



The economic feasibility of sugar-beet production for sugar in the Salt River Valley in Arizona

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THE ECONOMIC FEASIBILITY OF SUGAR-BEET PRODUCTION FOR SUGAR
IN THE SALT RIVER VALLEY OF ARIZONA

by
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(IRAQ)

A Thesis
submitted to the faculty of the
Department of Agricultural Economics
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE
in the Graduate College, University of Arizona

1957

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ACKNOWLEDGMENT

The author wishes to acknowledge, with most grateful appreciation the outstanding efforts, advice, and helpful suggestions received from Dr. Andrew Vanvig, Director of the Thesis, Dr. G. W. Barr, Head of the Department of Agricultural Economics, and Dr. Raymond E. Seltzer, Professor of Agricultural Economics. He wishes also to thank Dr. Keith Hamilton, from the Agronomy Department, for his reviewing the agronomy chapter of this study.

The author is also indebted to Government and State Offices, Agricultural Experiment Stations, and Sugar Companies mentioned in this thesis for instruction, illustrations, and materials.

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CHAPTER I

INTRODUCTION

In view of the federal crop limitation program, Arizona farmers are looking for crops to replace cotton on the diverted land. This is not a simple problem because no crop grows extensively on Arizona lands that has proved to be as profitable per acre as cotton. The choice of profitable alternative crops under the present existing agricultural situation in Arizona is limited. In many cases producers planted the land taken from cotton to another crop, although economic conditions alone might not have justified this decision. The acreage control program resulted in production decisions which are not necessarily economically sound.

Accordingly, because of the existing agricultural situation in Arizona, cotton producers and other farmers are anxiously seeking a profitable alternative crop. Available evidence indicates that sugar beets can be grown for sugar in both quantity and quality in the Salt River Valley of Arizona. Sugar-beet seed is presently being successfully produced in Arizona. Early and recent experiments regarding the possibility of successful sugar-beet production, for sugar, have had positive results. The earlier results of experiments were put in practice and a sugar factory was established for the beet sugar industry in Arizona in 1905.

The factory, however, did not long exist primarily because cotton, which at that time could be grown on unlimited acreage, provided higher returns. Now, with acreage controls on cotton, sugar beets appear to be a profitable alternative. Therefore, Arizona farmers are asking the question, "Why shouldn't we grow sugar beets for sugar since they are grown successfully in the Imperial Valley of California, an area with similar soil, climatic, etc., conditions with the Salt River Valley?" They would like, too, to enjoy the profitability of the crop resulting from the returns of the sugar extracted from the beets and from the sugar-beet by-products, which would be a valuable addition to the livestock feed resources of Arizona, and would thus give additional impetus to what is already one of the most profitable industries of the Salt River Valley.

For the purpose of answering the above question of Arizona farmers, a detailed study of all the interrelated problems and conditions which determine the profitability of sugar-beet production in the Salt River Valley has been undertaken under actual Arizona conditions and in the light of the Sugar Act of 1948. An effort has been made to determine whether the production of sugar beets for sugar can be a successful industry in Arizona.

Several methods have been used to obtain facts concerning the above-mentioned question of Arizona farmers. Both past and recent experiments, in sugar-beet production for sugar in the Salt River Valley, have been reviewed and the agronomic aspects of the problem have been analyzed. Conditions under which sugar beets are produced successfully in the Imperial Valley of California, an area similar to the Salt River Valley,

have been reviewed and studied. A number of farmers and individuals who are interested and well-informed with respect to the requirements for successful sugar-beet production have been consulted and interviewed.

In addition to the agronomic aspects of the problem, the economic feasibility of sugar-beet production for sugar has been analyzed in an effort to answer the question of Arizona farmers as to "why should we not grow sugar beets?" The problem is also considered with respect to sugar-beet factory requirements and with regard to the various Sugar Acts providing for state and national quotas and allotments. It is hoped that this study will help Arizona farmers to achieve their primary economic objective, i.e., to obtain the optimum returns from the use of the Valley resources by the most effective and judicious combination of the various possibilities.

The Imperial Valley of California and the
Salt River Valley of Arizona

The production of sugar beets for sugar and the establishment of a successful sugar industry in the Imperial Valley of California was an important impetus for making this study, "The Economic Feasibility of Sugar-Beet Production for Sugar in the Salt River Valley of Arizona." This is because of the similarities of conditions under which sugar beets are grown in the two areas and because a sugar industry has been established successfully in the Imperial Valley.

For the purpose of our study and because of our references to the Imperial Valley, it is desirable to make certain general remarks regarding

both of the valleys. It will be seen that many of the conditions required for successful sugar-beet production are similar in both of the big agricultural valleys.

Imperial Valley of California

The Imperial Valley of California is an agricultural valley located in the southwest desert region. Being closely encircled by arid mountain ranges, it is shut off from the moderating effects of moist ocean winds, and the hot and dry climatic conditions are plainly reflected in the characteristics of the soils.

General Features:

Soil: The soils, in general, are somewhat heavy in structure and are a clay loam, calcareous, and low in humus content. Certain sections are in need of artificial drainage, and alkali is troublesome in many localities.

Climate: The climate is arid; the mean annual precipitation is very low. At Calexico, for example, the annual precipitation is 3.4 inches, and at Brawley, 2.47 inches. The summers are long and hot. The mean annual temperature is 71° F. at Calexico, and 70.3° F. at Brawley. The normal growing season is about 300 days, although agricultural operations are continuous throughout the year.

Supply of labor: The supply of labor is adequate and somewhat cheap because of availability of Mexican nationals.

Farming: Farming in the Imperial Valley is entirely by irrigation. The water supply is relatively abundant. The Valley in 1900 was a barren desert entirely uninhabited, however, in 1901 and later on with the introduction of irrigation, the population of the Imperial Valley has grown to an estimated 74,000 in 1956.

The Valley is devoted principally to the production of the following crops and livestock.

- | | |
|------------------|---------------------------------|
| 1. cotton | 5. alfalfa |
| 2. sugar beets | 6. dairy and livestock products |
| 3. citrus fruits | 7. lettuce |
| 4. truck crops | |

Sugar beets, however, had not been introduced to the Valley in its earliest agricultural development in 1901, nevertheless, it became one of the most important crops shortly after 1901.

Salt River Valley of Arizona

General Features:

The Salt River Valley is the most fertile and the largest agricultural area, and the most populated area of Arizona. It is in the south-central part of Arizona. It occupies a part of a large valley extending on both sides of the Salt River.

Soil: The soils of the Salt River Valley, generally, speaking, are amply supplied with the more essential mineral-ash plant foods, including lime, potash, and phosphoric acid. Nitrogen and humus, however, are

undoubtedly deficient in quantity, and the addition of these soil ingredients is desirable, perhaps imperative. However, one of the methods of supplying the lack of humus and nitrogen, and of improving the tilth and water-holding power of these soils is by growing leguminous crops upon the lands and plowing them under as green manure. So far as known, alfalfa and crimson clover are the best of these, and their use for this purpose is undoubtedly an essential part of any scheme of crop rotation for this region.

Alkali salts are not prevalent in excessive amounts except in occasional localities of limited area. The injurious effects of alkali here are very limited, and adequate drainage has in the main been effected by a system of electrically-operated pumps and a few open drainage and waste ditches.

Climate: The climate is warm and arid. Temperatures vary considerably in different parts of the Valley. The climate is characterized by high maximum and mean temperatures; long, hot summers and short, mild winters; low annual rainfall; low relative humidity; rapid evaporation; and a high percentage of sunshine. The average frost-free season is 292 days. The rainfall, though normally light, varies greatly from year to year. The mean annual precipitation at Phoenix is 7.87 inches. Most of the rainfall occurs at two distinct periods -- in midwinter and in late summer.

Supply of labor: Supply of farm labor is principally performed by Mexicans, supplemented by Indians from the Salt River and Gila Indian Reservation, and migrant labor during harvest seasons for vegetables and cotton.

Farming: Farming in the Salt River Valley is entirely by irrigation. The water supply is from the dams on the Salt and Verde Rivers and from underground water which is generally adequate.

The Valley is devoted principally to the following crops and livestock.

- | | |
|------------------|--------------------------|
| 1. cotton | 6. alfalfa |
| 2. citrus fruits | 7. grains |
| 3. dates | 8. dairying and poultry |
| 4. truck crops | 9. cattle feeding |
| 5. lettuce | 10. sugar beets for seed |

Winter pasturing and feeding of livestock are sources of considerable income to the farmers.

CHAPTER II

SUGAR BEET AGRONOMY

The sugar beet is a most remarkable plant. It is grown below sea level in the Imperial Valley in California and at alpine elevations such as in the San Luis Valley in Colorado, where the altitude ranges from 7,500 to 7,800 feet above sea level.

In the United States the sugar beet is cultivated as a commercial crop from the Canadian border almost to the Gulf of Mexico in certain geographic areas.

In terms of length of growing season, the sugar beet is also a highly adaptable plant. Profitable crops of sugar beets are produced in areas whose growing season is as short as 125 days, and sometimes less, and in regions where the growing season may be eight or nine months in length. Examples of the former are in the Red River Valley of Minnesota and North Dakota, and of the latter in the Imperial Valley of California. The background for this successful adaption lies not only in the ability of the beet plant to thrive under such extreme variations as have been indicated, but also in the brilliant work done by a number of American plant breeders in developing varieties adaptable to certain areas and also resistant to the diseases peculiar to certain beet-growing regions.

The sugar beet has been referred to as a cool-weather plant. While it is grown in the Imperial Valley of California, it is not exposed

to much of the summer heat. Here the beet seed is planted in September and October, and the plants are thinned in November and December. They continue to grow during the winter months (when temperatures sometimes drop to freezing) and are ready for harvest in May and June. Along the Canadian border, on the other hand, where the mean summer temperatures do not reach the optimum of 67° to 70° F., the long daylight hours have a substituting effect for temperature. Here the long summer days bring about active growth of the plant and make possible the production of sugar in a shorter period of time. The statement, "It is the hours of sunlight that count", is often referred to, particularly in these northern regions. The sugar beets, then, are a relatively cold-hardy plant and can also be classified as a long-day or sunshine-loving plant.

In light of the preceding facts with regard to sugar-beet culture, interested people in Arizona desired (and are desiring) to introduce sugar beets to the agriculture of Arizona. This desire was generated from the possibility of profitable production of sugar beets in the state.

Accordingly, the agricultural experiment stations in Arizona, in response to this desire, conducted a variety of experiments dealing with the culture of sugar beets. The purpose of these experiments was to determine the facts concerning successful production of sugar beets for sugar and the possibility of their entrance into the cropping system in some localities of Arizona such as Yuma and the Salt River Valley.

Some of these experiments go back to 1897, and some of them are recent. We shall review, in this chapter, these old and recent experiments upon which we shall determine the possibility of their production.

The first part of this chapter is devoted to the early experiments since 1897 and after, in the Salt River Valley. The last part of it is devoted to the results of experiments conducted recently in both Yuma and the Salt River Valley. Favorable results, as we shall see, were obtained.

Sugar Beet Experiments in Arizona

Early Experiments

"The establishment of a beet-sugar factory in Eddy, New Mexico, on one hand, and at Chino and Los Alamitos in Southern California, on the other, had naturally led the people of Arizona to inquire as to the possibility of growing paying crops of sugar beets in the irrigated valleys of the territory".¹ In response to this demand for information, the agricultural experiment stations in the spring of 1897 undertook to ascertain the behavior of the sugar beet under Arizona conditions of soil, irrigation, and climate.

With this end in view, the cooperation of about 300 farmers in various parts of the Territory was secured, and seed of standard varieties, mostly Vilmonin and Klein Wanzlebender, obtained from the Department of Agriculture at Washington, was supplied, along with directions for preparation of the soil, planting, and care of the growing plants. In the Salt River Valley these directions were supplemented with regular

¹ Forbes, R. H., Sugar Beet Experiments, Arizona Agricultural Experiment Station Bul. No. 26, University of Arizona, Tucson, December, 1897, p. 1.

inspections of the test plots by members of the station force, who made suggestions from time to time. Carefully conducted experiments were also carried out on the substation's grounds near Phoenix, and similar work was attempted at Tucson.

The objectives of those experiments were to determine the following in Arizona:

1. Effect of soil on successful beet production.
2. Effect of climate on successful beet production.
3. Effect of time of seeding and harvesting.
4. Effect of previous crop.
5. Finding the best variety of seeds adapted to the local soil and climatic conditions.
6. Effect of irrigation.
7. Yield per acre.
8. Percentage of sugar content in the root.
9. Suitable rotations to crop the land and to maintain soil fertility.

In fact, the above mentioned objectives are the core of determining the possibility of sugar-beet production for sugar in any area.

As to the effect of soil in which sugar beets are to be grown, it has been found that sugar beets could be produced in a variety of soils,

and any moderately fertile soil such as will grow wheat, corn, cotton, etc., will also be found suited to sugar beets.¹ Sugar beets have been found a good crop to plant even upon soils somewhat alkaline. This is true in the slightly alkali soil in which sugar beets are successfully grown for sugar in the Imperial Valley of California. In this respect the soil conditions are expected to be more favorable for beet production in Salt River Valley of Arizona. This is because of less alkalinity than Imperial Valley, and because of the efficiency of potash, lime, and phosphoric acid. Nitrogen is found deficient. However, for the remedy of this defect the most practical method to be used is growing leguminous crops on the land such as alfalfa, clover, and others, as we will see in our later discussion of the crop rotation and cropping system.

As to the effect of temperature and time of seeding, a range of experiments had been conducted in the vicinity of Phoenix, as shown below:

- "1. January 1 to 15 - Seed germinates, but danger from frost.
2. January 15 to 31 - Seed germinates well, little danger from frost.
3. February 1 to 15 - An excellent time to sow seed.
4. February 15 to 18 - A fairly good time to sow seed.
5. March 1 to 15 - Somewhat difficult to secure stand.

¹ Experiments, however, have shown that growing sugar beets upon extremely light, sandy soils and upon heavy adobe and clay soils should be avoided. Medium soils of all kinds give satisfactory yields. The Salt River Valley of Arizona has the latter types of soils, as well as Imperial Valley, which produce satisfactory crops. Sugar beets grown in such soils, especially clayey loam and slightly coarser soils, would mature quickly, thus enabling the factory to begin operation early in June, as we shall see, and the yield would be quite as satisfactory during the seasons of abundant water.

6. March 15 to 31 - Seed needed to be irrigated up.
7. April - Seed still germinates if irrigated.
8. May - Difficult to secure a good stand, even with irrigation.
9. June to September - Impractical to secure a stand.
10. September 1 to 15 - Is difficult to secure a stand.
11. September 15 to 30 - Good stand can be secured with irrigation.
12. October - stand can be secured with irrigation.
13. November 1 to 15 - Somewhat difficult to secure a stand without irrigation.
14. November 15 to 30 - Seed germinates without irrigation, but danger of frost.
15. December - Seed germinates but young plants apt to be killed by frost."¹

To obtain satisfactory results, the experiments as shown in the summary just mentioned indicated that the best time for planting in the Salt River Valley is during January and early February², or as soon after the winter rains as the land can be plowed. In gravelly or sandy loams, the planting may be done early in January, but seed should be withheld from the fine adobe soils until at least the heavier winter rains are thought to be past. Any soil can usually be seeded by the middle of

¹ McClatchie, Alfred J., Sugar Beet Experiments During 1899, Arizona Agricultural Experiment Station Bul. No. 31, University of Arizona, Tucson, December, 1899, p. 271.

