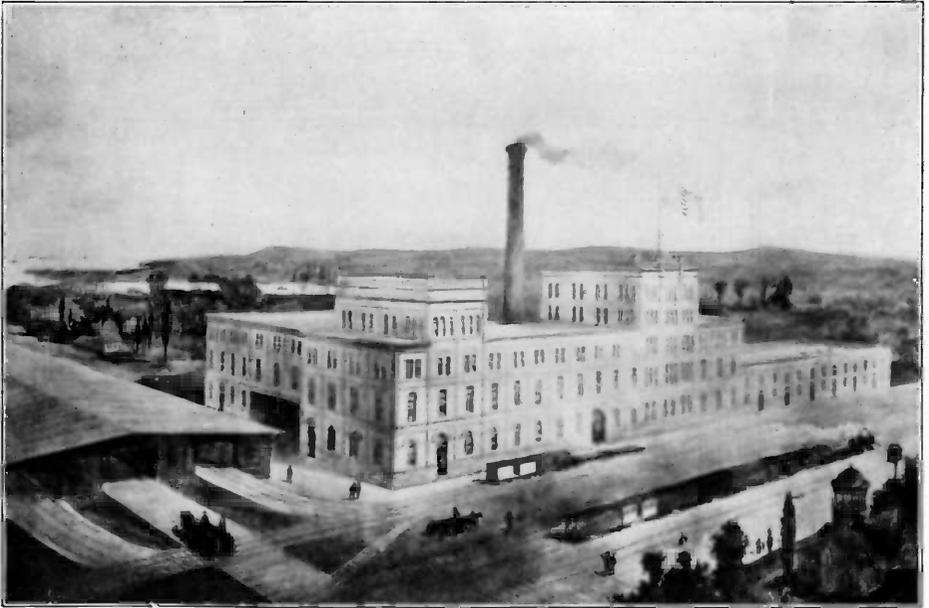
*in the
Great Salt River Valley
of Arizona*



B E E T
S U G A R

IN THE
GREAT SALT
RIVER VALLEY
OF ARIZONA





Eastern Sugar Company, Glendale, Arizona.

BEET SUGAR IN ARIZONA.

CONDITIONS IN THE ARID WEST.

The arid lands of Arizona, Colorado, Utah and California are peculiarly well adapted to the growing of sugar beets; they have but little rainfall; the land is irrigated, and the long, continuous bright sun and uniform weather insures a rich percentage of sugar in the beet.

The amount of sugar depends upon climate, not soil. Sugar comes from the air, none of it from the earth. The laboratory in which it is gathered is the leaf and the active agent is the sun's rays, unobstructed by clouds or fogs. Other things being equal, sugar in beets is in proportion to sunshine, and sunshine is, of course, in proportion to aridity.

The crop is never injured by rain or droughts, and can always be harvested at the proper time, thus preventing decay, sprouting and other injurious action.

The beet sugar industry in Michigan and other Middle West States has been uniformly profitable and of large benefit to farmer and manufacturer, and also to the country at large, since it is producing that which we would otherwise import. But it is noticeable that the large companies are now building new factories only in arid and semi-arid regions. Utah has seven already, California eight and Colorado nine. Think of the rough, mountainous, mining, arid State of Colorado with nine great beet sugar factories and actually exporting sugar as well as gold.

THE LENGTH OF OPERATING SEASON.

The season in Colorado, Utah and California is longer than in the rain belt, but still shorter than in Arizona. In Arizona, beets are planted from September to March, and mature from March to September, allowing a continuous manufacture of sugar for six months in the year, twice as long as in the North.

In the rain belt the average length of annual operation is 80 to 90 days; Utah and Colorado, 100 to 110; California, 120 to 140; Arizona, 160 to 180. The increased length of season is for obvious reasons of immense advantage.

YIELD AND SUGAR PERCENTAGE IN ARIZONA.

The average yield of sugar beets in Arizona for 1902 was nineteen and six-tenths tons to the acre, and $16\frac{6}{10}$ per cent of sugar in the beet, as against approximately nine tons and 13 per cent in the rain belt.

One field produced forty-two tons to the acre, which is believed to be the largest yield ever known. It is reasonable to expect of that particular belt of soil, of which there are about 50,000 acres in the valley, an average of twenty-five tons to the acre.

The difference in value is not fully expressed by a mere statement of the difference in the percentage; it costs about the same per ton to "process" the beets, regardless of their richness. It requires at least 11 per cent of sugar in the beet to pay for the beets and to pay operating expenses.

The profits increase rapidly with the increased richness of the beet. A 12 per cent beet would produce some profit, while a 16 per cent beet would soon pay for a factory and pay the farmer a like increase in profit.

