

Lettuce Production in California

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Background

In the early 20th century, California produced only little lettuce^[5]. For 1909, Knott and Tavernetti^[4] reported that lettuce was produced on 595 acres in California, which corresponded to 11% of the total U.S. acreage. Lettuce production increased dramatically in the 1920s (Figure 1). While 6,100 acres were harvested in 1919^[4], the harvested area reached 112,000 acres by 1930^[12]. The market share of California lettuce increased in tandem with the

area, reaching more than 50% of the U.S. production by 1930.

After 1930, lettuce production continued to increase, although at a slower pace, reaching a maximum with 244,000 acres in 2006 (Figure 1). Since 1930, the lettuce production area has increased by an average of more than 1600 acres each year^[12].

In 2011, lettuce was grown on 206,000 acres in California, which represented 73% of the total U.S. acreage^[11].

Types of Lettuce Produced

The emergence of California as a dominant lettuce production area in the 1920s had a large impact on the types of lettuce consumed. Before World War I most lettuce grown in the U.S. was either leaf or butter lettuce^[5]. In 1917, 3,350 carloads of butter lettuce were shipped to terminal markets across the U.S., compared to only 2,078 carloads of iceberg lettuce. Eight years later, almost four times as much iceberg as butter lettuce was shipped^[5]. Iceberg lettuce was mainly produced in the western U.S. The preference for iceberg lettuce was mainly due to the fact that it was better suited for the long transport across the continental U.S. than butter lettuce^[5].

Even though iceberg lettuce is much more robust than butter lettuce, losses during transport to the markets in the eastern U.S. were high^[7]. Before the 1950s, lettuce heads were trimmed in packing sheds and placed in crates. To keep the lettuce cool during transport,

cracked ice was placed between layers of packed lettuce, separated from the lettuce by waterproof liners, and on top of the crates in the refrigerator cars^[4]. However, keeping the temperature at an ideal 34° F was difficult with this method; and storage temperatures could vary between 30° F and 40° F during transport,

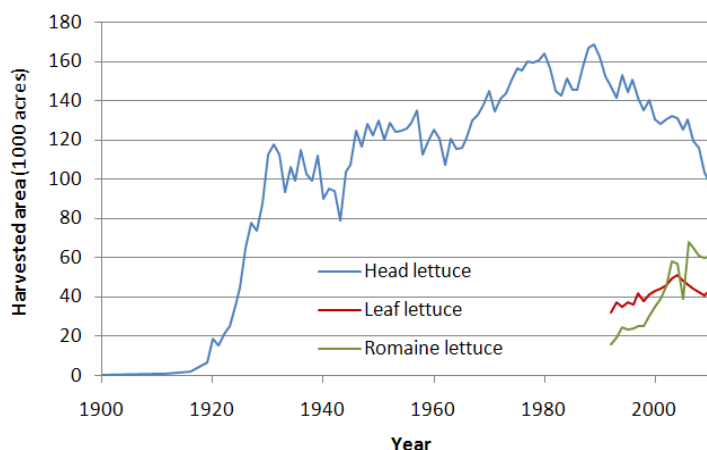


Figure 1: Harvested acreage of lettuce in California from 1900 to 2012^[4, 6, 12].

causing rotting in the summer or freezing in the winter ^[5].

In 1946, the first attempt at vacuum cooling lettuce took place near Salinas. Vacuum cooling eliminated the need for ice, which greatly reduced costs and simplified the packing process as lettuce could be packed in the field rather than in the packing shed ^[5]. Initially, growers and shippers did not embrace the technology ^[5]. However, once its reliability improved, adoption of vacuum cooling proceeded quickly. While in 1952 only 20% of the head lettuce shipped from Salinas was field packed and vacuum cooled, this proportion reached 73% in 1954 ^[8]. By 1955, nine vacuum-

cooling plants processed 95% of the lettuce in the Salinas Valley ^[5].

Vacuum cooling significantly improved quality of the lettuce arriving at the markets in the eastern U.S. ^[5]. However, even in 1958 shippers were losing over 25 percent of their lettuce in transit because of disease, temperature variations, and rough handling ^[5].

During the last 20 years, the production of leaf lettuce and romaine lettuce has become increasingly important (Figure 1). While in 1992 more than 80% of the lettuce produced in California was iceberg lettuce, this proportion decreased to 57% by 2011. Romaine lettuce and leaf lettuce now account for 27 and 16% of the production, respectively ^[12].

Production Regions

In the early 1920s, Los Angeles and Imperial Counties were the dominant lettuce producing counties in California, with 57% of the lettuce being produced in Los Angeles County and 42% in Imperial County in 1920 ^[14]. While Imperial Valley growers produced lettuce in winter when the desert was not too hot, growers in Los Angeles County supplied lettuce for spring, summer, and fall consumption ^[1]. With urban development, lettuce production in Los Angeles County decreased gradually, so that in 1930 only 3% of the lettuce produced in California came from Los Angeles County ^[3].