² This date of planting has not been tried with the new varieties in the recent experiments conducted in Yuma and the Salt River Valley. November planting, however, with the new varieties, as we shall see later in the chapter, may be a good practice.

February and should be seeded by that date if possible. The longer the seeding is delayed after the middle of February, the more irrigation will be required¹, and the less growth will the beets make before they are checked by the higher temperature of summer. The best results from winter-sown beets were obtained from a sowing made during the latter part of January and the first half of February. Beets will mature, however, and produce their results if sown as late as the middle of March. Judging by the experiments conducted, it will not be profitable to grow sugar beets in the Salt River Valley during any other season than the one just mentioned. The period from the beginning of April to the end of August, when beets are grown in cool, humid regions, is too hot and dry for successful beet culture here. If they could be started during July and kept growing a month or so, the cooler weather that follows would enable them to make a good growth before they would be checked by the cold weather of December. But with the temperature of the surface of the soil 140° to 150° F. during the heat of the day, starting beets during July is very difficult. Beets might be started during early June but would require so much irrigation to carry them through the hot weather that their culture could hardly be profitable. As soon as the cool weather of September and October comes, it is comparatively easy to secure a good stand of young beets. But they do not then have sufficient time to make much growth before they are checked by the cold weather of December and January. In the Imperial Valley of California, an area similar to Salt River Valley of Arizona,

¹ This requirement of more water is very important because water is a limiting factor of production in Arizona.

from soil and climatic points of view, fall sugar beets are obtained very successfully from a sowing made during a latter part of September and October, and the crop will be ready for harvest by the second half of May and June. The results indicate that in Arizona's climate the desired qualities of beets are present in a winter-sown standing crop from about the middle of June to about the middle of August, and that it would be advisable to have all beets dug by the latter date.¹

Thus, it was definitely settled, as a result of the experiments done, that summer planting of beets is impractical in the Salt River Valley. Difficulties are encountered in securing a stand during weather when the maximum temperature is much above 95° F. The results of the experiments were that beet seed will not germinate satisfactorily in the Arizona climate from early May to the middle of September. While the maximum temperature of each day is above 105° F., a stand of beets cannot be secured. Some of the seed may germinate, but most of it will not, and any young plants that appear soon succumb to the heat.

As to seeding, it had been found that the seed should be placed at a depth of three-fourths to one and one-fourth inches in the lighter soils. They may be sown deeper than in the heavy ones. Fully twenty pounds of seed should be sown per acre. A distance of twenty inches has proven to be a very convenient one for the rows.

As to the effect of the previous crop grown on the sugar-beet land, the results of the experiment indicated that lower yields would be

¹ This is the only conclusion reached from the results of the past experiments. Further tests of date of planting with the new varieties, obtained recently, are very necessary.

obtained from lands on which beets had been grown upon during the previous year, whereas higher yields were obtained on lands on which alfalfa had been grown during the previous year.¹

As to the effect of variety, the results of experiments showed that the variety Klein Wanzlebenens, among several other varieties tried in the old tests, was the best and gave the best results under Salt River Valley soil and climatic conditions.²

Since 1897, however, a number of variety trials have been made and new varieties have been found in the United States. More variety trials are advisable in Arizona.

As to the effect of irrigation, the results of the experiments indicated that the highest yield of sugar was obtained from the February-sown seed irrigated once (May twentieth, when the beets were about three months old) provided that the soil should artificially be irrigated just before seeding.³

As to the yield per acre and the percentage content of sugar in the root, the results of the experiments indicated that the highest average yields of beets were 12.85 tons per acre, 13.8 per cent sugar in beets, 78.53 per cent purity⁴, 2,438 pounds per acre yield of sugar⁵.

¹ McClatchie, Alfred J., op. cit., Bul. 31, p. 266.

² Forbes, R. H., op. cit., Bul. 26, p. 9.

³ McClatchie, Alfred J., op. cit., Bul. 31, p. 268.

⁴ By "purity" is meant the ratio of pure sugar to total substances estimated in the juice.

⁵ McClatchie, Alfred J., and Robert H. Forbes, Arizona Agricultural Experiment Station Bul. No. 30, Sugar Beet Experiments During 1898, University of Arizona, Tucson, January, 1899, p. 225.

The region to the west of Phoenix in the Salt River Valley, because of the existence of a suitable water supply and the nature of the soil, would probably be the best portion of the Valley for the best culture. The averages of the five flats in this section were: 15.2 tons of beets per acre, 13.1 per cent sugar in beets, 76.3 purity, 2,742 pounds of sugar per acre.

Finally, as to the suitable crop rotation¹ to crop the land and to maintain the soil fertility (the Salt River Valley soils, as we indicated earlier, are deficient in humus and nitrogen, which are necessary for satisfactory crop production), the results showed that a mixture of about one per cent of humus is highly desirable.

"This condition can best be secured by plowing under alfalfa, or some other leguminous plant. Alfalfa should be turned under 8 to 18 months previous to seeding to beets. In the meantime, grain or some other field crop may be grown upon the plot. A good practice is to turn under the alfalfa during April or May, and withhold water from the land until July, when it may be planted to corn. As soon as the corn has matured, the stubble should be turned under to decay and add more humus to the soil. Or, the alfalfa may be turned under during July and August, water withheld for a few months, and the land seeded to wheat or barley to be followed by beets the next season. It is important that the plow point be kept sharp so that it may cut all the alfalfa roots."²

¹ The common crop rotation followed now in the Imperial Valley is as follows: 2 years sugar beets, 3 years alfalfa, 2 years sugar beets or cotton, fallow, sugar beets.

² McClatchie, Alfred J. and Robert H. Forbes, op. cit. Bul. 30, p. 209.

Recent Experiments

A variety of experiments have been conducted recently by the University of Arizona Agricultural Experiment Station. The purpose of these experiments has been to determine some facts concerning the possibility of successful sugar-beet production for sugar in Arizona. These facts include variety tests, date of planting and harvesting tests, yield of beets and sugar per acre, percentage of sugar content, effect of fertilizing, etc.

These tests were carried out in two Arizona localities: (1) At the Yuma Experiment Station, and (2) At the Mesa Experiment Station.

The results of these experiments, as will be seen in Tables 1 and 2, were quite satisfactory. The yield per acre and the percentage of sugar content at both Yuma and Mesa were as satisfactory as those in the Imperial Valley of California. The results of the recent tests were also much more favorable than those obtained in the early experiments of 1897 and the years immediately after. In the early experiments, the maximum yield of beets per acre and the percentage of sugar content were 15.2 tons and 13.8 per cent, respectively, whereas the average yield per acre and the percentage of sugar content was 22.0 tons and 17.5 per cent of sugar, respectively, at Yuma in 1948-49, and reached 19.08 tons and 17 per cent, respectively, at the Mesa farm in 1955. Yields of 30 tons per acre have been obtained on experimental plots at Yuma.¹

¹ Reports from the University of Arizona Yuma Farm, 1950-1951, p. 126.

Table 1. Yield and Percentage of Sugar Content of Sugar Beets at the Yuma Experiment Station Compared With the Imperial Valley of California, 1948-49.

Factor compared	Yuma Station	Imperial Valley Station
Yield per acre	22.0 tons	17.45 tons
Sugar content	17.5 per cent	18.17 per cent

Source: Data from Yuma Farms - reports from University of Arizona Yuma Farms, 1948-49, p. 58. Data for Imperial Valley - 1949 Sugar Program, p. 59, Agricultural Stabilization and Conservation Committee, Berkeley 4, California

This increase in both the yield per acre and the percentage of sugar content in all probability was due to the development of new varieties and new techniques in beet culture.

Accordingly, the recent experiments conducted with regard to successful sugar-beet production should be given greater emphasis. However, in conducting further tests, the conditions under which the old experiments were made should be considered. Such conditions such as date of planting and number of irrigations needed are very important. In the early tests, the best results from winter-sown beets were obtained from a sowing made during the latter part of January and the first half of February. Making further tests on date of planting, the second half of January and the first half of February would be interesting, especially with the new varieties which were developed and proved to be successful under both Yuma and Salt River Valley conditions. Moreover, in the light of the early experiments, a planting date of January 15 to February 15

would make the crop available for harvest by August. The results of this proposed date of planting test, if it could be successful with the new varieties, will be advantageous from these standpoints:

1. The crop takes a shorter period of time, about seven months or less from time of seeding to the time of harvesting.
2. Less irrigation water will be needed. This is very important in Arizona because water is the limiting factor in production.

Next, let us consider the results of the tests conducted at Yuma and Mesa and make a comparison with the actual situation in the Imperial Valley of California where sugar-beet production has become a very successful industry.

The University of Arizona recently conducted an experiment at the Mesa Experiment Station to determine the possibility of successful sugar-beet production in the Salt River Valley. The test was conducted in 1955 with two different American varieties -- U. S. 75 and U. S. 56. Very satisfactory results, as indicated in Table 2, were obtained. The yield per acre of Variety U. S. 75 was excellent and was very close to the yield in the Imperial Valley. Sugar content, however, was higher than the Imperial Valley. Further tests as to the date of planting and varieties are needed. Table 2 shows the results of the test conducted, compared with the crop situation in Imperial Valley in 1955.

Table 2. Yield and Sugar Content of Sugar Beets in the Salt River Valley Compared With Imperial Valley, 1955.

Variety	Mesa Farms ¹		Imperial Valley Farms ²	
	Average Yield	Sugar	Average ³ Yield	Sugar
	tons/acre	per cent	tons/acre	per cent
U. S. 75	19.08	17.0	20.50	15.91
U. S. 56	10.53	18.2		

¹ In Mesa farms, planted November 15, 1955, harvested August 3, 1956. Irrigated Nov. 16, Dec. 31, Jan. 25, Feb. 23, March 10, March 29, April 12, May 16, May 30, June 15, July 11. Pre-planting irrigation Oct. 11.

² The sugar content of the beets produced in the experimental plots in the Imperial Valley was 16.2 per cent. Notice it is less than the sugar content in the Salt River Valley. However, the yield per acre in the Imperial experimental plots was more than the ones in the Salt River Valley. The yields per acre as it is noticed are 28 and 19.08 tons, respectively. However, the yield per acre in the latter may be used in the case of further experiments.

³ All varieties.

Source: Data for Imperial Valley - 1955 Sugar-beet Program, In California, Agricultural Stabilization and Conservation, Berkeley 4, California, Table 2, p. 4. Data for Mesa farms - Annual Report of the University of Arizona Agricultural Experiment Station, Mesa, Arizona, for the year ending December 1956.

CHAPTER III

THE ECONOMICS OF SUGAR BEET-PRODUCTION FOR SUGAR IN THE SALT RIVER VALLEY

From the preceding chapter on the results of past experiments, it will be seen that sugar-beets of satisfactory quality and quantity can be grown in the Salt River Valley. However, this by no means solves the problem unless it can be shown that sugar beets are a profitable crop and that a factory can be established and an acreage allotment for sugar-beet production in Arizona can be secured.

In this chapter an attempt will be made to determine the economic feasibility of sugar-beet production in the Salt River Valley. The first part of the chapter is devoted to an analysis of the costs and returns from the sugar-beet crop in comparison with alternative crops. The latter part of the chapter discusses the importance of sugar beet by-products (beet tops, beet pulp, and molasses) for livestock feeding. The problems of both the requirements for the establishment of a factory and the qualification of Arizona in this respect and the sugar quota and sugar-beet acreage allotment will be discussed in the next two chapters, respectively.

In order to make the goal of this study positive, therefore, the following should be available:

1. A good quantity and quality of sugar beets must be available.

2. Sugar beets must be a profitable crop.
3. A factory for processing sugar beets must be established.
4. An acreage allotment allowing sugar-beet production must be secured.

Sugar Beets in the Cropping System

The agronomic feasibility of sugar-beet production for sugar in the Salt River Valley has already been determined. The next step is the determination of the profitability of sugar-beet production for sugar in competition with other crops or in supplementing them to provide an additional profitable crop to Arizona farmers. Perhaps one of the reasons for the disappearance and failure of the beet factory which was erected at Glendale, Arizona in 1905 was the failure of the sugar-beet crop to compete with cotton.

However, even with the assumption that sugar beets could not compete with some of the other crops such as cotton, this does not mean the culture of sugar beets should be forgotten. Evidently sugar beets can play an important role in Arizona agriculture under the existing agricultural situation in Arizona. Cotton, which is the principal crop in Arizona, is under production restriction (acreage allotment). Farmers are not allowed to grow as much as they want because of the over-production of cotton. Therefore, farmers are looking for more alternative

crops.¹ This is not a simple problem because no crop grown extensively on Arizona lands has proven to be nearly as profitable per acre as cotton.

The situation now is very different from the situation which existed in 1905, and the year after, when the erected beet factory failed. Perhaps then cotton was more profitable than sugar beets and there were no restrictions to its production. The idle lands now, which result from the restriction of cotton production, could be planted to sugar beets to supplement the return from other crops. Sugar beets may more likely displace alfalfa, barley or grain sorghums.

In general, small grains, alfalfa, and cotton compete for land in the cotton-producing areas of Arizona. In the cotton producing areas, small grains and alfalfa are considered more or less as supplementary or complimentary crops and are not largely depended upon as primary sources of cash income as compared with cotton.

Under the present price support program, acreage allotments and quotas for cotton are established for each farm in the producing areas.

In order to maintain his allotment, each producer has to plant his entire yearly allotted acreage of cotton, with the exception of that part of the allotment placed in the acreage reserve of the Soil Bank. In some cases, allotments are changed from year to year. Since the current acreage allotment program was put into effect, cotton producers have

¹ Through the author's personal contacts with a number of farmers, most of them large-scale farmers in the Salt River Valley, the farmers expressed, collectively, their dissatisfaction with the present alternative crops, namely, alfalfa and grains. They all welcomed the idea of introducing sugar beets, for sugar, into Arizona agriculture if this would be possible.

had to divert land from the production of cotton to alternative crops. The choice of profitable alternatives in Arizona, however, is limited. In many cases producers planted the land taken from cotton to another alternative, although agricultural conditions alone might not have justified this decision.

In the Salt River Valley, as indicated in Chapter II, sugar beets can be grown for sugar successfully in both quantity and quality. This crop has proven to be profitable in many localities in the United States. In the Imperial Valley of California, an area with conditions similar to the Salt River Valley, sugar beets are raised profitably. In the Imperial Valley returns from both the sugar, which is extracted from the roots and from the by-products, make this crop highly profitable. Sugar beets are not the only profitable crop in the Imperial Valley; however, they are given an important place in the cropping system.

Evidently, sugar beets for sugar seem to be a profitable alternative crop in the Salt River Valley, especially bearing in mind that there are limited profitable alternative crops in Arizona. The Salt River Valley of Arizona has equal, if not better, qualifications than the Imperial Valley to make this crop a profitable one. This is not to say that sugar beets should necessarily replace cotton. However, the role of the sugar-beet crop in the cropping system can be considered from the standpoint of competing with other crops, supplementing other crops (diversification), as well as a complementary crop. Perhaps the best base on which to make a sound decision is to determine the average net income per acre from different prevailing crops in the Salt River Valley, and an average net income per acre from sugar beets. In this connection,

consideration of the net behavior of the land, on which different kinds of competing crops are grown, should not be forgotten. This net behavior of the land bears either on soil exploitation or increasing soil fertility for the next crop. This is important from an economic standpoint, particularly as far as the cost of maintaining fertility is concerned. In this respect, as to the effect of sugar-beet culture upon the growing of other crops, it is an established fact that notwithstanding the extensive cultivation of sugar beets, no decrease in the normal yield of cereals has taken place but has, on the contrary, been actually increased. The growth of sugar beets requires that the soil be tilled to a greater depth, thus adding to the thrift also of other plants to be cultivated later on the same soil. Besides, some parts of the roots, which go to a considerable depth, would be left in the soil adding an amount of organic matter which is deficient in the Salt River Valley soil.