Beets in Arizona cost more than 20 per cent less for the sugar in the beet than in any part of the rain belt. Sugar there, by reason of long freight hauls, etc., is worth about 15 per cent more than in the East.

Again, sugar there will be produced in the *summer*, when the price averages about one-half cent per pound more than during other seasons of the year.

The product of the Arizona factory will be consumed in that Territory and can be distributed at an average freight charge of 50 cents per 100. Sugar is now shipped there from California at \$1 per 100. The advantage in freight charges and summer operation will be about \$20 per ton.

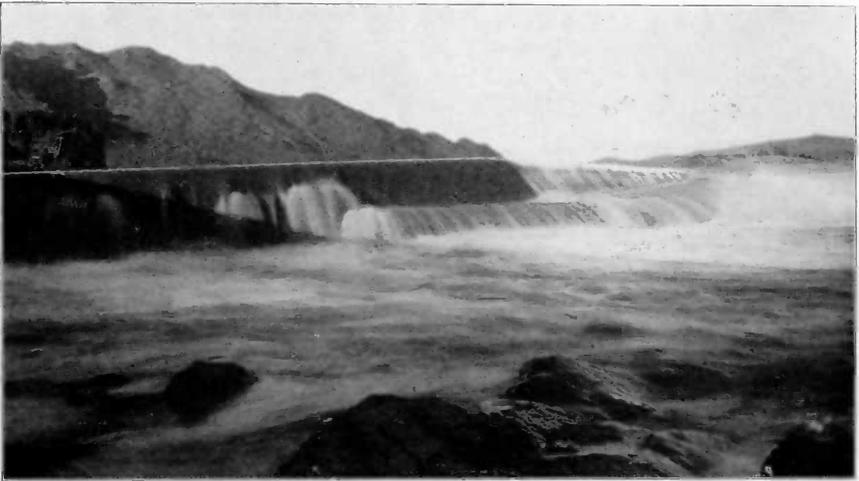
THE SALT RIVER VALLEY.

(Editorial Correspondence to "Farm Loans and City Bonds.")

PHOENIX, ARIZ., May 10, 1903.

Arid America is continually presenting surprises. The time is not far back when the American desert was considered simply a great barren tract of desolation, useless for any human purpose. And that would seem to be the view of many Eastern people even now. It finally became apparent that this rainless region was a vast storehouse of every variety of the precious metals. The nation is growing rich from the gold, silver, copper and other metals of this region. Now follows some startling results in agriculture and horticulture. The finest oranges in the world are produced in the desert of Arizona. The choice sizes were sold last year to dealers in New York at the rate of \$9 per box, which is largely above the price paid for oranges from any other section. The long fiber cotton of Egypt, of which we import many million dollars' worth annually, cannot be grown in the Gulf States or in any humid atmosphere, but grows to perfection in the lower irrigated valleys of Arizona. The same thing may be said of the finest dates such as are produced only in Algeria, on the border of the Sahara Desert.

It has been learned that the ideal beet sugar climate is the arid region; this has been fully demonstrated. In the rain belt of no country can beet sugar be produced so cheaply as in the mild, rainless regions of the West. The advantages are distinct at every important point. Greater certainty of crop, larger tonnage, richer beets, longer season of operation of factories. These are some of the most distinguishing characteristics. Can plant all winter and run the factory all summer. There are two other important factors peculiar to this locality. Sugar will be produced in the spring and summer time when the price of sugar averages from one-half to five-eighths of a cent higher than during the balance of the year. This is on account of its



Arizona Canal Diversion Dam, in the Salt River.

increased use in connection with fruit, and also because it is before the sugar harvest in other localities. Then again, the matter of freight charges. Here is a large area rapidly increasing in population now depending upon the Pacific coast for its sugar. Freight averages about \$1 per hundred, whereas for local distribution from this factory it will be about one-half this amount. There seems to be a combination of uncommonly favorable conditions here for this industry. The seasons, too, are very accommodating. Planting may continue from four to five months, and operation of factory from five to six months. Profits to both farmer and factory greater than they can be in the rain belt anywhere.

It may not be generally known that the Salt River Valley shows evidence of having been one of the most densely populated sections of prehistoric America. It is estimated from the ruins of towns and canals that 250,000 souls dwelt here and watered the soil before the Man of Galilee walked the earth. Over 300 miles of their irrigating canals are visible. Some of their buildings were imposing in size, and pottery and stone implements are found in all parts of the valley. It now ap-



Grand Canal, Salt River Valley.

pears probable that history is to repeat prehistoric conditions, and that this valley is to be the most densely peopled rural district of modern America.

The new facilities for irrigation will be immensely superior to the old. The ancients had some small reservoirs, but the capacity of the Tonto Basin Reservoir is more than 10,000 times greater than all of theirs together. The Salt River cuts through the Mazatzal Range of

mountains in a "box" canyon, only 210 feet wide. The dam is located in this canyon, and back of the range is a valley called "Tonto Basin," which forms the reservoir site. This is the most extensive and complete natural reservoir site known to civilized man. It is over twenty miles long, three miles wide, and the water will be 230 feet deep, by far the largest artificial body of water in the world. And yet it will be built at the smallest proportionate cost. Its capacity is several times greater than that produced by the Nile dam, for which Egypt pays the British \$25,000,000, and yet the Tonto dam will cost only about \$3,000,000. The Assouan dam is sixty-five feet high; the Tonto dam as now planned by the government is 300 feet from bed rock to crest, the highest dam in the world. The department has decided wisely that this shall be the first dam to be built in the great scheme of water storage which will give to this territory an Egypt that will rival in the extent of its productions that for which Marc Antony bartered the imperial crown of Rome. With this reservoir the Salt River Valley will have the most extensive and perfect system of irrigation on this hemisphere, and the Old World furnishes its equal only in two cases—that of the Nile in Egypt and the Ganges in India—both the results of our enterprising British cousins. Think of this here in what was once supposed to be the least promising for agriculture, of all our territories. It has been said that there is not known on the earth's surface a body of land of so large an area that is so perfectly adapted to irrigation as this valley. There are lateral ditches running fifteen miles straight in one direction without encountering an elevation knee high in that entire distance; and this with a soil declared by scientific men to be superior to the Delta of the Nile. Add to this soil and ample water supply, a climate so genial that crops of almost every variety under the sun grow twelve months in the year, and one may get some faint conception of the future of this great Salt River Valley.

THE DESERT AND RAIN BELT COMPARED.

BY ALFRED MUSY, SUGAR EXPERT, DETROIT, MICH.

The best sugar men of the rain belt have been astonished since 1901 at the wonderful reports on the beet sugar industry in Colorado.

They knew already that sugar beets have been successfully raised on irrigated lands, for instance in Utah since 1891, but they had never heard of crops of 20 to 40 tons of beets per acre raised in the first season, nor of campaigns of 60,000 and even 100,000 tons of beets showing an average percentage of sugar of 17 per cent.

ENORMOUS YIELDS.

The rapid development of the sugar industry in Colorado is due to the fact that the farmers have been making money even in the first season. It does not require much work nor much experience from a

Colorado farmer to raise from 15 to 25 tons of sugar beets per acre. The weeding of the beet field, which is sometimes so expensive in the rain belt, is unknown there, as there are practically no weeds. All the hard work consists in the thinning out and in the topping of the beets, which operations are never delayed by excessive rains. The roads are always in perfect shape. Under such conditions it is as easy for a farmer to grow fifteen or twenty acres as to raise five acres in the rain belt. In the North the farmer receives a flat price, \$4.50 per ton. In the South the scale price, for an average of 17 per cent sugar, gives about the same amount, if I am well informed.

LARGE PROFITS.

No wonder that the Colorado farmer is satisfied with that price. His crop of 15 to 25 tons per acre is paid at the rate of \$67.50 to \$112.50, which, after deducting all expenses, about \$35 at the most, leaves him a net profit per acre of \$32.50 to \$77.50, or in many cases much more than the value of the ground.

The sugar manufacturer has no reason to complain. From beets averaging 17 per cent he can extract by using the osmose process 14 per cent in granulated sugar, or 280 pounds to the ton of beets. The working expenses are about the same as in the rain belt; the coal is even cheaper. The only drawback, on account of the development of the industry, is the necessity of shipping the sugar to Chicago, which results in an expense of 35 cents per 100 pounds for freight, or about 98 cents per ton of beets. This is largely compensated by the lower cost of the beets for the same percentage of sugar compared to the eastern regions.

COLORADO AND MICHIGAN COMPARED.

I tried to make a comparison between the probable returns of a 600 tons' factory—per ton of beets—in Colorado and in a State of the rain belt, for instance, Michigan.

For this purpose I assume that the polarization is 17° in Colorado, 14° in Michigan; that the extraction—by using the osmose process—amounts to 14 per cent and 11 per cent, respectively; that the Colorado beets are paid for at the rate of \$4.50 per ton, flat price; the Michigan beets, \$4.50 for 12 per cent sugar, or \$5.16 for 14 per cent; that in both cases the weighing, receiving expenses and extra freight on a part of the crop amount to 50 cents per ton on the whole supply, and that the price of sugar, supposed to be \$4.50 per 100 pounds in Chicago, represents only \$4.15 in Colorado and \$4.40 in Michigan. All these figures, which are not mathematically exact, can be accepted as a reasonable basis for such a comparison.