Another phase of the economics of sugar-beet production and the beet sugar industry is the considerable payroll which this industry affords people who work in the sugar factory. Employment is also provided throughout the whole year, in the growing and cultivation of the beets during the growing season, as well as during the season the sugar factory is operated.

In order to make a sound evaluation of the economic role of sugar beets in the Salt River Valley, it is necessary, as was stated earlier, to consider the cost of and income from the crops which are competing for the land and capital resources, namely, cotton, grains, and alfalfa. This will lead us to the question of whether agricultural resources as

now used or whether some re-direction of effort would result in a higher level of real income to the farmers of Arizona.

Before calculating expected returns from sugar beets, such things as government incentives to growers, conditional payments, sugar-beet pricing and marketing, and grower-producer contracts, which have an effect on grower's returns from the sugar-beet crop, should be considered first. Later in the chapter the profitability of a possible sugar-beet production in the Salt River Valley relative to the other alternatives will be shown.

Security in the Sugar-Beet Industry, Government Incentives,
and Compensation Disaster Losses

Few farmers can look to the future with as great a feeling of security as can the growers of sugar beets. This feeling of security does not arise from the certainty that prices and income will continue to be profitable into the indefinite future. It stems, rather, from the greater degree of favoritism, protection, and assistance received by sugar-beet growers from both the government and the sugar companies. As a result of government programs, growers can expect protection from excessive market supplies and a continuation of their subsidy payments. Their very close relationship with the sugar companies means that they do not have to face future problems alone. Some of the individual production problems of the grower are taken over by the companies who can devote additional time and resources to their solution. In addition, marketing problems, with which most agricultural producers must be concerned, do not confront sugar-beet growers.

The regulation of the sugar market through the quota system is supplemented by a system of benefit payments called conditional payments. Conditional payments are financed out of the general funds for the treasury.¹ The rates of conditional payments vary with the volume of sugar, raw value, produced from the cane or beets grown on a farm and are graduated downward from the smaller to the larger producers. The basic rate of \$0.80 per hundred pounds of sugar, raw value, is paid on the first 350 short tons produced on a farm. This rate is reduced progressively to a minimum of \$0.30 per hundred pounds on all sugar produced in excess of thirty thousand short tons.

In computing the amount of the conditional payments,

"...the total payments with respect to a farm shall be the product of the base rate of \$0.80 multiplied by the amount of sugar and liquid sugar, raw value, with respect to which payment is to be made, except that reduction shall be made from such total payments in accordance with the following scale: that portion of the quantity of sugar and liquid sugar which is included within the following intervals of short tons, raw value."²

¹ However a tax on sugar provides funds for the Treasury which more than offsets the total of all conditional payments plus the costs incurred by the Department of Agriculture in administering the Sugar Act. These tax receipts exceed the cost of the program. However, this is because the tax is imposed on all sugar (foreign and domestic) processed or imported for direct consumption and payments are made on domestic production only. Conditional payments act as an incentive to growers to adjust their production to the quota and carry over needs. The payments are conditional upon the producers meeting several requirements: (1) Employing no child labor, (2) Paying farm laborers in full and at wage rates not less than those determined by the Secretary of Agriculture, and (3) Observance of the specified allotment, if they have been assigned.

² Sugar Act of 1948, United States Department of Agriculture, Commodity Stabilization Service, Sugar Division, June, 1956, p. 19.

<u>Short Tons of Sugar</u>	<u>Reduction in the base rate payments per hundred weight of such portion</u>
350 to 700	\$ 0.05
700 to 1,000	0.10
1,000 to 1,500	0.20
1,500 to 3,000	0.25
3,000 to 6,000	0.275
6,000 to 12,000	0.30
12,000 to 30,000	0.325
more than 30,000	0.50

As far as acreage abandonment and crop deficiency are concerned, in addition to the amount of sugar or liquid sugar, with respect to which conditional payments are authorized,

"...the Secretary of Agriculture is also authorized to make conditional payments with respect to bona fide abandonment of planted acreage and crop deficiencies of harvested acreage, resulting from drought, flood, storm, freeze, disease, or insects which cause such damage to all or a substantial part of the crop of sugar beets or sugar cane in the same factory district (as established by the Secretary), country, parish, municipality, or local producing area, as determined in accordance with regulations issued by the Secretary, on the following quantities of sugar or liquid sugar:

(1) With respect to such bona fide abandonment of each planted acre of sugar beets or sugar cane, one-third of the normal yield of commercially recoverable sugar or liquid sugar per acre for the farms, as determined by the Secretary.

(2) With respect to such crop deficiencies of harvested acreage of sugar beets or sugar cane, the excess of 80 per cent of the normal yield of commercially recoverable sugar or liquid sugar for such acreage for the farms, as determined by the Secretary, over the actual yield."¹

¹ Ibid., p. 18.

Sugar-Beet Marketing, Pricing, and Payments to Growers

Typical grower-processor contracts state that the beets will be delivered to the factory by the growers.

"However, the corporation shall pay all freight charges on beets loaded in cars where the corporation operates a beet dump. In case beets grown under the contract, between the grower and the processor, are loaded into cars at a point where the corporation does not operate a beet dump, the corporation will pay the railroad freight charges for delivering to it such beets, provided cars are loaded to capacity. Any extra charge because of cars not being so loaded shall be charged to the grower."¹

Under the present contracting methods, as seen in the contract, when the grower and processor sign a contract for the coming season, the level of the year's payments is left to be determined by the net returns that will be received from the sugar sold (1) from the one factory or (2) from a group of factories in one area. Under the present quota arrangement, system prices received by sugar-beet growers do not fluctuate considerably. Growers, as indicated in Table 3, can secure a semi-fixed price. Figure 1 shows trends in production of beet sugar and cane sugar in the United States and prices received by farmers from 1946 to 1956.

¹ Contract from Holly Sugar Corporation, Imperial Valley District, item no. 8, 1956-57 crop season.

Table 3. Sugar Beets and Sugar Cane, Quantity of Sugar Produced, and Prices Received by Farmers Per Ton, and Total Sugar Production, United States, 1946-1956.

Year	SUGAR BEETS		SUGAR CANE		Total United States Production of sugar ¹ (000 tons)
	Sugar Produced ¹ (000 tons)	Prices Received by Farmers ² (per ton)	Sugar Produced ¹ (000 tons)	Prices Received by Farmers ² (per ton)	
1946	1,522	\$ 13.53	435	\$ 7.77	5,621
1947	1,839	14.24	377	8.34	7,448
1948	1,370	13.01	477	6.86	7,343
1949	1,570	13.27	521	7.38	7,580
1950	2,019	13.61	564	9.01	8,279
1951	1,594	14.10	419	7.38	7,737
1952	1,505	14.35	605	8.08	8,104
1953	1,817	13.94	630	8.44	8,485
1954	2,043	13.45	610	8.17	8,207
1955	1,789	13.25	580	7.70	8,392
1956	-	13.76	-	7.91	-

¹ Jackson, Donald, D. B. DeLoach, and Rado J. Kinzhuber, Marketing Sugar Beets, U. S. Department of Agriculture, Agricultural Marketing Service, Marketing Research Division, Nov., 1956 AMS No. 137, p. 23.

² 1946-1954: Agricultural Statistics 1955, U. S. Department of Agriculture, p. 74; and data for 1955 and 1956: Sugar Reports, U. S. Department of Agriculture, Commodity Stabilization Service, Sugar Division, Oct., 1956, Report No. 54, p. 20.

"Under the present system of dividing income, the beet grower shares to the extent of 50 to 60 per cent in the marketing risk of the industry, whether it is risk of lower price or risk of obtaining a higher price at too high merchandising cost. Conversely, he has the opportunity for increasing his return. Use of the national average returns, either net or gross, passes a large part of that risk to the processor - in whom title to the physical commodity has resided since delivery of the beets."¹

¹ Jackson, Donald, D. B. DeLoach, and Rado J. Kinshuber, Marketing Sugar Beets, U. S. Department of Agriculture, Agricultural Marketing Service, Marketing Research Division, AMS No. 137, Nov., 1956, p. 13.

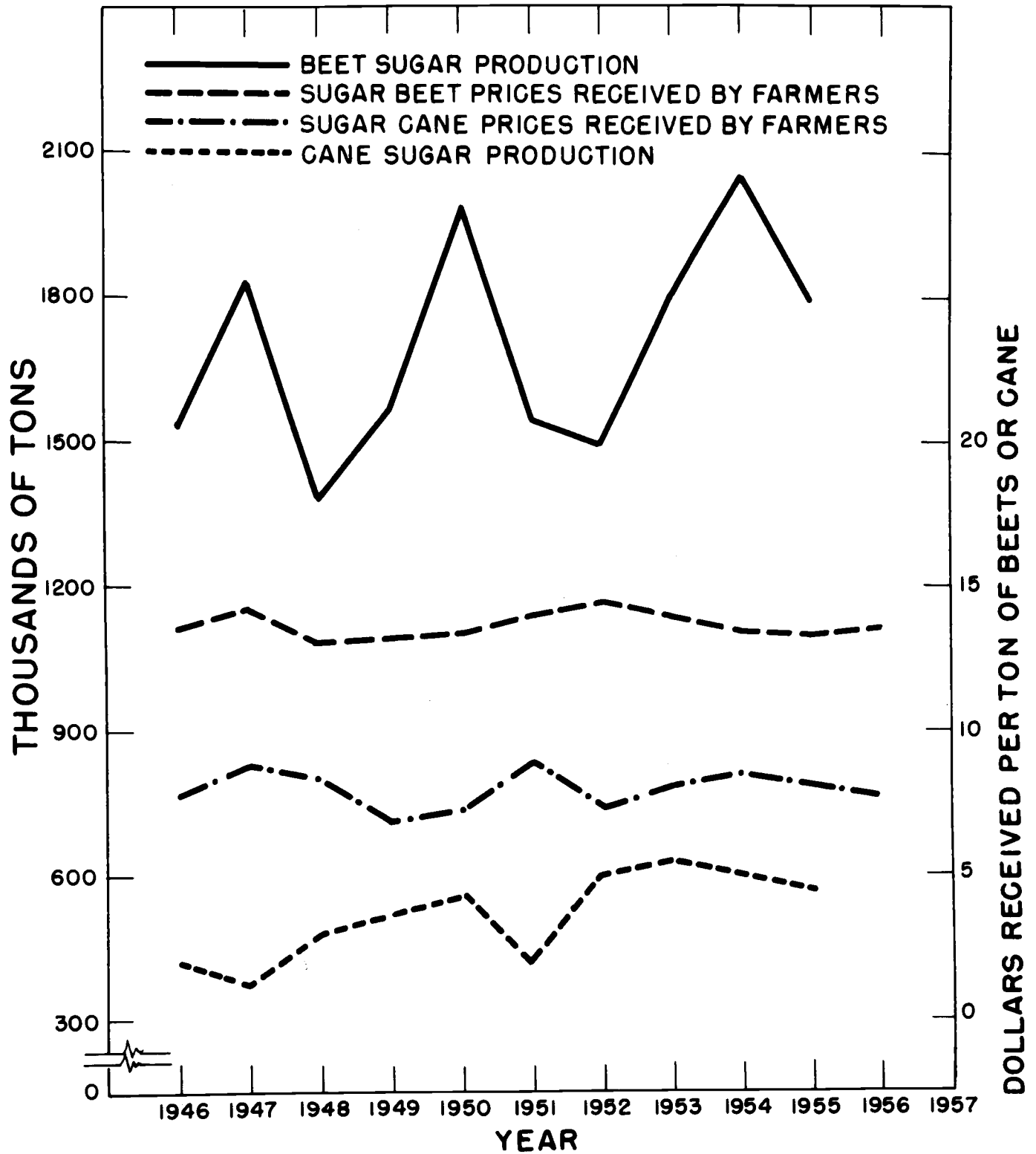


Figure 1. Beet Sugar and Cane Sugar, United States Production and Prices Received by Farmers per Ton, 1946-1956.

Source: Table 3.

Normally, one must be paid for assuming a risk. Under closely competitive conditions, a beet processor will feel unable to guarantee unconditionally the same scale of payments that he now promises conditionally. Most business transactions do involve fixed prices, however, and it is conceivable that beet growers and processors could reach agreement on the value and cost of the shift in risk involved.

In general, the prices of sugar beets reflect area differences in transportation costs of sugar from competing sugar sources. They seem to give clear evidence of rivalry among areas in a search for the best market.

"These differences in competition that influence sugar beet returns by area cannot be altered by any change in method of computation. In addition to the regional differences, certain individual plants exhibit levels of net returns clearly different from the general run. Conditions permitting such differences may relate either to a unique production or market situation or to different merchandising policies on the part of factory management."¹

An examination of the type of contract employed by sugar-beet producers and processors in the Intermountain and West Coast sugar-beet regions and consideration of their economic effects make the following points clear:

"(1) Over the past three decades, no substitution of one of the national sugar price series as a basis of beet payments would have made a significant difference in beet prices.

(2) The processor and the grower have shared the marketing risks of the industry. If either the grower or the processor is to carry a greater part of the risk than he carries under the present agreement, he will expect to be paid for doing so. Any such change would be expected to appear as a change in the payment, or the scale of payments, for beets.

¹ Loc. cit.

- (3) Complete removal of the marketing risks from the shoulder of the growers would require an entirely different basis of payments. It would require a fixed price for beets of a given quality, determined before (and regardless of) the sale of the resulting sugar."¹

The Grower-Processor Contract and the Division
of the Net Proceeds

One basic type of grower-processor contract is in use throughout the sugar-beet regions. The important uniform feature, as stated earlier, is the statement of a basis on which to divide the net proceeds from the sale of sugar in the coming season, rather than a statement of a fixed price to be paid for sugar beets.

The method of division differs between the East and the West. In the East, the net proceeds from sugar sales for a season are normally divided evenly between processors and growers. In the West, however, a more complex scheme is employed under which payments vary with quality of beets and payments for any one quality of beets vary with the average of the season's net proceeds per pound of sugar sold.

The contract normally states, as indicated in the following copy of the Holly Sugar Corporation Contract, Imperial Valley District, the acreage of beets that a grower will produce and deliver, the services that the processor will furnish to the grower, the supervision he will have over cultural methods, harvesting time and methods, and the time and conditions of delivery. It also shows the scale of prices which the

¹ Ibid., p. 14.

HOLLY SUGAR CORPORATION
IMPERIAL VALLEY DISTRICT

SUGAR BEET CONTRACT
FOR CROP SEASON OF 1956-57

(1956 CROP)

Receiving Station _____

Contract No. _____

Date of Contract _____, 1956.

HOLLY SUGAR CORPORATION (hereinafter called the Corporation) and _____
 (A corporation, a partnership, an individual, _____, County of _____, State of California, (hereinafter called the Grower) hereby agree as follows:

1. The Grower shall, in a farmerlike manner, during the cropping season beginning July 1, 1956, grow, harvest and deliver in good condition to the Corporation, aboard cars or other conveyances provided by the Corporation at the receiving station designated above, _____ acres of sugar beets. Such beets shall be harvested and delivered in such quantities and at such times as may be specified in delivery schedules from time to time prepared by the Corporation. The land upon which such beets are to be grown is described as follows:

_____ per cent of proceeds of all net beets delivered hereunder (such proceeds to be as determined under paragraph 4 hereof) shall be paid as crop rental by the Corporation direct to _____, who agrees to such rental and whose address is _____, County of _____, State of California.