The estimates would be as follows:

		PER TON OF BEETS.	
In Colorado.		In Michigan.	
Expenses—			
One ton of beets.....	\$4.50	One ton of beets.....	\$5.16
Receiving, freight, etc.....	.50	Receiving, freight, etc.....	.50
Working expenses at the factory....	2.50	Working expenses.....	2.50
	<u>\$7.50</u>		<u>\$8.16</u>
Receipts—			
280 lbs. sugar at \$4.15.....	<u>\$11.62</u>	220 lbs. sugar at \$4.40.....	<u>\$9.68</u>
Gross profit.....	\$4.12	Gross profit.....	\$1.52

In the above estimates no account has been kept of the interest on the capital invested, nor of the wear and tear on buildings and machinery, which would reduce considerably the final net profit in each case, but the difference of \$2.60 per ton, or of \$156,000 in a 60,000 tons' campaign, explains why the capitalists are more eager to invest in beet sugar enterprises in Colorado than in the rain belt.

No great industry has ever been developed in this country that has been so largely and generally successful as beet sugar. It has been successful in the rain belt and doubly so in the arid West.



Irrigating Orange Orchard, Salt River Valley.

THE FOLLOWING RESULTS ARE FROM A RELIABLE SOURCE AND CAN BE SUBSTANTIATED.

"The Holland Sugar Factory, of Holland, Mich., have wound up their last year's business, and declared a dividend of 16% upon the year's operations, besides greatly reducing the indebtedness of the plant."

"The Peninsular Sugar Company, Caro, Mich., in 1900 paid two dividends of 10% each, and in 1901 the same factory paid two dividends of 10% each, besides a stock dividend of \$100,000."

"The Bay City Factory, of Bay City, Mich., for the campaign of 1901 retired

\$100,000 in bonds, paid a floating indebtedness of \$70,000 and 5% dividend on \$300,000 capitalization."

"The Alma, Mich., Beet Sugar Factory liquidated \$70,000 of their bonded indebtedness and paid a dividend of 8% for year 1900."

"Any good beet sugar factory in Michigan will pay for itself in three years."—(Clarence H. Gould, of W. J. Gould & Co., Detroit, Mich., Wholesale Grocers.)

"The net profits of a 500 ton beet sugar factory per annum are \$173,077."—U. S. Govt. Report 1897, page 216.

The factory at Lehi, Utah, made one year a profit of over 60 per cent on its stock, and that at Oxnard, Cal., over 70 per cent.

Inquiry was made by a disinterested party for \$5,000 worth of stock of a number of sugar companies. No stock was offered for sale and the following extracts are taken from some of the replies:

Alma Sugar Company, Alma, Mich.

"Our stock is not on the market and is held by few individuals. I do not know where you can buy any of our stock." (Signed) F. R. HATHAWAY.

**Minnesota Sugar Company,
St. Louis Park, Minn.**

"Beg to state that this corporation is a closed one. Our stock is not for sale on the market or elsewhere." (Signed) F. W. FINK.

Ogden Sugar Company, Ogden, Utah.

"If you are aware of any of the above stock being on the market at a reasonable figure please inform us, as we wish to purchase some few thousand dollars' worth ourselves."

OGDEN SUGAR COMPANY.

**Colorado Sugar Mfg. Company,
Grand Junction, Colo.**

"This corporation is a closed one. Our stock is not for sale." (Signed) J. M. McFARLANE.

**Wisconsin Sugar Company,
Milwaukee, Wis.**

"This company has no stock for sale at the present time, and know of no

stockholder who wishes to dispose of any of his stock."

(Signed) R. G. WAGNER,
President.

**Michigan Sugar Company,
Bay City, Mich.**

"We do not know of any of our stock now for sale, but know of a great many stockholders who would be pleased to add to their holdings of stock at a very considerable advance above par."

(Signed) THOMAS CRANAGE.

**Saginaw Sugar Company,
Saginaw, Mich.**

"There is none of this company's stock for sale, all of it having been taken the time the company was organized."

(Signed) W. P. PENOFAR,
President.

**Bay City Sugar Company,
Bay City, Mich.**

"We do not know of any stockholders who desire to dispose of their stock at the present time.

(Signed) EUGENE FIFIELD.

Utah Sugar Company, Lehi, Utah.

"None of our stock is for sale."

UTAH SUGAR COMPANY.

Stock of Michigan beet sugar companies has sold as high as 100 per cent premium. The stock of the company at Watsonville, Cal., has sold at 200 per cent premium.

BEET SUGAR IN GENERAL.

SENATE DOCUMENT NO. 204, 57TH CONGRESS, MARCH 2, 1903.

REPORT BY TRUMAN A. PALMER, SUGAR EXPERT.

The development of the manufacture of sugar from beet roots is one of the marvels of the nineteenth century, and represents an investment in factories alone, mostly in Europe, of between \$600,000,000 and \$700,000,000.

To consider the beet sugar industry intelligently, a word should be said concerning the history of cane sugar, the production of which supplied the world's markets for centuries before it was known that sugar could be produced, commercially, from beet roots.

CANE SUGAR.

The original habitat of sugar cane is unknown, but is supposed to be in the country extending from Cochin China to Bengal.

The art of boiling sugar is mentioned as early as the seventh century. The art of refining was discovered in the fourteenth century. Venice became the great European center of the sugar trade in the fifteenth century, and during that century a Venetian received a reward of 100,000 crowns (\$111,940) for the invention of the process of making loaf sugar.

One of the earliest references to sugar in Great Britain is that of 50 tons being shipped to London in 1319, to be exchanged by a merchant for wool. At that time sugar sold for 43 cents per pound, and continued to be used only as a luxury and for medicinal purposes until the eighteenth century.

EARLY HISTORY OF BEET ROOTS IN EUROPE.

After the fall of the Roman Empire, the barbarians took to Bohemia a so-called beet root, containing a few saccharine elements, but not enough to attract attention at that period.

The beet root is not mentioned again until 1705, when Oliver De Serre discovered that alcohol could be obtained from the fermentation, which convinced him that sugar existed therein.

In 1747 the Prussian chemist, Marggraf, director of the physical classes in the Academy of Science at Berlin, obtained sugar from the common beet root, possessing all the properties known to exist in cane sugar.

THE FIRST BEET SUGAR FACTORY.

In 1801 Franz Carl Achard, the pupil and successor of Marggraf, erected at Cunern, Silesia, the first beet sugar factory in the world.

Achard was the subject of much ridicule, and by many of his countrymen was looked upon as an insane enthusiast. By the presentation of substantial evidences however, he was in time able to dissipate the prejudice which existed and to secure the further coöperation of the German Government.

THE FIRST FRENCH FACTORY.

In 1810 the first French factory was erected at Lille, and produced sugar at a cost of 30 cents per pound, the beets at that time averaging but 6 per cent of sugar.

EXTRACTS FROM REPORT ON BEET SUGAR BY THE FRENCH MINISTER OF THE INTERIOR, IN 1813.

By 1813 France had in operation 334 small factories which the minister of the interior estimated would produce 7,700,000 pounds of sugar, or an average of 102 tons per factory for the season, an amount equal to but two days' output of the average American factory of to-day. In his report at the beginning of 1813, under the head of "New industries," the minister said :

To replace in our consumption the sugar, indigo, and cochineal of the colonies; to find in the south of Europe and at home the cottons and soda to supply our manufactures seemed impossible. It was ardently wished for, and the impossibility disappeared before our efforts.

During this year the manufacture of sugar which is extracted from the beet root will give us 7,700,000 pounds of this staple. It is prepared in 334 factories, all of which are in actual activity.

After numerous trials, processes are finally employed by which beet root sugar will not cost more than 15 cents per pound to the manufacturer. Mr. Bonmatin, inventor of this new method, profited by the useful labors of his predecessors, and the government, in order to hasten the fortunate results of his discovery, charged him to proceed to propagate it in those sections in which the principal manufactories are established.

Encouraged by Napoleon and by Frederick the Great, the industry assumed great commercial proportions, and from 1822 to 1825 over one hundred factories were erected, while by 1830 nearly all the European countries were taking an active interest in the industry.

By systematic, fostering legislation, Europe has secured the investment of \$630,000,000 in an industry which annually distributes over \$200,000,000 to its farmers and \$100,000,000 to other home interests.

In 1840, thirty-nine years subsequent to the erection of the first beet sugar factory, the total world's production of cane sugar was 1,100,000 tons and of beet sugar 50,000 tons, beet sugar forming 4.35 per cent of the total world's production.

In 1900 the total world's production of cane sugar was 2,867,041 tons, and of beet sugar 5,607,944 tons, beet sugar forming 66.17 per cent of the total world's production. In 1840 the world's yield of beet sugar was 50,000 tons, in 1900 it was 5,607,944 tons; an increase of 11,100 per cent in sixty years, as shown by the following table :

World's production of sugar.