The acreage of beets herein contracted for is expressly subject to any reduction in amount thereof required by lawful authority or deemed necessary by the Corporation on account of any allotment or quota imposed upon or applicable to the Grower and/or Corporation in respect to production and processing of beets and/or shipment or sale of beet sugar by virtue of any law, governmental regulation, or order; and this contract shall obligate the Grower to grow and the Corporation to buy only such reduced acreage of beets.

2. The seed to be used in growing such beets shall be furnished by the Corporation for the price of twenty-six cents (26¢) per pound for regular whole seed and fifty cents (50¢) per pound for processed seed. An additional charge at rates to be established by the Corporation shall be made for special treatment of seed. Seed furnished by the Corporation shall not be planted upon any land not contracted to the Corporation. Any seed furnished by the Corporation and not planted shall be returned in good order in the original unopened bags to the Corporation at the end of the planting season, and the Grower credited therefor. No credit will be given for seed which, in the judgment of the Corporation, is not in good order when returned.

3. All beets delivered hereunder by the Grower shall be properly trimmed below the base of the bottom leaf, shall be delivered free from stones, trash or other foreign substances, and shall be subject to proper deduction for tare. The Corporation shall have the option of rejecting any beets if the above-mentioned conditions have not been properly complied with, as well as the option of rejecting any diseased or wilted beets, or beets that are not suitable in the judgment of the Corporation for the manufacture of sugar, anything in this contract to the contrary notwithstanding.

4. All sound beets grown in accordance with and under this contract shall be bought by the Corporation and paid for by it according to the following terms and schedule of prices:

The price per net ton (2,000 lbs.) for beets delivered hereunder to the Corporation shall be determined upon the average net proceeds (said average net proceeds being defined in paragraph 7 hereof) per one hundred pounds of sugar received by the Corporation from sugar manufactured at all its California factories which is sold and delivered by the Corporation during the period May 1, 1957-April 30, 1958, inclusive, and based upon the Corporation's test of the sugar content of the individual grower's 1956-crop beets in accordance with the following schedule:

Average Net Proceeds for Sugar per 100 Pounds.	SUGAR CONTENT (% OF BEETS)									
	14	15	16	17	18	19	20	21	22	
\$4.00	\$ 4.41	\$ 4.77	\$ 5.14	\$ 5.32	\$ 5.51	\$ 5.89	\$ 6.27	\$ 6.66	\$ 7.06	\$ 7.46
4.50	5.11	5.52	5.94	6.15	6.36	6.79	7.22	7.66	8.11	8.56
5.00	6.03	6.51	6.99	7.23	7.48	7.97	8.47	8.98	9.49	10.01
5.50	6.96	7.50	8.05	8.32	8.60	9.16	9.73	10.30	10.88	11.46
6.00	7.88	8.49	9.10	9.41	9.72	10.35	10.98	11.62	12.26	12.91
6.50	8.81	9.48	10.16	10.50	10.85	11.54	12.24	12.94	13.65	14.37
7.00	9.73	10.47	11.22	11.59	11.97	12.73	13.49	14.26	15.04	15.82
7.50	10.65	11.46	12.27	12.68	13.09	13.91	14.74	15.58	16.42	17.27
8.00	11.35	12.21	13.07	13.50	13.94	14.81	15.69	16.58	17.47	18.37

Fractions of sugar proceeds and beet tests shall be in the same relative proportion. If sugar proceeds or beet tests are higher or lower than shown in the foregoing schedule, the price to be paid for beets shall be increased or decreased in proportion to the immediately preceding interval.

5. The provisions of paragraphs numbered 6 to 19, both inclusive, as shown on the reverse side hereof are hereby accepted as part of this contract.

NOTE:

The Landowner in signing this contract does not become a party to the contract. However, he agrees to the division of proceeds of all net beets delivered hereunder as specified in paragraph 1 hereof.

Grower _____

Grower _____

Landowner _____
 (To be signed by Landowner or his Agent)

Grower's Address _____

Landowner's Address _____
 HOLLY SUGAR CORPORATION,

By _____
 *Strike out all but the appropriate designation. If a partnership, the names of all partners should appear and each partner should sign the contract.

6. Settlements will be made as follows: For all beets delivered during any month, settlements will be due on the 15th day of the succeeding month. The foregoing settlements will be made at as high an amount per ton as may be justified in the judgment of the Corporation, based upon the Corporation's test of the sugar content of the individual Grower's beets and the Corporation's estimate of the average net proceeds to be received by it, as aforesaid.

Further settlements will be made from time to time in such amounts as the Corporation may deem to be justified by market conditions and quantity of sugar sold. Final settlements for all beets delivered hereunder shall be made in accordance with this contract not later than May 31, 1958.

7. The average net proceeds for sugar sold as aforesaid shall be determined by deducting from the gross sales price all such charges and expenditures as are regularly and customarily deducted from the gross sales price of sugar, in accordance with the Corporation's system of accounting heretofore established, showing net proceeds from sugar sold and delivered, and by deducting also: the excess cost of packaging over the cost of packaging in the standard 100-pound bag designated by the Corporation as such; and any amounts which may be paid or accrued by the Corporation for excise, sales, or other taxes, or for other charges or payments of any kind, either now or hereafter levied, exacted or imposed, directly or indirectly on, or with respect to, or arising out of, the manufacture, processing, production, ownership, possession, holding for sale, sale, marketing, or shipment of such sugar or any part thereof, or on all or any part of the proceeds of such sale. Also in accordance with such accounting system, net proceeds shall be credited, as to all such sugar sold in unpackaged form, with the cost of packaging in such standard 100-pound bag. Such average net proceeds, determined as aforesaid, shall be verified by a firm of independent certified public accountants chosen by the Corporation, which verification shall be conclusive.

8. The Corporation shall pay all freight charges on beets loaded in cars where the Corporation operates a beet dump. In case beets grown under this contract are loaded into cars at a point where the Corporation does not operate a beet dump, the Corporation will pay the railroad freight charges for delivering to it such beets, provided cars are loaded to capacity. Any extra charge because of cars not being so loaded shall be charged to the Grower.

9. To ascertain the quality of the beets, the Corporation's representatives shall have the privilege from time to time during the growing and harvesting season of entering the field and taking samples of the beets for testing purposes.

10. Any advances made to the Grower by the Corporation in the way of seed, cash, labor, equipment rental, or otherwise, shall be considered as part payment for the crop of beets and be the first lien thereon, and the Corporation shall be entitled to deduct from any amounts due hereunder any and all indebtedness whatsoever which may be owing at any time by the Grower to the Corporation.

11. The Growers may, at their own expense, have representatives (weighman, tareman and chemist) in scale house, tare room, and laboratory to check weights, tares and sugar analyses, such representatives to be experienced in the line of work to be performed and satisfactory to both parties.

12. Fire, labor trouble, accident, act of God or of the public enemy, weather or other cause beyond the control of the parties which prevents the Grower from the performance of this contract or which prevents the Corporation from utilizing the beets contracted for in the manufacture of sugar therefrom at the Corporation's nearest factory, shall excuse the Grower or the Corporation, as the case may be, from the performance of this contract.

13. The Corporation, unless notified in writing by the Grower prior to April 1, 1957 not to make such deductions, shall deduct from any monies coming due for beets delivered under this contract such amount, not to exceed the sum of four cents (4¢) per ton of the Grower's share of beets delivered by the Grower hereunder, as the California Beet Growers Association, Ltd. may specify, and shall pay such amount to the Association.

14. The Grower shall comply, in the production, cultivation, harvesting and delivery of sugar beets, with all applicable laws and authorized rules and regulations (including, but not limited to, the conditions upon which full payments are authorized by law to be made with respect to sugar recoverable from sugar beets) relating to the employment of persons under 18 years of age. The Corporation's purchase of beets hereunder will be made in reliance upon the Grower's agreement to comply with all such requirements.

15. The Grower is an independent contractor. Agricultural or other advice may be offered the Grower by the Corporation's representatives, but the Grower's status as an independent contractor shall not be thereby affected. In no event shall the Corporation be responsible for any failure or partial failure of crop or damage to beets.

16. The Grower shall not assign this contract without the written consent of the Corporation.

17. No agent of the Corporation is authorized to make erasures, additions, or alterations of the printed terms of this contract.

18. This contract shall be in duplicate, each of which shall be signed by both parties above named.

19. When signed by the Grower and the District Manager or the District Agriculturist of the Corporation, or such other person or persons as may be designated by the Corporation, this contract shall bind both the Grower, his heirs and legal representatives, and the Corporation, its successors and assigns.

grower will receive for beets of various sugar contents, at various levels of average net return per hundred pounds, at which the season's sugar may be sold.

Sugar Beets as A Possible Alternative Crop
In Arizona

As stated earlier in this chapter, in view of the federal crop limitation program, farmers are looking for profitable crops to replace cotton on the land left uncultivated or planted to less profitable alternative crops. This is not a simple problem because no crop grown extensively on Arizona lands has proven to be nearly as profitable per acre as cotton. The net return to land and management per acre of cotton, with a two-bale yield, is about \$115.¹

The main alternative crops which have been tried on large acreages, include alfalfa, barley, and grain sorghums. Alfalfa, as an alternative crop, is more or less restricted to areas with a plentiful supply of water.

Barley and grain sorghums have been grown successfully in Arizona on extensive acreages for many years. They are comparatively low consumers of water.

The net returns from alfalfa and grains under current price and cost conditions are not large. The estimated net returns for land and management from alfalfa hay per acre in the Salt River Valley for 1957 is only \$23 (based on a 5-ton yield at a price of \$25 per ton).² For

¹ Barr, George W., Arizona Agriculture 1957, Ariz. Agri. Exp. Sta. Bul. No. 281, Univ. of Ariz., Tucson, Jan., 1957, Table 2, p. 6.

² Ibid., Table 4, p. 13.

barley the estimated net return is \$31 per acre (based on a 1.6 ton yield at a price of \$50 per ton),¹ and for grain sorghum at a yield of 1.8 ton and a price of \$50 per ton, the expected net return is \$25 per acre².

Cotton, as indicated earlier, is the most profitable crop in the Arizona cropping system, with the exception of certain vegetables grown on limited acreage. Its production, however, is restricted. The present alternative crops (alfalfa and grains) provide much lower returns. The introduction of a sugar-beet crop, for sugar, into Arizona's agriculture should provide an additional crop to replace part of the acreage now devoted to alfalfa and grains. The profitability of sugar beets, as shown in Table 4, would be second only to cotton in Arizona. The possible net income per acre, with a yield of 20 tons, would be about \$65.13 in the pumping areas of the Salt River Valley (at a pumping lift of 260 feet). In the Salt River Project, however, because of the lower cost of water (about \$20 for 4-acre feet), the possible net income would be about \$87.13 per acre. It is noticed that the average net income per acre for sugar beets³ is more than double that for grain sorghum, alfalfa hay, and barley.

¹ Ibid., Table 5, p. 14.

² Ibid., Table 6, p. 15.

³ The net income per acre of sugar beets is based on enterprise efficiency studies in Imperial County of California, an area with similar conditions to the Salt River Valley. In this computation, the major cost item of sugar-beet production in the Imperial Valley has been considered and the cost of water has been adjusted to Arizona conditions. The net income is calculated on the basis of an expected yield of 20 tons per acre.

Table 4. Probable Costs and Income of Sugar-Beet Production in Arizona, Based on Expected 20-Ton Yield Per Acre.

COSTS OF PRODUCTION		INCOME	
	Per Acre (20-Ton Yield)	Items	Per Acre (20-Ton Yield) Per Ton
Land Preparation - Labor & Field Power		Beets	\$ 231.80 \$11.59
Subsoil, disc 3 times, float, border, pre-irrigate, knock out border, land plane	\$ 20.00	Beet Tops	10.00 .50
Cultural Labor & Field Power		Conditional payment	49.00 2.45
Shape and plant bed	2.25		
Fertilizer - 3 times	5.00		
Thin - once	15.00		
Hoe - 2 times	20.00		
Cultivate - 3 times	6.00		
Irrigate - 12 times	6.00		
Ditch & irrigation preparation	2.00		
Apply insecticides - 3 times	4.50		
Miscellaneous	4.00		
Total Culture	64.75		
Materials			
Irrigation water - 4 acre-feet ¹ (260-foot lift)	42.00		
Seed - 6 lbs.	3.42		
Fertilizer (160N - 80P ₂ O ₅)	32.00		
Insecticide	6.00		
Miscellaneous	2.00		
Total Materials	85.42		
Harvesting			
Harvest - machine @ \$1.25 per ton screened weight	25.00		
Hauling - \$0.85 per ton	17.00		
Total Harvest	42.00		
Cash Overhead			
General expense (5% to harvest)	8.50		
Miscellaneous (taxes, insurance, depreciation, etc.)	5.00		
Total Cash Overhead	13.50		
Total All Costs	\$ 225.67	Total Return	\$290.80 \$14.54
BALANCE			\$65.13

¹ In the Salt River Valley Project this cost would be only \$20 for 4-acre feet.

Returns for income items in Table 4 are computed on the following basis:

(A) Returns for the beets (\$11.59 per ton) on the basis of a net price of \$7.00 per hundred pounds of sugar, 16.5 per cent sugar content, as it is regulated on the accompanying contract (1956 price was \$7.90 from Holly Sugar Corporation of the Imperial Valley District). Expected yield is assumed to be 20 tons per acre.

(B) Conditional payments (\$0.80 per hundred pounds of sugar) per ton of beets computed on the basis of 92 per cent efficiency of sugar extraction from the sugar beets. This computation is shown mathematically as follows:

2,000 lbs. with 16.5% sugar content	=	330 lbs. sugar with	
			100% efficiency
330 lbs. of sugar with 92% efficiency	=	303.6 lbs. sugar	
303.6 lbs. at \$0.80 per cwt. sugar	=	\$2.45 per ton of beets	
\$2.45 x 20	=	\$49.00 per acre	

(C) Returns for the beet tops on the basis of \$0.50 per ton of beets at a yield of 20 tons would be \$10.00 per acre pasture value.

The Importance of Sugar-Beet By-Products

Before discussing the importance of sugar-beet by-products for livestock feeding, it may be useful to give a birds-eye glance of the importance of the livestock industry to the Arizona agricultural income as a whole. Also, attention will be given to the existing methods and conditions under which livestock is produced and fed.

Arizona Livestock and Feeding Situation

Livestock plays a significant role in Arizona farm income. Farmers receive annually a total of about 95 millions of dollars from livestock and livestock products. More than one-fourth of the average total cash receipts from farming (crops and livestock) comes from livestock and livestock products. Table 5 shows the total annual receipts from the livestock industry in comparison with the total annual dollar receipts from farming (crops and livestock). It also shows the annual percentage that livestock receipts are of the total annual cash receipts from farming, 1950-56.

Table 5. Total Cash Receipts from Farming (Crops and Livestock), Cash Receipts From Livestock and Livestock Products, and Percentage that Livestock Receipts are of the Total Cash Receipts from Farming, Arizona, 1950-1956.

Year	TOTAL CASH RECEIPTS FROM		Livestock Receipts as a per cent of total farm Receipts
	Farming (crops & livestock)	Livestock and Livestock Products	
	(000 dols.)	(000 dols.)	(per cent)
1950	275,895	89,858	32
1951	278,865	94,211	34
1952	382,195	112,195	29
1953	415,132	99,502	24
1954	370,485	92,304	25
1955	337,270	89,334	26
1956	361,244	98,178	27

Source: 1950-1954: Agricultural Statistics 1950, 1951, 1952, 1953, and 1954. U. S. Department of Agriculture, Washington.
1955 and 1956: Farm Income Situation, U. S. Department of Agriculture, March, 1956 and March, 1957, respectively.