Years.	Cane sugar.	Beet Sugar.	Total sugar.	Supplied by beets.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Per cent.</i>
1840.....	1,100,000	50,000	1,150,000	4.35
1850.....	1,200,000	200,000	1,400,000	14.29
1860.....	1,510,000	389,000	1,899,000	20.43
1870.....	1,585,000	831,000	2,416,000	34.40
1880.....	1,852,000	1,402,000	3,254,000	43.08
1890.....	2,069,000	3,633,000	5,702,000	63.70
1900.....	2,867,041	5,607,044	8,474,085	66.17

The transference of the sugar industry from the Tropics to the Temperate Zone is largely due to five causes :

First. Intelligent, fostering legislation for the home beet sugar industry by nations within the Temperate Zone.

Second. Scientific culture of beet roots, which has more than doubled the sugar content therein.

Third. Failure of science to perceptibly increase the sugar content of cane.

Fourth. Abolition of slave labor in the Tropics.

Fifth. The habitat of the sugar beet being in the most highly civilized portions of the world, has brought to its manufacture the concentration of the highest scientific investigation and achievement.

EUROPEAN MONEY KEPT AT HOME BY ENCOURAGING THE BEET SUGAR INDUSTRY.

United States Census Bulletin No. 59, for the year 1899, shows that per each ton of daily beet capacity the investment in American beet sugar factories is \$1,097. In the following estimate the investment of European factories is figured at \$1,000 per ton of daily capacity. The average acreage yield is placed at 10 tons, the cost of beets at \$4 per ton, the "factory expense" at \$2 per ton, and the extraction of sugar at 12 per cent.

Number of factories.....	1,511
Capital invested.....	\$625,000,000
Tons of beets worked annually.....	51,598,400
Acres cultivated to beets.....	5,159,840
Paid to farmers for beets.....	\$206,393,600
Paid for labor, fuel, lime rock, coke, limestone, mill supplies, etc.....	\$103,198,800
Total annual expenditures.....	\$309,592,400



Bartlett Ranch, Glendale, Arizona.

UNITED STATES PRODUCTION OF BEET SUGAR.

The following table, showing the American production of beet sugar from the first year when we produced 1,000 tons, to the present date, also shows the effect of the tariff law of 1897 and the great strides which we are now making:

Year.	Tons of American beet sugar produced.	Year.	Tons of American beet sugar produced.
1888.....	1,010	1895.....	30,000
1889.....	2,600	1896.....	40,000
1890.....	2,800	1897.....	40,399
1891.....	5,359	1898.....	32,471
1892.....	12,091	1899.....	72,944
1893.....	20,453	1900.....	76,859
1894.....	20,443	1901.....	185,000

FIRST SUCCESSFUL PLANTS.

In 1879 the first successful American factory was erected at Alvarado, Cal. In 1888 we had two factories, and for the first time in our history produced 1,000 tons of beet sugar in a single season. When the Dingley bill was passed five years ago we had six factories, which it had cost \$2,000,000 to construct.

EXPANSION UNDER THE 1897 TARIFF.

Since the passage of the 1897 law we have erected thirty-six factories and enlarged the other plants at a cost of over \$30,000,000.

In addition to this, the Department of Agriculture in January of this year gave out a list of eighty-six factories which were projected and would require an expenditure of \$49,000,000 in construction work alone.

The production of beet sugar in the United States in 1900 was 76,659 tons; in 1901, 185,000 tons; an increase of 140 per cent in a single year, and the plantings this year are reported to be 85 per cent greater than in 1901.

Under the law of 1897 the tariff on sugar "above No. 16 Dutch standard in color and upon all sugars which have gone through a process of refining, is \$1.95 per 100 pounds."

FUTURE EXPANSION.

The United States importations of sugar last year, in excess of what we produced at home and received from our island possessions, were over a million and a half tons. To produce this sugar at home would mean the construction of 500 new factories, at an expense of \$275,000,000, and the cultivation of over 1,600,000 acres to beets, for which our farmers would receive about \$70,000,000 annually. As the sugar consumption in the United States is increasing at the rate of over 6 per cent per annum, sixteen years hence we should provide for the production of another two and one-half million tons annually, which would return \$100,000,000 more to our farmers, or a total of \$170,000,000 each year. To cover the increase alone would require fifty new 500 ton factories each year.

EARLY MISCONCEPTIONS.

We have had and still have, many things to learn concerning the industry. I remember very well that when I commenced to investigate this subject, the prevailing opinion was that California was the only State in the Union in which beets could be grown successfully. To-day, we have a chain of forty-five factories, stretching from ocean to ocean.

It was but six or eight years ago that the officers of the Chino, Cal., factory, learning that some of the farmers were irrigating their beets, sent out notice that no irrigated beets would be received, no beets ever having been raised by irrigation, and the supposition being that they would be of low sugar content. To-day our richest beets are grown by irrigation.

TEN YEARS' PROGRESS IN LEHI.

In 1891 the acreage tonnage at Lehi, Utah, was 6.6 tons per acre; in 1901, 11.50 tons per acre, an increase of 74 per cent in ten years. In 1891 the sugar content of the Lehi beets was 11 per cent; in 1901, 15.20 per cent, an increase of 38 per cent. In 1891 the sugar extrac-

tion at Lehi was 110 pounds per ton of beets; in 1901 it was 235 pounds, an increase of 114 per cent. In 1889 the "factory expense" in working up a ton of beets at the Alvarado, Cal., factory, was \$6.57; in 1897, \$2.71, a decrease of 58 per cent.

Ten years ago the production of sugar from American beets was yet in the experimental stages, neither the farmer nor the manufacturer feeling sure of a profit. Since that time, as shown above, the farmer at Lehi has increased his tonnage 74 per cent and has increased the sugar content of each ton of beets by 38 per cent. During the same time, the factory management has increased the extraction of sugar from a ton of beets by 114 per cent, and at Alvarado the "factory expense" in extracting the sugar from the beets was decreased 58 per cent in eight years.

With all this progress the opportunities to still further reduce the cost of production, especially in the field, are almost limitless.

If the development of the industry be not checked by unwise legislation, another ten years of scientific work should find us producing beet sugar as cheaply as any country in the world.

LABOR-SAVING APPLIANCES.

Europe has cheap labor and dear horses, and hence has not the American incentive to decrease the labor of the former and increase that of the latter. With us the reverse condition is true, and hence more and more of our field work is being done by horses. In all parts of the beet belt various experiments are being made, the success of which will still further reduce the hand labor. In Kansas they are trying a new method to avoid much of the hand work of weeding and thinning; in Michigan they are experimenting with ridge planting to accomplish the same purpose, and various experiments are being made whereby the beets are lifted, topped, and loaded into wagons entirely by machinery. Ten years from now but little hand work will be necessary, and therein lies one of the most important points in the development of the industry.

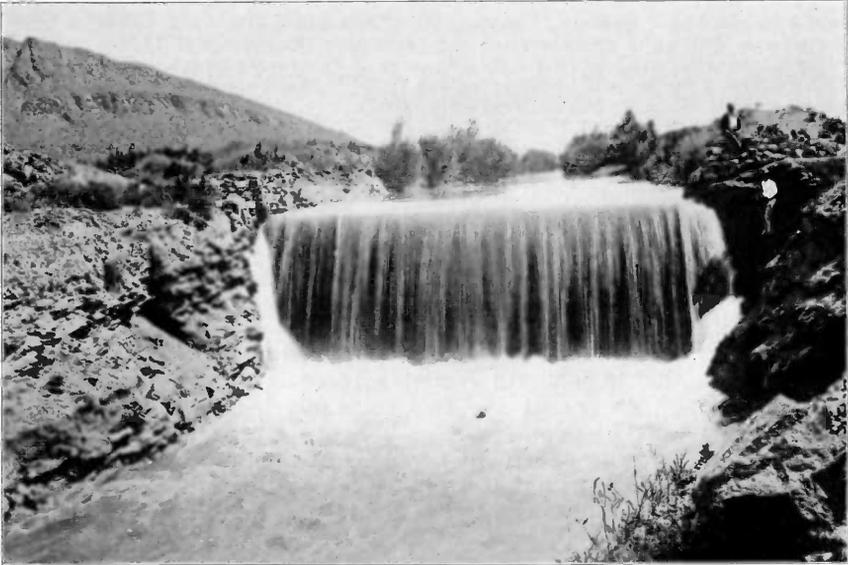
WASTE OF BY-PRODUCTS.

In France the returns from the sale of pulp alone amount to over 4 per cent on the entire capital invested in beet sugar factories. In the United States, with few exceptions, the disposal of the pulp is a positive expense, yet for bone, blood, and milk, beet pulp is worth \$3.40 per ton, as against hay at \$10 and corn meal at \$18 per ton. Our farmers will learn this in time, and this utilization of a single by-product will yield a fair interest on the entire investment. In Europe, alcohol, potash, vinegar, shoe blacking, and other products are obtained from the waste of the beet, and it can be but a question of time when the American will utilize every particle of the beet, just as the late Phil. Armour said the packers now utilized every particle of the pig except the squeal.

FULL ACREAGE TONNAGE.

The full tonnage of beets, planted 8 inches apart, in rows 18 inches wide, is 42 tons per acre, and the honorable Secretary of Agriculture informs me that time and again he has raised 28 tons per acre on his Iowa farm. Yet the average tonnage last year in the United States was 9.6 tons. All this will be rapidly rectified as our farmers become familiar with the culture.