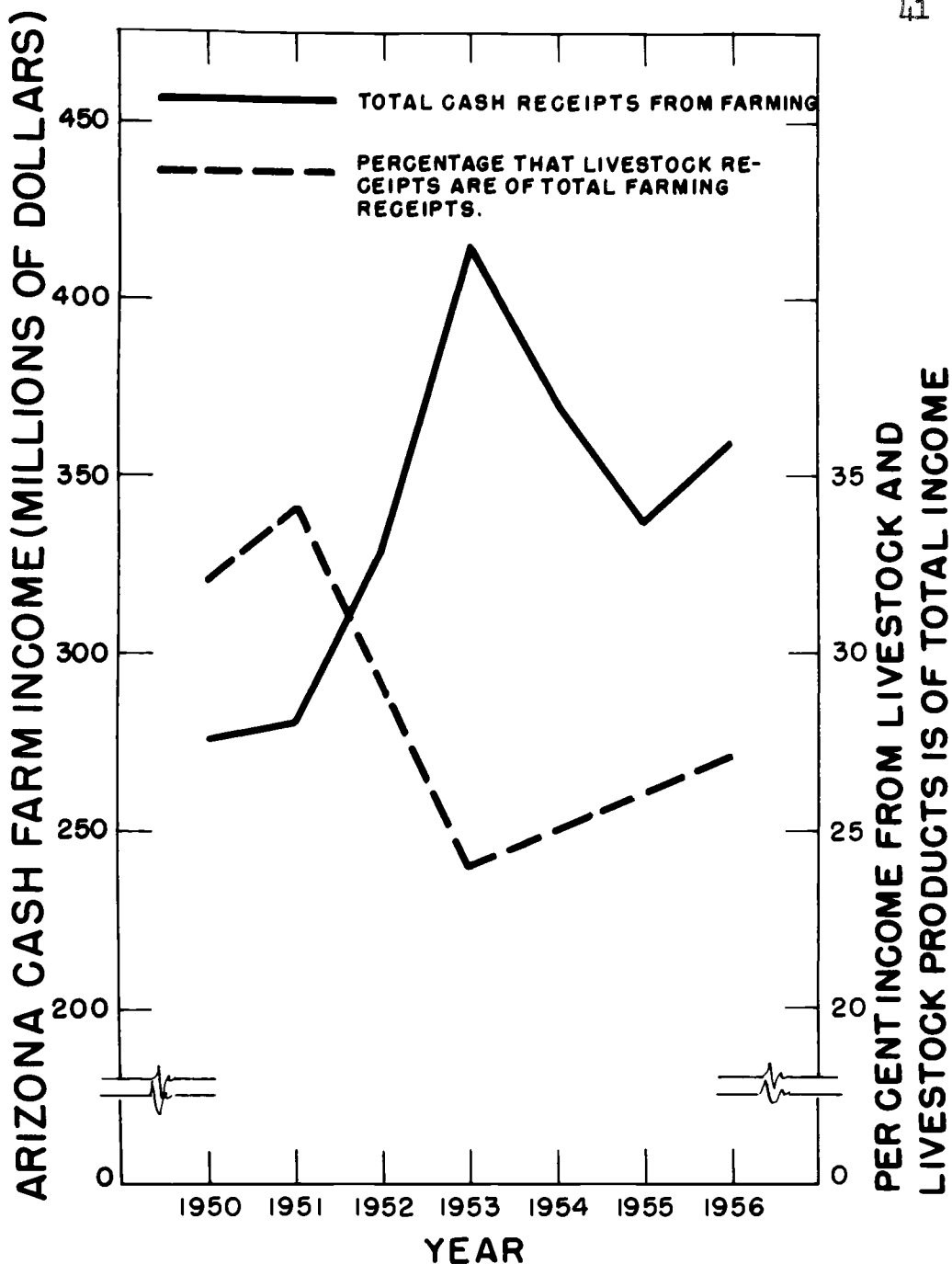


Figure 2. Total Cash Receipts from Farming and the Percentage Which Receipts from Livestock and Livestock Products Are of the Total in Arizona, 1950-1956.

Source: Table 5.

Livestock production and feeding fits in well with Arizona farming. The irrigated valleys of the state are ideal for the economical production of beef and dairy products. With a wide selection of feeds, mild winter climate, and rapidly expanding markets, excellent opportunities exist for fattening beef animals and for dairy production.

Many feeders, both large and small, are using cattle as a market for home-grown feeds. Feed crops are produced in abundance throughout the year. High crop yields produce many pounds of beef per acre. The bulk of the cattle fattened in Arizona are short-fed, i.e., they are on feed from 100 to 150 days.

The principal feeds presently used for feeding in Arizona are the following:

<u>Concentrates</u>	<u>Roughage</u>
(1) Feed grains: barley and grain sorghum	(1) Cereal hay
(2) Citrus meal	(2) Alfalfa hay
(3) Cotton seed meal	(3) Cereal straw
(4) Molasses	(4) Cotton seed hulls
	(5) Silage (there is an increasing use of corn for silage)

The following table shows the typical make-up of three rations used in fattening cattle in Arizona.

Table 6. Three Typical Rations Used in A Short-fed Feeding Program in Arizona

Kind of Feed	RATION		
	First 20 to 30 days (per cent)	Next 30 days (per cent)	Last 60 to 70 days (per cent)
Grain	28	36	50
Meal	8	8	8
Molasses	10	10	10
Hulls	21	17	13
Hay	33	29	19

Source: Vanvig, Andrew, Cattle Feeding Costs in Arizona, Department of Agricultural Economics, University of Arizona, Tucson, Report No. 140, October, 1956, p. 3.

Feed Prices:

Feed prices are not stable. They fluctuate from year to year and from season to season. Table 7 shows average feed prices for the 1955-56 feeding season.

Table 7. Average Feed Prices in Arizona, 1955-56.

Kind of feed	Dollars per ton
Grain	45.00
cotton seed meal	60.00
molasses	32.00
hulls	20.00
hay	25.00
silage	8.50
green feed	6.75

Source: Vanvig, Andrew, Cattle Feeding Costs in Arizona, Department of Agricultural Economics, University of Arizona, Tucson, Report No. 140, October, 1956, p. 1.

"Approximately 55 to 60 per cent of the rations used in cattle feeding in Arizona were concentrate type feeds, and 40 to 45 per cent were roughage type feeds."¹

Feed accounts for approximately 85 per cent of the total cost of the gain of cattle.² Therefore, careful attention should be given to the economical selection of the ration constituents in such a way to get the maximum possible gain and production with the least possible cost.

Sugar-Beet By-Products as Feed for Livestock

Sugar-beets are often called two crops in one, because the by-products on the farm and in the factory have significant values in excess of cost as feeds for livestock.

The establishment of a possible sugar-beet industry in Arizona would make the feeding of beef and dairy stock, and of hogs and sheep, with the beet tops in the field and the extracted sugar-beet pulp, an industry of much importance. In the neighborhood of a factory, this supply of beet by-products would be a valuable addition to the stock-feeding resources of, for instance, the Salt River Valley, and would give additional impetus to what is already one of the most profitable industries of that region.

Sugar-beet by-products come from two phases of the industry.

First, the growing and harvesting of the beets yield the crown and leafy

¹ Vanvig, Andrew, Cattle Feeding Costs in Arizona, Department of Agricultural Economics, University of Arizona, Tucson, Report No. 140, October, 1956, p. 1.

² Ibid., p. 1.

tops, and, second, the extraction of sugar from the beet root yields beet pulp and molasses.

Without reference to sugar, the vegetable portion of the sugar beet is important in its own right. Ever since the first beet was sliced, the feeding of those by-products to cattle and sheep has been an integral part of the whole beet sugar economy. "Many thousands of sheep and cattle from the ranges of the Western states are annually fattened in the feed-lots of the sugar-beet regions. The rise of livestock feeding has been coincident with the expansion in sugar-beet culture."¹

The beet tops and crown, left after the harvesting operation, are utilized for livestock feeding. They are an excellent protein and fattening feed if used promptly or silaged. "The feeding value of tops from an acre of beets is equivalent to one ton of alfalfa hay."² This is an excellent feeding alternative for the livestock feeder, bearing in mind that the cost of one ton of alfalfa hay is about \$25, whereas its equivalent in feeding value, the tops from one acre of sugar beets, costs only about \$10. The value of beet tops are normally figured at \$.50 per ton or for a 20-ton yield of beets equals \$10 per acre. Since few growers may own livestock, they generally rent the fields for pasturing. Returns may be based on a per head basis, or on the basis of the tonnage yield of beets. Outright sale of the tops to the dairymen and livestock men for silaging is increasing.

¹ "The Sugar-Beet Industry in the Twelfth Federal Reserve District," supplemented to Monthly Review, Federal Reserve Bank of San Francisco, April, 1951, p. 7.

² Loc. cit.

Beet pulp is also used almost entirely as a livestock feed, in wet, pressed, or dried form. Wet pulp direct from the processing plant comprises an excellent, bulky, succulent, carbohydrate feed. Pulp is usually at a cost considerably below the cost of comparable feeds.¹ Since wet pulp is a bulky product, most factories sell it to livestock feeders in the immediate vicinity of the plant. Part of the pulp that is not consumed wet is pressed to remove part of the moisture, but most of it is dried. In the dried form it is widely distributed throughout the United States and is especially well-fitted to the ration of dairy cows.

Beet molasses, as a carbohydrate concentrate, is commonly mixed with beet pulp or alfalfa hay. In addition to its nutrient value, it adds palatability to the entire ration. This palatability-adding characteristic of molasses feeding in the ration is very important in Arizona in order to make the best use of roughages, especially the unpalatable ones.

There has been shown that "prolonged feeding of a heavy grain ration is not required. More roughage feeding is required. In beef cattle feeding choice cattle, weighing 1,000 pounds or less, can be produced with relatively high roughage rations."²

The present cost of molasses, \$32 per ton in Arizona, is much less than the cost of the amount of cereal grains which it will replace.³

¹ See Table 8, this thesis.

² Lane, Albert M., Cattle Feeding in Arizona, Agricultural Extension Circ. No. 131, University of Arizona, Tucson, March, 1954, p. 15.

³ See Table 8, this thesis.

Relative Costs of Net Fattening Units in Sugar-Beet By-Products and Their Comparison With Common Feeds

There can be a very great difference in the cost of the same amount of net fattening value in different feeds. This difference can often mean a substantial saving in fattening costs to the one who will study these comparative fattening values and net fattening costs of the different feeds available to him, as was shown in Table 8. The most successful fattening operations in any area are those that take fullest advantage of all low-cost fattening feeds produced on the farm. In the beet belt such feeds are represented by beet tops, beet pulps, alfalfa hay, and silage. A certain amount of concentrated feed such as grain, or cotton seed meal, is usually needed to produce a satisfactory market finish on most classes of livestock, but the aim of the practical feeder should always be to keep that amount as low as is consistent with good practice in taking advantage of the fattening qualities in his roughage and by-product supply.

For the purpose of simplification, the term "net fattening unit" has been used in place of "total digestible nutrient" to designate the pounds of net fattening value contained in feeds concerned.

The feed cost per ton may vary from time to time. Maynard¹ uses the following procedure to calculate the relative cost of net fattening units in our feeds, "Just list today's feed prices per ton in column (1), then divide column (1) by column (2) and multiply the result by 100 to secure figure for column (3)." This table serves as a guide for the selection of economical feeds and demonstrates the high relative fattening

¹ Maynard, E. J., Beet and Meat, New Revised Edition, 1950, Denver, Colorado, p. 17.

values of beet by-products. It also helps to show advantages in using the greatest possible proportion of low net cost fattening feeds when sufficient protein is available in the ration to take care of growth requirements. Table 8 below shows the relative cost per hundred pounds of net fattening units for common Arizona feeds at current prices.

Table 8. The Relative Cost of Net Fattening in Common Feeds.

Kind of feed	Assuming the following prices per ton	lbs. of net ¹ fattening units per ton	Relative cost per 100 lbs. of net fattening units
	(dollars)	(pounds)	(dollars)
Alfalfa hay	25.00	1,006	2.50
Corn silage	-	362	-
Wheat	-	1,600	-
Barley	50.00	1,554	3.20
Corn	-	1,602	-
Oats	-	1,528	-
Cotton seed meal	60.00	1,500	4.00
Grain sorghum	-	1,602	3.10
Beet tops (per ton of beets)	.50	112	.45
Beet pulp (dry)	29.00	1,848	1.50
Molasses	32.00 ²	1,212	2.60

Source: Maynard, E. J., Consultant for the Great Western Sugar Company, Beet and Meat, New Revised Edition, 1950, Denver, Colorado, p. 17.

¹ Pounds of net fattening units per ton of feed shown in this table are based on Morrison's figures per total digestible nutrients, except for beet by-products where the figures shown are based on the net fattening units values of the amounts of grain and hay that have actually been replaced by beet by-products as reported in 106 feeding tests conducted at six Western state and federal experiment stations.

² \$32.00 is a price for imported molasses. With the development of the industry in Arizona, however, molasses costs would probably be lower.

A number of experiments have been conducted with regard to feed value of sugar-beet by-products in terms of grains and hay replaced. Maynard¹ made a survey of all feeding experiments conducted at six state and federal agricultural experiment stations during 1943 to secure an over-all picture of the value of beet by-products in terms of corn or alfalfa hay.

The results of this survey, covering 106 separate tests in which beet by-products had been fed with grain and alfalfa hay, showed that in terms of net fattening units saved by the by-products from a ton of beets, tops replaced 143.2 pounds of corn or 228.8 pounds of alfalfa; wet pulp replaced 88.7 pounds of corn or 142.2 pounds of alfalfa, and dried pulp replaced 104.2 pounds of corn or 167 pounds of alfalfa. Based on a 13½ ton average acre yield of beets, this survey showed that tops replaced 34.7 bushels of corn or 1.54 tons of alfalfa, wet pulp replaced 21.4 bushels of corn or .96 tons of alfalfa hay, and dried pulp replaced 25.1 bushels of corn or 1.13 tons of alfalfa hay.²

¹ Ibid., appendix p. 1.

² Loc. cit.

CHAPTER IV

FACTORY REQUIREMENTS AND THE QUALIFICATIONS OF ARIZONA TO MEET THESE REQUIREMENTS

From the preceding two chapters it has been shown that sugar beets of good quality and in paying quantity can be grown profitably in the Salt River Valley of Arizona. However, this still by no means solves the problem of the establishment of a beet-sugar factory. Production of sugar beets for sugar in the Salt River Valley for any substantial acreage means a new factory here. Modern sugar factories and equipment represents an investment of fifteen million dollars or more and the present sugar companies are reluctant to build new factories in the face of quotas. It would not be practical to ship large quantities of beets to the Imperial Valley or other California plants due to freight costs. Also, at the present time such factories can get more than the needed acreages locally. The full use of the sugar beets would be impossible and unprofitable unless a factory would be erected locally. For example, the utilization of the factory beet by-products would be impossible unless a factory were erected in the Salt River Valley.

Up to now in our discussion the problems associated with the establishment of a beet-sugar factory have not been considered. For a factory requires not only a suitable supply of beets produced from a

planted allotment of 18,000-19,000 acres¹, but also an abundance of good water, pure limestone, and cheap fuel, as well as favorable commercial conditions, including a convenient market for the product, good railroad facilities, and opportunity to utilize the pulp in stock-feeding. Expecting, therefore, that success in growing beets would lead to further inquiry concerning the water, limestone, and fuel supply, certain information is given below on these features of the problem. These requirements for a factory in Arizona are to be considered.

Factory Requirements

Water Supply

McClatchie and Forbes discuss the need for an adequate supply of water as follows:

"The importance of an abundant supply of suitable water will be recognized when it is stated that a factory using 350 tons of beets a day, requires no less than two million gallons of water every twenty-four hours, or, in other words, an amount sufficient to cover an acre to a depth of about six feet. Most of this quantity is required for washing the beets and need only be reasonably pure. Common ditch water will answer, and a sufficient amount could easily be supplied from any of the large canals in the Salt River Valley. An unfailing supply would be essential during the manufacturing season -- a requirement that would limit the location to points on canals having a constant flow. Water used for washing the beets would not be sacrificed, as it could be used subsequently for irrigation.

The water, however, that is used in the diffusion batteries of the factory for the extraction of sugar from

¹ In a reply from chief agriculturalist of Holly Sugar Company sugar factory, Brawley, Imperial Valley, California, May, 1957.

the sliced beets must be of a certain degree of purity, for the reason that some of the salts commonly dissolved in water prevent considerable amounts of sugar from crystallizing during the process of manufacture. The cost of manufacture is also increased by the presence of calcium and magnesium carbonates and calcium sulphate in the diffusion water, for the reason that when the latter is heated these salts are deposited upon the sliced beets and the interior surface of the batteries, thus rendering the extraction of sugar more difficult and decreasing the evaporating power of the apparatus. The amount of salts in solution that can be tolerated in diffusion water varies, according to other factory conditions, since this is but one of a combination of factors that influence the cost of manufactured sugar.¹

In the Holly Sugar Factory in the Imperial Valley, the water used is not entirely pure, but still successful.

With these requirements in mind, a survey for suitable diffusion water in the Salt River Valley should be done in response to the goal of our study.

It should be remembered, in this connection, that such a survey for suitable diffusion water in the Salt River Valley was begun in 1898. This was to find the best location for a sugar-beet factory, with a suitable diffusion water supply. The results of the survey made was that there were some samples considered within the requirements, and some samples contained excessive and enormous quantities of dissolved salts, and could hardly be made valuable for factory purposes. However, a location with suitable diffusion water was found in Glendale and a factory

¹ McClatchie, Alfred J. and Robert H. Forbes, Sugar Beet Experiments during 1898, Arizona Agricultural Experiment Station Bul. No. 30, University of Arizona, Tucson, January, 1898, p. 215.

was erected in 1905.¹ This means there is the possibility of finding a location with suitable diffusion water for erecting a factory in the Salt River Valley.

However, further survey and sampling should be carried on to find the best location with the suitable diffusion water.

The surface water is the same quality in all locations. Only the pump water varies in different locations. According to the Salt River Valley Water Association pump water records, now, the Peoria area or Glendale would probably be the best location for salt-free water.² The right to the use of surface water of the Salt River Project belongs to the lands of the Project, as all the waters of the Salt and Verde Rivers have been appropriated for the irrigation of these lands. "The only way to acquire a Water Right to surface water in this project is to acquire the land which has the Water Right."³

Limestone

With reference to limestone, McClatchie and Forbes make the following statements.

"Limestone is used in removing impurities from the

¹ This factory lived only a few years. Sugar beets were processed at this factory for seven or eight seasons. In 1920 it was moved to Delta, Colorado. It is understood that the important factor in the discontinuance and failure of this factory was that the sugar-beet crop could not compete with the other crops at that time.

² Based on a reply from the secretary of the Salt River Valley Water Users Association.

³ Loc. cit.

diffusion juices. Accordingly, it is important that it shall contain the smallest amounts of those soluble salts that we have seen to be objectionable in diffusion water. In addition to this, the lime rock should contain but small amounts of silica and moisture, because those constituents affect the facility with which it is converted into lime."¹

The required quality of the limestone can be obtained for the proposed factory within a distance much closer than that from which limestone is obtained for the Holly Sugar Factory in the Imperial Valley, which gets limestone from Nevada, a distance of 400 miles. A good quality and quantity of limestone could be obtained from either Snyder Hill, which is 10 miles west of Tucson on Ajo Road, or from Superior which is provided with good highways and a railroad.

Fuel

The fuel question is fortunately not a serious one as it was before. The natural gas pipe lines are available in the Phoenix area and Glendale, which in all probability might be a place for the proposed factory.

Labor

A factory needs about 250 to 300² employees in order to fulfill the various different necessary works. Labor would not be a problem in Arizona, and would be relatively cheap because of Mexicans and Indians.

¹ McClatchie, Loc. cit.

² The number of workers in the Holly Sugar Factory, In Imperial Valley, is 270 workers.

Market

Arizona Market:

Apparently, there is a good and wide market for the sugar to be refined from a possible factory in Arizona. Arizona itself is an excellent home market. As indicated in Table 9, Arizona imported 88.5 million pounds of sugar for consumption in 1954, costing 88.8 million dollars.

The market for sugar in both the United States as a whole and Arizona as a part is certainly promising because of the continuous increase in population and thus the continuous increase in total sugar consumption, accompanied by a gradual national policy, as shown in Chapter 4, to strengthen local sugar production in the United States. The present sugar quota and acreage allotment is nothing more than a temporary effort to balance the sugar market in both the United States and the world as a whole.

Table 9 shows the estimated quantity of sugar consumed and the prices paid for sugar in Arizona and gives an indication of the importance of the home sugar market in Arizona.

Table 9. Sugar Consumption and Total Amount Spent for Sugar in Arizona, 1947-1954.

Year	Total Consumption ¹	Total Cost ²
	(millions of pounds)	(millions of dollars)
1947	61.812	59,660
1948	63.963	60,120
1949	57.473	64,100
1950	75.047	75,780
1951	72.890	75,080
1952	82.086	84,550
1953	86.271	91,450
1954	88.531	88,760

Source: Agricultural Statistics, 1955, U. S. Department of Agriculture.

- ¹ Total consumption for each year is estimated by taking United States per capita consumption and multiplying by population of Arizona of each year.
- ² Total cost is on the basis of U. S. average retail prices multiplied by the total consumption.

United States Market:

The United States is the largest sugar consuming nation in the world. Its annual consumption, as shown in Table 10, is presently at the rate of approximately 8,350,000 short tons. This is about 20 per cent of the world's production. At present price levels, the sugar bill of the nation is well over one and a quarter billion dollars per annum. It is interesting to note that, in normal times, the per capita consumption of the United States has been one of the highest in the world. Generally speaking, for many years, excepting for the recent war period when rationing was in effect, the American consumer has used an average of more than 95 pounds of refined sugar per year.

The United States produces locally, about 25 per cent of the total consumption. The rest of the required sugar for consumption is imported from foreign sources and United States territory.¹ Table 10 shows the sugar situation in the United States from 1947-1954.

Table 10. Sugar Cane and Sugar Beets: Receipts from Foreign Sources and Territories, Local Production, Total and Per Capita Consumption, United States, 1947-1954.

Year	Receipts From		Local Produ- tion	Total Consump- tion	Per Capita Consump- tion
	Foreign sources	Terri- tories			
	(000 tons)	(000 tons)	(000 tons)	(000 tons)	(pounds)
1947	4,217	1,812	2,160	8,189	94.2
1948	3,320	1,733	1,921	6,974	92.7
1949	3,809	1,893	2,114	7,816	94.5
1950	3,783	2,173	2,466	8,422	99.4
1951	3,725	1,918	2,042	7,685	92.5
1952	3,897	2,004	2,102	8,003	96.8
1953	3,881	2,249	2,375	8,505	96.5
1954	3,799	2,097	2,610	8,506	95.4

Source: Agricultural Statistics, 1955, U. S. Department of Agriculture, Washington, p 79.

Another noteworthy thing which should be mentioned here is the future importance of sugar beets and their role in the United State's sugar industry. This is noticed in the great increase in acreage

¹ This quantity of sugar which is produced locally and imported from foreign sources and United States territories is according to a special quota determined by the Secretary of Agriculture and will be treated later in detail in Chapter IV.

allotments of sugar beets from 1955 to 1957. Table 12 in Chapter V shows the allocation of the national acreage and state limitation for 1955, 1956, and 1957. The 1956 allotment was 35 thousand acres above that of 1955, and the allotment was increased an additional 65 thousand acres in 1957 above that of 1956. Also, it is decided, as far as sugar quota and consumption are concerned, that 55 per cent of any additional consumption above 8,350,000 short tons would be from domestic sugar producing areas of which 51.5 per cent is devoted to the domestic beet sugar areas.¹ The above statements would seem to indicate an expanding market for beet sugar in the United States. However, although the signs for market expansion for sugar appear favorable, in the United States, much of what happens to the local sugar industry will depend on the agricultural and foreign policy of the United States government.

Further details about the United States' sugar industry are discussed in Chapter V, dealing with the Sugar Quota and acreage allotments.

Who May Build the Factory for A Sugar Industry in Arizona

The possibility of an adequate supply of raw materials (sugar-beet roots), the relative profitability of the crop to the farmers, and the availability of essential factory requirements, determined in the preceding chapters, still do not solve the problem. We still have the

¹ Sugar Act of 1948, U. S. Department of Agriculture, Commodity Stabilization Service, Sugar Division, June, 1956, p. 5.

important question of who is going to establish and finance it.

There are two major considerations, among others, in erecting a factory. These are:

1. The possibility of resistance reactions from the sugar-beet companies. This might be due to two main reasons.
 - a. Their belief that the production of sugar beets for sugar might overthrow, or at least compete with their beet seed industry. However, beet seed producers have actually obtained a good income from beet seed production, and it appears that a sufficient number would continue to produce enough to meet sugar-beet seed requirements.
 - b. According to a statement made by Orin Hills¹ in a special personal interview with him, there are insect and disease problems associated with sugar-beet production in the Salt River Valley, especially curly top and virus yellow. He stated that sugar companies might resist a movement of sugar production into their sugar-beet seed producing areas because of the likelihood that sugar beets being in the ground the year around would tend to spread and hold over the diseases and insects that go with the crop.

¹ Hills, Orin, Entomologist of the U. S. Department of Agriculture, Phoenix, has been in the Salt River Valley working on sugar-beet insects and diseases since 1938. He stated, however, that the insect problem is a common problem in all the sugar-beet localities.

2. Modern sugar factories and equipment cost about fifteen million dollars, and the present sugar companies are reluctant to build factories in new areas in the face of quotas. One possibility, however, would be for the growers themselves to build their own factory.

This problem of erecting a factory for a sugar industry in Arizona, however, must be left to the interested individuals and responsible groups in the state.

The problems of the quota and the acreage allotment for sugar-beet culture and the sugar industry will be discussed in Chapter V.

CHAPTER V

SUGAR QUOTA AND ACREAGE ALLOTMENT

In view of the importance of sugar-beet quotas in the domestic sugar-beet industry, it is desirable to include in this chapter a brief historical sketch of the government Sugar Acts and the conditions which led to the development of such a policy.

Conditions Leading to Sugar Acts

The Sugar Act of 1948, which is presently a major factor in the United States sugar picture, will be discussed in detail later in this chapter. But it is important, before getting into that detail, to understand that this Act and its predecessors, the Jones-Costigan Act of 1934 and the Sugar Act of 1937, together with its amendments, substantially replaced the tariff system which was prevailing in the protection of the sugar producing areas favored by the United States. Cottrell states:

"The Jones-Costigan Act of 1934 was a revolutionary step in the control of sugar from the standpoint of importation, marketing, price influences, and the like. While the tariff system on sugar was used as a revenue producer for the United States Treasury, it more importantly was designed for protection of the domestic industry."¹

It is of interest to touch upon the conditions which brought about this departure through the enactment of the Sugar Acts of 1934, 1937, and 1948.

¹ Cottrell, R. H., Beet Sugar Economics, The Caston Printers, Ltd., Caldwell, Idaho, 1952, p. 268.

Cottrell reviews this as follows:

"As the world began to recover from the ravages of World War I, the sugar industry the world over began slowly to rebuild itself. Naturally, after the First World War, the people of the world were sugar-hungry, for in most countries, including the United States, rationing, in various degrees, existed during the war period and for some little time thereafter. Furthermore, much of the sugar production in continental Europe was destroyed by war, particularly in France.

In 1919, when sugar was decontrolled by the United States and by her European allies, the immediate demand was greater than the immediate supply and the price of sugar skyrocketed very sharply. Such an incentive, pricewise, naturally gave so great an impetus to the production of sugar and the creation of new facilities that, in a relatively short space of time, the world had more sugar than it could consume.

While the United States tariff system was effective in preventing 'unfavored' sugar from coming into the United States, still it did not prevent the keenest kind of competition during this period of overproduction and intensive marketing pressure amongst the areas favored. The domestic beet and cane-sugar growers and processors were suffering from unprofitable returns for their labors. Many domestic beet and cane producers were on the verge of bankruptcy."¹

The Sugar Acts of 1934, 1937, and 1948

As a result of the situation just described, the administration in Washington became concerned and felt that something had to be done. As a consequence, the United States government came into the picture in 1934 to correct the situation. The Congress thus passed the Jones-Costigan

¹ Ibid., p. 268.

Act of 1934. This Act, an amendment to the Agricultural Adjustment Act, contained six principal instruments for dealing with the sugar problem.¹

These were:

- "1. The determination each year of the quantity of sugar needed to supply the nation's requirements at prices reasonable to consumers and fair to producers.
2. The division of the United States sugar market among the domestic and foreign supply areas by the use of quotas.
3. The allotment of these quotas among the various processors in each area.
4. The adjustment of production in each area to the established quotas.
5. The levying of a tax on the processing of sugar beets and sugar cane, the proceeds of which are to be used to make payments to producers to compensate them for crop curtailment and adjusting their production to marketing quotas and to augment their income.
6. The equitable division of sugar returns among beet and cane processors, growers, and farm workers."¹

This Act had improved conditions in the sugar industry of the United States, its possessions, and Cuba. Prices had improved and domestic sugar producers as a whole welcomed the change. As to the duration of the Act,

"The Act remained unchanged until 1936, when the Supreme Court ruled that a tax on processors of agricultural commodities was unconstitutional when used as a device to control production. In view of this decision, Congress repealed the provisions of the Act permitting the imposition of processing taxes and the

¹ U. S. Department of Agriculture, The United States Sugar Program, Production & Marketing Administration, Agricultural Information Bulletin No. 111, July, 1953, p. 8.

making of production control contracts between the Government and growers. But the quota and allotment system remained in effect.

The repeal of the processing tax and payment provisions of the Jones-Costigan Act of 1934 was considered crippling to the sugar program by the government and others interested in the program because it removed the incentive to growers for holding production in line with quota. Therefore, the government favored an enactment embodying, in general, the principles of the earlier legislation of 1934. This resulted in the enactment of the Sugar Act of 1937. To meet the objections of the Supreme Court to the old processing tax, the new excise tax was not related to government payments to growers. The new Act of 1937 authorized the Secretary of Agriculture to make such payments out of the treasury from funds appropriated for this purpose.

The Sugar Act of 1937 was originally scheduled to expire in 1940. However, it was extended to 1941, then from 1941 to 1944, from 1944 to 1946, and again to December of 1947.¹

Sugar Act of 1948

The Sugar Act of 1948 superseded the 1937 Act and extended the sugar program through December 1952, and then to 1956, and it is still active.