In the vicinity of Magdeburg, Germany, beets are grown on land worth \$800 to \$1,200 per acre, land where the rent is high, and where



Falls of the Arizona Canal.

fertilizers to the value of \$12 to \$15 per acre must be added each year, and still the beets are sold at a profit at \$4 to \$4.50 per ton. So anxious are the farmers to raise this most profitable crop that the factories are obliged to limit the beet acreage of each farmer.

BEETS AND DROUGHT.

The sugar beet will stand more drought on the one hand, or more excessively wet weather on the other, than will almost any crop that the farmer can raise, hence it is a safe crop, which is sold in advance at a fixed cash price.

BEETS IN ROTATION.

As a rotator the sugar beet is far above any other ordinary crop. The opinion formerly prevailed that the sugar beet rapidly exhausted the soil, but this is not the case, if properly rotated.

The following is from a report by one of our consuls to Germany.

A German farm of 625 acres produced, before the introduction of beet culture, yearly, 9,736 bushels of grain in ten years' average. After beet culture was introduced, with 125 acres yearly to beets, the average yearly grain crop from the remaining 500 acres was 9,870 bushels, or 134 bushels' increase. Another farm in the province of Saxony, also of 625 acres, produced before beet culture was introduced, in ten years' average, 13,879 bushels of grain. When five years afterward 135 acres were planted with beets, the grain crop of the remaining 490 acres was 14,365 bushels' average, and afterward, when yearly 220 acres of beets were planted, the average grain crop from the remaining 405 acres was 14,397 bushels, or 518 bushels more than from the whole 625 acres before beets were raised.

The above demonstrations show what a boon the culture of beets will be to our farmers, who are the backbone of our national wealth. The Secretary of Agriculture states that in order to get the benefit of beets as a rotator, and to get the pulp to feed to his cows, the farmer could actually afford to furnish the factory the sugar from his beets free, and then would be only selling the air, for the sugar in beets comes wholly from the air.

Professor Powell, formerly of the Smithsonian Institution, makes the statement that in semiarid America there is enough rich, tillable land and enough water that the two, once married, would support in affluence 70,000,000 of people.

I am familiar with nearly all of our arid country, and I can form no other conclusion than that from an agricultural standpoint our most productive land has been left to the last, an inheritance for future generations.

PRIZE SUGAR BEETS.

BETTER METHODS EMPLOYED IN THE CULTIVATION OF BEETS BRING
DISTRIBUTION OF PRIZE MONEY.

Fort Collins, Colo., March 31, 1903.—The principal subject of interest among farmers in this vicinity just now is the best method of sugar beet culture. Almost every farmer around here last season raised a few acres of beets and intends to raise more this year. Last year the Loveland sugar factory management in order to stimulate interest in raising the best quality of beets, offered prizes of \$600 for the best fifteen acre tract of beets, \$350 for the best ten acres and \$250 for the largest yield from a five acre tract.

Robert Boyd and Sons, of Greeley, won the \$600 prize. They cleared something like \$5,000 from a tract of 100 acres. The cost of raising the fifteen acre prize winning tract amounted to \$40 per acre, or \$600 for the whole tract, including the hire of Russians and seeding the ground. Two thousand one hundred and forty dollars was received from the factory for the crop, giving a profit of \$1,540 for the tract, not including the prize money. The yield amounted to 31.7 tons per acre and the percentage of sugar to 17 per cent.

BEETS AND IRRIGATION.

Congress, for the first time, has now acted in the matter of national irrigation, and we hope that soon large areas of our desert country will be placed under irrigation ditches. Now, ask any agricultural expert as to what is the best crop that can be grown in large quantities on this arid land. He will tell you "sugar beets," because the farmer has a market that cannot be overdone. It is by all odds the greatest agricultural possibility in America, both East and West, but more especially the West, where the variety of crops is more limited and the industry deserves the continued fostering care of our federal government.

Increased acreage tonnage by cultivation and proper rotation, utilization of the waste, and reduction of the hand labor are evolutions of the near future in the production of American beet sugar which will revolutionize its cost of production, give employment to hundreds of thousands of farmers and artisans, and cheaper sugar to the nation.

Another thing about the beet sugar industry is that it is impossible to make a trust out of it without taking the farmers into the deal, and the factories must be scattered, whereas the cane sugar refineries are all located on the coast, and virtually all in a trust, which arbitrarily fixes the price which 76,000,000 of Americans shall pay for an article of daily consumption.

The material results of fostering the beet sugar industry will be the retention at home of from \$100,000,000 to \$125,000,000 which we now annually send abroad, cheaper sugar, better farming, more grain per acre, less competition, a boon to the dairy and stock interests, besides many minor advantages.