The primary objective of the Sugar Act of 1948 is to regulate the stabilization of the domestic sugar-producing, refining, and importing sugar industries. This over-all objective should be effectuated through the establishment and use of quotas under which the United States market would be divided among the various domestic sugar-producing areas and certain foreign sugar-producing areas which have historically supplied the domestic market.

¹

Loc. cit.

The purpose of the Act is "to regulate commerce among the several states, with the territories and possessions of the United States, and the foreign countries to protect the welfare of consumers of sugar and to promote the export trade of the United States, and for other purposes."¹

As to the objectives of the Sugar Act of 1948,

"The new legislation of 1948 did not change the basic objectives of the Sugar Act of 1937 but it did change the method of establishing quotas. In the 1937 Act, a fixed percentage of the estimated requirements was assigned to each domestic and foreign area. The Sugar Act of 1948, however, assigned fixed quantities to domestic areas and the Philippines and variable quotas to Cuba and 'other foreign countries' by distributing the balance of the United States requirements to these countries on a percentage basis. This gave the benefit of our increased consumption largely to Cuba."²

The present Act, the Sugar Act of 1948, therefore, is essentially the same as the two acts in general. It consists of three basic features which have shaped the sugar production and consumption policy in the United States. These three features are the following:

The Sugar Quota

Title II of the Sugar Act of 1948, "quota provisions", requires the Secretary of Agriculture to determine how much sugar will be needed to meet United States requirements during each calendar year.

"In making such determinations, the Secretary shall use as a basis the quantity of direct-consumption sugar distributed for consumption, as indicated by

¹ U. S. Department of Agriculture, Sugar Act of 1948, Commodity Stabilization Service, Sugar Division, June, 1956, p. 1.

² The United States Sugar Program, op. cit., p. 9.

official statistics of the Department of Agriculture, during the twelve-month period ending October 31 next preceding the calendar year for which the determination is being made. Then, after making such initial estimate, the Secretary must make allowances for deficiencies or surpluses in the nation's sugar inventories and for changes in consumption caused by changes in population and demand conditions."¹

When the Secretary has arrived at a tentative figure, using the standards outlined above, he must then consider the price that this quantity of sugar would likely bring on a wholesale refined basis. If the estimated sugar price will be excessive to consumers or too low to protect the welfare of the domestic industry, the Secretary is authorized to increase or decrease the determination of the quantity of sugar that may be marketed to achieve a reasonable price.

Since the World War II, the Secretary has started holding a public hearing each year at which all interested persons -- consumers, industrial users, wholesalers, producers, refiners, beet processors -- would present their views on the matter. The date for this meeting is usually in November of each year, a few weeks before the consumption determination in December. Written statements can also be submitted for the Secretary's consideration.

The Secretary must also determine requirements for local consumption in Hawaii and Puerto Rico, as well as for the United States mainland, so that the general price and marketing objectives will be the same in all American markets.

¹ Sugar Act of 1948, op. cit., p. 4.

The different sources of sugar supply, namely, the mainland beet areas, the mainland cane areas, Puerto Rico, Hawaii, the Virgin Islands, the Philippines, Cuba, and full duty countries, are each allotted a specific share of the total amount determined as required. The first five areas are allotted a total of 4,444 million tons.

Apportioning this quantity of sugar for the domestic sugar-producing areas is as follows:¹

<u>Area</u>	<u>Short tons (raw value)</u>
Domestic beet sugar	1,800,000
Mainland cane sugar	500,000
Hawaii	1,052,000
Puerto Rico	1,080,000
Virgin Islands	<u>12,000</u>
Total	4,444,000

As stated under the proration of quota of Section 202 (a) (2) of the Sugar Act, to the above total of 4,444,000 short tons, raw value, there shall be added an amount equal to 55 per centum of the amount by which the Secretary's determination of requirements of consumers in the continental United States for the calendar year exceed 8,350,000 short tons, raw value. Such additional amount shall be apportioned among and added to the quotas of domestic sugar producing areas (4,444,000 tons), respectively as follows:

¹ Ibid., Sec. 202 (a) (1), p. 4.

- (A) The first one hundred sixty-five thousand short tons, raw value, or any part thereof, by which quotas for the domestic areas are so increased shall be apportioned 51.5 per centum to the domestic beet sugar area and 48.5 per centum to the mainland cane sugar area.
- (B) The next twenty thousand short tons, raw value, or any part thereof, by which such quotas are so increased shall be apportioned to Puerto Rico.
- (C) The next three thousand short tons, raw value, or any part thereof, by which such quotas are so increased shall be apportioned to the Virgin Islands.
- (D) Any additional amount shall be apportioned on the basis of the quotas established for the domestic sugar producing areas as adjusted by (A), (B), and (C) above.

For the Republic of the Philippines, in the amount of 952 thousand short tons of sugar, as specified in Section 211 of the Philippine Trade Act of 1946.

For the calendar year 1956, the foreign countries other than the Republic of the Philippines, by prorating among such countries an amount of sugar, raw value equal to the amount determined pursuant to Sec. 201 of the Sugar Act, the Secretary's determinations of the continental United States requirement of sugar, less the sum of the quotas established pursuant to subsections (d) and (b) of Section 202 of the Sugar Act, which were mentioned earlier, on the following basis:

<u>Country</u>	<u>Per Centum</u>
Cuba	96
Foreign countries other than Philippines	4

For the calendar year 1957 and for each subsequent calendar year for foreign countries other than the Republic of the Philippines, (A) by prorating to Cuba 96 per cent and to other foreign countries 4 per cent of the amount of sugar, raw value, by which 8,350,000 short tons, raw value, and the quota established pursuant to subsection (b) of Section 202, for the Republic of the Philippines, an amount of 952,000 short tons of sugar, and (B) by prorating 45 per cent of the amount of sugar, raw value, by which the amount determined pursuant to Section 201, Secretary's determination of the required sugar for the continental United States for each calendar year, exceeds the sum of 8,350,000 short tons, raw value, as follows:¹

<u>Country</u>	<u>Per Cent</u>
Cuba	29.59
Peru	4.33
Dominican Republic	4.95
Mexico	5.10
Other countries	1.03

Furthermore, the Sugar Act of 1948 provides that

"...whenever in any year any foreign country with a quota or proration thereof of more than 10,000 short tons fails to fill such quota or proration by more

¹ Ibid., Sec. 202, a(2), (b), (c) 1 and 2, pp. 5 and 6.

than 10 per cent and at any time during such year the world price of sugar exceeds the domestic price, the quota or proration thereof for such country for subsequent year shall be reduced by an amount equal to the amount by which such country failed to fill its quota or proration thereof, unless the Secretary finds that such failure was due to crop disaster or finds that such reduction would be contrary to the objectives of the Act."¹

And, finally, one noteworthy thing should be mentioned as far as readjustment is concerned, that deficiencies from domestic areas are reallocated to other domestic areas and to Cuba, and a Philippine deficit is assigned to Cuba.

It is not within the scope of this thesis to deal in any more detail with the vast subject of markets and the marketing of sugar. It is important, however, to recognize that, in sugar marketing, there is not any insulated or isolated sugar area in the world.

Payments to Growers

A second basic feature of the Sugar Act of 1948 (sugar quota was first) is payments to growers.

"Regulation of the sugar market through the quota system is supplemented by a system of conditional or benefit payments by the government to continental and insular producers. These payments are conditioned upon the producer's meeting several requirements: employing no child labor; paying farm laborers in full and at wage rates not less than those determined by the Secretary of Agriculture; and finally, observance of the specific allotments if they have been assigned.

¹ Ibid., Sec. 202 (e), p. 7.

"The rate of payment is based on the amount of raw sugar commercially recoverable from the production of the farm. Growers whose crop produces less than 350 short tons of raw sugar receive 80 cents per 100 pounds; larger growers receive payments on descending scales; reaching a minimum of 30 cents per 100 pounds on any production in excess of 30,000 short tons. Payment may also be made to growers whose yield is deficient or who must abandon acreage because of adverse weather, disease, or insects."¹

Table 11 shows the government payment to the growers from 1947 to 1954.

Table 11. Sugar Beets, Payments to Growers Per Ton, United States, 1947-1954.

Crop year	Basis of payment	Payment to growers per ton of sugar beets	
	Net return per 100 lbs. of sugar (dollars)	Sugar (dollars)	Abandonment and deficiency (dollars)
1947	6.48	2.44	.10
1948	6.61	2.44	.161
1949	6.69	2.47	.07
1950	6.96	2.40	.08
1951	7.27	2.38	.08
1952	7.46	2.37	.06
1953	7.14	2.35	.04
1954	7.00	2.32	.10

Source: Jackson, Donald, D. B. DeLoach, and Rado J. Kinzhuber, Marketing Sugar Beets, U. S. Department of Agriculture, Agricultural Marketing Service, Marketing Research Division, AMS No. 137, November, 1956, p. 27.

¹ Phelps, H. Fisk, "The Sugar Beet Industry in the Twelfth Reserve District", Supplemented to Monthly Review, Federal Reserve Bank of San Francisco, April, 1951, p. 3.

Excise Taxes

A third feature of the Sugar Act of 1948, which is still active, is excise taxes. In order to provide funds for these subsidiary payments, which are financed out of the general funds of the treasury

"...the government imposes either an excise or an import-compensating tax on sugar. The excise tax is levied on all sugar refined in the United States, whether from imported or domestic raw sugar. The refined sugar, which is imported into the United States is subject to an import-compensating tax of the same amount. This tax is paid in the same manner as a duty.

In effect, the conditional payments to growers compensate for the lower price which the grower receives from the processors as a result of the excise tax placed on the refined sugar sold by the processor. For the vast majority of the smaller producers, the payments are in excess of the tax. But the lowering of the scale of payments for the larger producers means that some of the largest receive payments smaller than the tax. Since producers in foreign countries and Cuba receive no payments, the tax has the same effect as a duty in reducing the net amount received for sugar sold by them in the United States market."¹

Sugar Beet Acreage Allotment

Restrictive proportionate shares (farm acreage allotment) became effective in the beet sugar area beginning with the 1955 crop, pursuant to the provisions of the Sugar Act of 1948, Section 302 (b) which states as follows:

"In determining the proportionate shares with

¹ Loc. cit.

respect to a farm, the Secretary of Agriculture may take into consideration the past production on the farm of sugar beets and sugar cane marketed (or processed) within the proportionate share for the extraction of sugar or liquid sugar and the ability to produce such sugar beets or sugar cane, and the Secretary shall, insofar as practicable, protect the interests of new producers and small producers and the interests of producers and small producers and the interests of producers who are cash tenants, share tenants, adherent planters, or share croppers and of the producers in any local producing area whose past production has been adversely, seriously, and generally affected by drought, storm, flood, freeze, disease insects, or other similar abnormal and uncontrollable conditions."

As a preliminary step, acreage allocations were established by the determination for the various sugar beet producing states primarily on the basis of the acreages of sugar beets planted in the 1950-1954 crop period.

The purpose of assigning specific shares to farms in a particular area is to adjust crop output to the area's quota and carry-over determination and to assure that each farm will share in this adjustment equitably.

Administration of Proportionate Share Program

Each year the Secretary of Agriculture determines a national and state acreage allotment. The procedure for administration of the proportionate share program is outlined by the Commodity Stabilization Service as follows:

"Then, in each state the Agricultural Stabilization and Conservation State Committee (hereinafter referred to as "State Committee") shall establish individual farm proportionate shares in accordance with the past beet production records in the crop period 1950-1954.

In carrying out the proportionate share program within the state, the State Committee may utilize the services of members of the Agricultural Stabilization and Conservation County Committees, and may cooperate with advisory committees consisting of sugar beet growers, representatives of sugar beet grower associations, representatives of sugar beet processors or combinations of these groups. The State Committee shall formulate these standards and procedures in written forms for establishing proportionate shares within the state in accordance with the past production records of the crop. Such standards and procedures shall be reviewed by the Director of the Sugar Division, Commodity Stabilization Service, for conformity and to assure reasonable uniformity between adjoining areas in adjacent states, shall be subject to the approval of the Director, and shall be available for public inspection in state and county offices."¹

Subdivision of State Acreage Allocation

The Commodity Stabilization Service states the following with regard to assigning the acreage allocation within a state:

"Before establishing individual farm proportionate shares, the State Committee may subdivide the state acreage allocation into allotments for areas within the state, such as an area served by a beet sugar company, a county or a group of counties. In making any such subdivision, appropriate weightings, approved by the Director, shall be given to the past production of sugar beets and the ability to produce sugar. 'Past production' shall be measured by the average planted acreage of the area for not less than 1950-1954, except that if the State Committee determines that the inclusion of one or both of the 1955 and 1956 crop years would provide a more representative period, one or both of such crop years may be included upon prior approval of the Director. 'Ability' shall be measured by the area's largest planted acreage during any of

¹ U. S. Department of Agriculture, Commodity Stabilization Service, Proportionate Share, Domestic Beet Sugar Producing Area, 1957 Crop, S. D. 850. 53, Revised, p. 1.

the crop years used to measure 'past production' or by a combination of planted acreage for any such years. If the state acreage allocation is not subdivided, proportionate shares will be established directly from such allocation and the state shall be deemed to be one allotment area. Unused acreage in any area may be reallocated by the State Committee among other areas within the state."¹

Establishment of Individual Proportionate Shares For
Old Operator Farmers

Again, quoting from the Commodity Stabilization Service

"In establishing proportionate shares for individual farms from area allotment, the State Committee shall consider the factors of past production of sugar beets and ability to produce sugar beets. These factors shall be measured by reference to the planted sugar beet acreage record of the farm, the '1956 crop share established for the farm' or if the farm operator is a tenant in an area where sugar beet production is organized around tenant operators rather than around units of land, they may be measured by reference to the personal planted sugar beet acreage record of the farm operator within the state or allotment area, as specified in procedure formulated by the State Committee, or they may be measured by a combination of such farm and personal records. However, in an area where such personal records are utilized, the farm base for each farm whose operator is not a tenant or is a tenant with no such personal record shall be established solely from the farm records in the period of crop years used in measuring past production. In case of death or incapacity of a tenant, his personal sugar beet production record shall be credited to the administrator or executor of his estate or to a member of his family, if in the year of such death or incapacity, or in the following year, such administrator, executor, or family member continues as a tenant the customary sugar beet operation of the deceased or incapacitated tenant. The term '1956-crop share established for the farm' shall mean either the 1956-crop share

¹ Ibid., (h), p. 2.

established for the farm, including adjustments made under appeals but excluding any downward adjustment made because the 1956 crop acreage planted on the farm was less than the share originally established for the farm and any upward adjustment made because the 1956 crop shares of other farms were not fully planted, or the initial 1956 crop share which would have been established, if it had been requested by the farm operator, except as a 1956 crop new producer."¹

Set-Aside Acreage for New Producers, Appeals, and Adjustments

Regarding set-aside acreages for new producers, appeals, and adjustments, the Commodity Stabilization Service states the following:

"Not less than 2 per cent of the state acreage allocation shall be set aside for establishing proportionate shares for farms operated by new producers and not less than 1 per cent shall be set aside for adjustments under appeals. Any acreage required to supplement the acreage available from initial proportionate shares in excess of requested acreages in making adjustments in initial proportionate shares pursuant to paragraph 'i' (mentioned earlier) may also be set aside.

In determining proportionate shares for new producers, the State Committee shall take into consideration availability and suitability of land, area of available fields, availability of irrigation water (where irrigation is used), adequacy of drainage, availability of production and marketing facilities and the production experience of the operator.

A farm operator who believes that the proportionate share established for his farm is inequitable, may file a written appeal for reconsideration of such proportionate share of the local Agricultural Stabilization and Conservation County Office, not later

¹ Ibid., (i), p. 2.

than the date shown in the notification of proportionate share, as established by a statement of facts constituting the basis for such appeal. The appeal shall be reviewed in such county office and forwarded with recommendations to the Agricultural Stabilization and Conservation State Office. The appeal shall be reviewed and acted upon by the State Committee, or in lieu thereof, by a sugar beet appeal committee to be designated by the State Committee and to be composed of three members, including the State Administrative Officer. Each of the two other members shall be a state committeeman or an employee of the A.S.C. State Office. Decision will be made. If the farm operator is dissatisfied with the decision in his case, he may appeal in writing to the Director, whose decision shall be final."¹

Arizona and Possible Acreage Allotment

As was stated in preceding discussions concerning sugar beet acreage allotments under the Sugar Act of 1948, there will be no one state, region, or farm allowed to grow sugar beets, for sugar, without having an acreage allotment. Accordingly, Arizona cannot raise sugar beets for sugar without an acreage allotment under the existing Act of 1948. One question, however, will be raised by interested people who are anxious to get its answer. Should Arizona be denied forever? The answer is not easy. The author's answer to this question, based on this study, is the following:

"No, Arizona should not be denied forever." The facts supporting this decision may be grouped into two major categories.

1. As determined in the preceding chapters, Arizona has the qualifications to produce an excellent quality and quantity of sugar

¹ Ibid., (g), (j), and (n), p. 2.

beets, and to build up a successful industry like her sister, the Imperial Valley of California. Accordingly, there is no logical reason why Arizona should not utilize her capital and resources to the best possible uses. This point is supplemented and supported by the second point which together would build a strong case against denying Arizona the opportunity to attain an acreage allotment.

2. A continuous increase in the national and the state acreage allocation, is indicated in Table 12 since the beginning of the allotment system. This may indicate the encouraging policy of the United States government to increase domestic sugar production because of the continuous increase in the sugar consumption by the American people due largely to a continuous increase in population.¹

Since all the sugar factories at the present time are almost satisfied with the quantity of sugar beets they need for their industries, an allocation of an acreage large enough to meet the requirements of a factory for Arizona will not be at the expense of the other sugar beet states and factories. This is because the trend of the national acreage is evidently going upward.

¹ Roughly, 25 per cent of the sugar consumption in the United States comes from mainland sources, 3/4 to 4/5 of this domestic production is beet sugar, the remainder being cane sugar, as indicated in Table 3, p. 31, this thesis.

Table 12. The 1943-1952, 1953, and 1954 Sugar Beet Crop. Acreage Base with National and State Allocations for the 1955, 1956, and 1957 Sugar Beet Crops for Comparison.

State	Base of Allotment			Allocation of Acres		
	Average 1943-1952	1953	1954	1955	1956	1957
California	142,500	174,900	224,600	182,530	192,141	206,041
Colorado	143,900	121,300	151,400	131,591	137,275	147,053
Idaho	75,500	82,500	93,400	80,050	83,425	89,367
Illinois	2,210	1,460	2,060	2,007	2,201	2,358
Indiana	900	200	60	64	64	68
Iowa	1,500	750	1,480	1,485	1,630	1,746
Kansas	6,800	5,600	6,800	7,267	7,611	8,153
Michigan	81,100	55,700	76,600	77,803	77,803	83,244
Minnesota	144,800	68,700	76,000	67,263	70,095	75,082
Montana	66,700	45,300	55,500	51,248	53,406	57,210
Nebraska	58,800	55,200	67,500	58,816	61,292	65,657
Nevada				500	525	563
New Mexico	520	440	650	764	796	853
North Dakota	21,900	36,400	38,200	35,006	36,479	39,077
Ohio	22,000	15,600	1,800	20,367	21,224	22,736
Oregon	19,000	17,600	16,600	17,805	18,555	19,877
South Dakota	5,600	5,100	6,600	5,478	5,709	6,116
Texas			1,300	1,631	1,699	1,820
Utah	35,400	28,400	35,800	30,814	31,903	34,897
Washington	16,900	32,400	35,500	30,813	32,110	34,397
Wisconsin	13,300	9,800	13,900	12,149	12,149	13,014
Wyoming	34,200	35,600	39,600	34,445	36,208	38,487
Reserve				500	500	2,500
Total U. S.	853,630	792,950	963,600	850,000	885,000	950,000

Source: Data for average 1943-1952, 1953, and 1954 (prior to establishment of allotments): Agricultural Statistics 1955, U. S. Department of Agriculture, p. 71. Data for 1955 (the beginning of current acreage allotment system) and 1956: Holly Agricultural News, published by Holly Sugar Corporation, Fall, 1956, p. 4. Data for 1957: "Proportionate Shares, Domestic Beet Sugar Producing Area, 1957 Crop," Commodity Stabilization Service, U. S. Department of Agriculture, S. D. 850.53 Rev., Title 7, January, 1957.

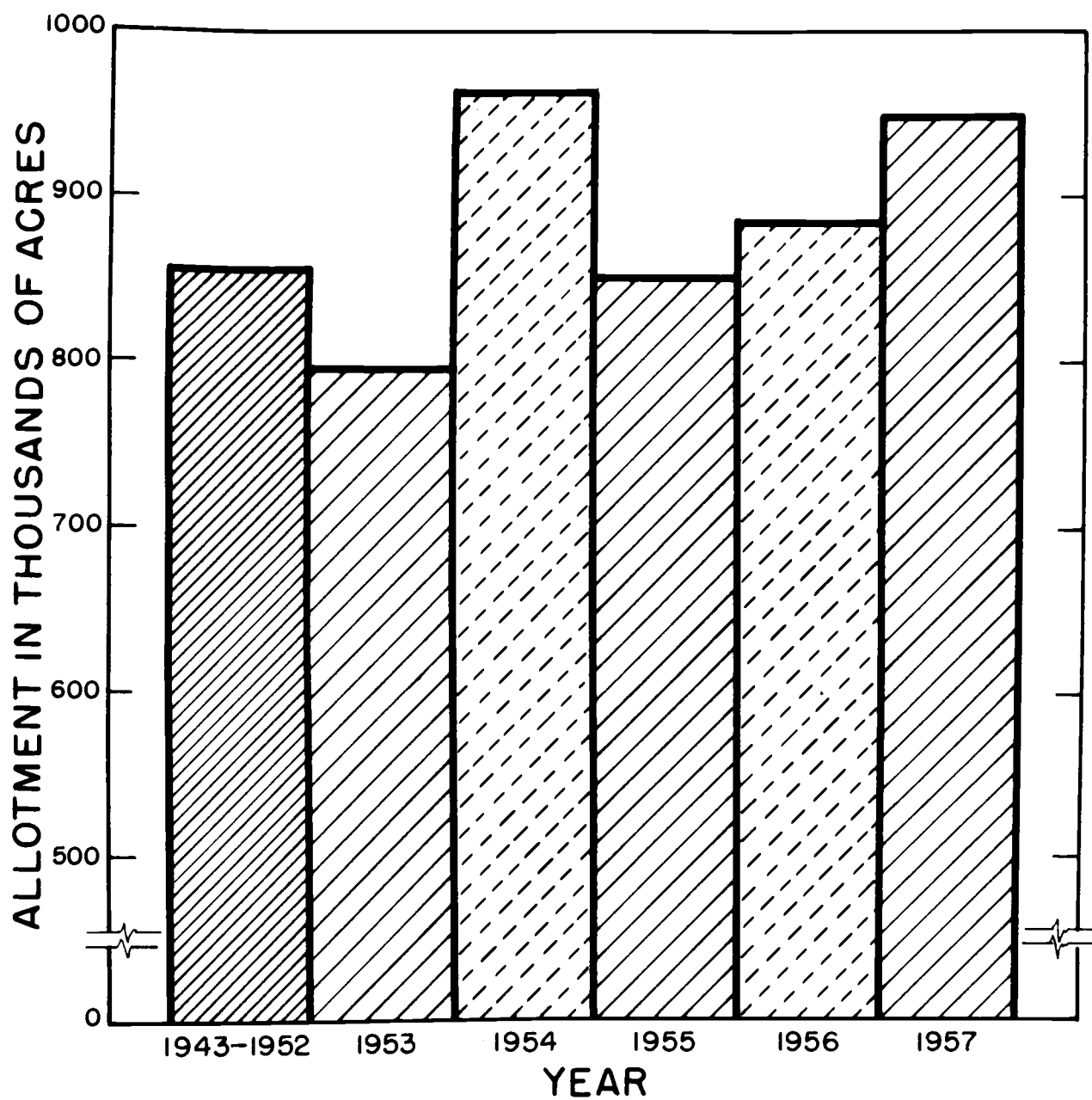


Figure 3. Acreage Allocation for Sugar Beets, United States. 1943-1952 Base Allocation and Annual Allotments, 1953-1957.

Source: Table 12.

What Might Be Done To Get Allotment For Arizona

The appropriate procedure to obtain an acreage allotment for Arizona would be the filing of a request for such an allocation with the Director of the Sugar Division, Commodity Stabilization Service, U. S. Department of Agriculture, on behalf of the farmers who are interested in engaging in sugar beet production. The request should be accompanied by a statement of facts constituting the basis of such a request. Obtaining a satisfactory acreage allotment, however, under Arizona special conditions is not a simple one. This is particularly true, bearing in mind that any allotment less than the minimum requirements for the economical operation of a sugar factory (about 18 - 19 thousand acres)¹ will be useless in accordance with the assumption of the request. This is because the farmers will not grow sugar beets unless they find a home market for them. A sugar factory in Arizona will provide this home market. It is not practical for Arizona farmers to ship the possible beets to California, due to freight rates. Since the possible factory in Arizona requires an allotment of 18-19 thousand acres, much more than the whole national reserve, the most effective way to get the necessary allotment may be through Arizona's representative in Washington.

Anyway, the solution of this problem is left to Arizona farmers themselves to follow whatever course they may think proper.

¹ The whole national reserve was only 500 acres for 1955 and 1956, and 2,500 acres for 1957, as indicated in Table 12.

CHAPTER IV

SUMMARY AND CONCLUSIONS

1. Sugar beets of good quality and paying quantity are grown successfully in the Imperial Valley of California, an area with soil and climatic conditions similar to the Salt River Valley of Arizona. The average yield of sugar beets per acre in the Imperial Valley during the past five years has been approximately 20 tons per acre. A long period of years of continuous research on sugar beet production at the Mellowland Station, compared to minor occasional research in Arizona, may well be the principal factor causing the difference of beet-sugar industry development in Imperial Valley and the Salt River Valley.
2. The University of Arizona's Agricultural Experiment Station has conducted a variety of experiments regarding the possibilities for successful production of sugar beets (for sugar) under Arizona soil and climatic conditions. Some of these experiments go back as far as 1897, while others are more recent. The results of early experiments were put in practice, and a sugar factory was established in Glendale, Arizona in 1905. This factory, however, did not long exist, primarily because sugar beets could not compete with cotton (which at that time was not under controls) for the land and capital resources. Recent experiments (1948-1955), however, with newer and better adapted varieties and better cultural techniques have given better results than

early experiments. A comparison of early and recent experiments in the Salt River Valley, with regard to yield and sugar content is shown below.

<u>Early Experiments (1897-1899)</u>		<u>Recent Experiments (1955)</u>	
Max. yield per acre	sugar content	Avg. yield per acre	sugar content
15.2 tons	13.8 per cent	19.08 tons	17 per cent

Yields of as high as 30 tons per acre have been obtained on experimental lots at Yuma.

2. With acreage controls on cotton, sugar beets could become a profitable alternative crop in the Salt River Valley. Based on recent experimental results in the Salt River Valley and considering the yields obtained by the farmers in the Imperial Valley, a yield of 20 tons per acre can likely be obtained under farm conditions in the Salt River Valley. The net return to land and management from an expected yield of 20 tons per acre would be much higher than the net return from the other extensively grown crops, other than cotton, as shown below. Net returns for each crop are based on estimated 1957 prices and costs for two water cost conditions: (1) the Salt River Project and (2) for a pumping lift of 260 feet.

Crop	Yield	Price	Gross Return	Estimated net return to land and management per acre	
				Salt River Project	Pump Area 260-ft. lift
Cotton	2.0 bale	30¢/lb lint	\$300	\$ 115	\$ 93
Alfalfa hay	5.0 tons	\$25/ton	125	23	- 4
G. sorghum	1.8 tons	\$50/ton	90	25	6
Barley	1.6	\$50/ton	80	31	14
Sugar beets (for sugar)	20 tons	\$14.54/ton (includes value of tops)	291	87	65

3. Under the existing agricultural situation in Arizona, with the restriction of cotton production, farmers are anxiously seeking a profitable alternative crop to replace cotton in the cotton diverted lands. The choice of profitable alternatives, however, is limited in Arizona. In many cases, producers planted the land taken from cotton to another alternative crop such as alfalfa or grain sorghum, although economic conditions alone might not have justified this decision.
4. Sugar-beet by-products from the farm (beet tops) and from the factory (pulp and molasses) have proved to be excellent supplements to other feeds such as grains and hay for livestock feeding. They are usually cheaper than grains with equivalent fattening values. Sugar-beet by-products would be a valuable addition to the feed resources of Arizona and would thus give additional impetus to what is already one of the most profitable industries in the Salt River Valley.

5. Arizona has the qualifications to meet the necessary requirements for establishing a beet-sugar factory, namely, water supply, limestone, fuel, labor, and markets, upon which the profitability of the possible sugar-beet production is dependent. However, as to the question of erecting a factory in the Salt River Valley, there are two major considerations:

- (1) The possibility of resistance reactions from the sugar-beet seed companies. This might be due to two main reasons:
 - (a) Their belief that the production of sugar beets for sugar might overthrow, or at least compete, with their beet seed industry. However, beet seed producers have actually obtained a good income from beet seed production, and it appears that a sufficient number would continue to produce enough to meet sugar-beet seed requirements.
 - (b) There are insect and disease problems associated with sugar-beet seed production in the Salt River Valley and the likelihood that sugar beets being in the ground the year around would tend to spread and hold over the diseases and insects that go with the crop. However, the disease and insect problems are common problems in nearly all the sugar-beet localities.
- (2) A modern sugar factory costs about \$15 million, and the present sugar companies are reluctant to build factories in new areas in the face of sugar quotas. One possibility, however, would be for the sugar-beet growers themselves to build their own factory.

This problem of erecting a factory for a sugar industry in Arizona, however, must be left to the interested individuals and responsible groups in the state.

6. Achieving the desire of Arizona farmers and livestock men to introduce sugar beets into the agriculture of Arizona as an alternative crop, however, is not possible under the present existing Sugar Act of 1948, because of the sugar quota and sugar-beet acreage allotment restriction. Arizona is the only one of the 11 Western states which does not have an allotment to grow sugar beets. Necessary arrangements must be made to get the privilege of sugar-beet production. A minimum of 18-19 thousand acres is required for economical operation of a modern sugar beet factory.

The present frustration of Arizona from the acreage allotment privilege, however, does not mean that Arizona should be denied forever. Since Arizona has the qualifications to make the sugar-beet industry a successful one in this state, there should no longer be any reason why Arizona should not produce sugar beets for sugar. Consequently, the author would highly recommend the introduction of the sugar-beet crop into Arizona agriculture and to build up a sugar industry with its full advantages.

This, however, is more or less a political problem, and the author would like to leave its solution to the people of Arizona and their representatives in Congress.

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