The Imperial Valley remained an important region for lettuce production. However, as the total area in California increased faster than the area in the Imperial Valley, its market share gradually decreased from 55% in 1923 to 33% by 1930 ^[3, 14].

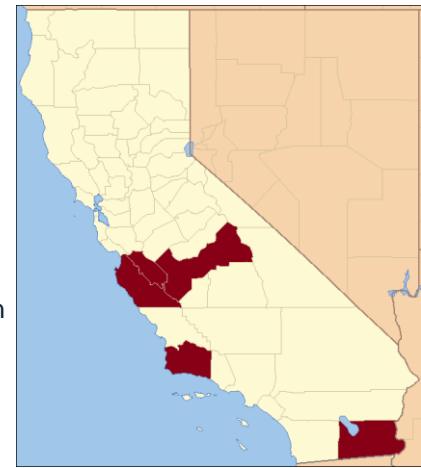
In the 1920s, Monterey County became the dominant lettuce production area in California. The first commercial planting of lettuce in the Salinas Valley occurred in 1920 ^[1]. While its market share was only 2% in 1922, it had reached 50% by 1930 ^[3, 14].

Several factors contributed to the increase in lettuce production in the Salinas Valley:

- The climate and soils were ideal for growing high quality lettuce ^[1, 5].
- Thanks to its climate, the valley also has one of the longest growing seasons for lettuce in the country, allowing harvesting lettuce from April to November ^[5, 9, 10].
- The increasing demand in the East for Western lettuce and the gradual disappearance of the Los Angeles area occurred at a time when Salinas Valley farmers were beginning to find themselves without a satisfactory crop ^[1]. These developments led the California Vegetable Union, the largest vegetable shipper in California, to promote lettuce production in the Salinas Valley ^[5].
- Lettuce production in the Salinas Valley benefited from earlier agricultural crops, especially sugar beet production. Thanks to the large scale of sugar production, railroad tracks led through the center of the valley. Packing sheds for lettuce could so be simply constructed along the railroad tracks ^[5]. In addition, refrigerator cars were readily available thanks to the fruit industry in the area ^[5].

In 2007, 57% of the lettuce produced in California came from fields in Monterey County, where lettuce is harvested from spring to fall. During the winter months, lettuce is predominantly produced in Imperial County, which accounted for 13% of the lettuce production in California in 2007^[13]. Therefore, these two counties together produce 70% of California's the lettuce, which corresponds to more than half of the lettuce produced in the U.S. With a share of roughly 5% each of the total production, San Benito, Santa Barbara, and Fresno Counties are other important lettuce producing counties (Figure 2)^[13].

Figure 2: Location of the five leading lettuce producing counties in California^[13].



Yield

Between 1920 and 1932, the yield of iceberg lettuce decreased considerably from 185 to 74 cwt/acre (Figure 3)^[12]. This decrease coincided with the huge increase in acreage (Figure 1). This expansion meant that new growers started lettuce production on soils and in regions formerly not under lettuce. The lack of experience is likely the reason for the observed decrease in yield. Between 1932 and 2000, iceberg lettuce yield has increased almost linearly by 4.65 cwt/acre each year, reaching 390 cwt/acre in 2000 (Figure 3)^[12]. Therefore, during this period, lettuce yields increased fivefold.

The yields of romaine and leaf lettuce tend to be lower than the yield of iceberg lettuce.

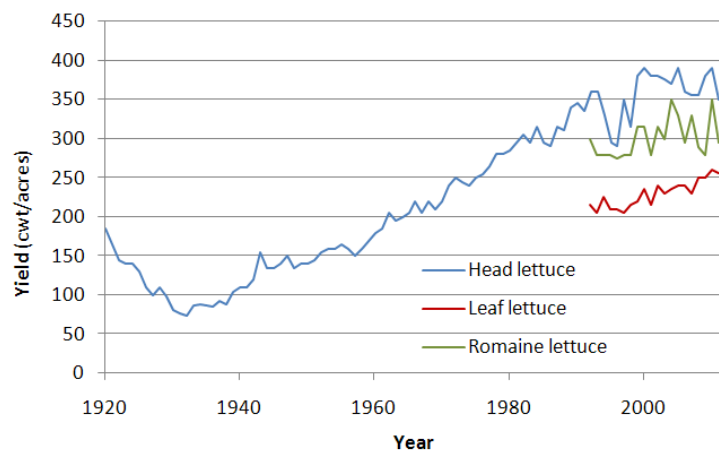


Figure 3: Development of lettuce yield since 1920 in California^[12].

Over the last decade, the average leaf lettuce yield reached 240 cwt/acre, while the romaine lettuce yield reached 310 cwt/acre^[12].

Production Practices

Most lettuce is planted using pelleted seed and a precision planter. Very little lettuce is transplanted in California. Transplanting may be favorable at the start of the season and at midseason when there is a need to get a crop in to meet production schedules^[9, 10].

Based on a survey carried out in 2004 and 2005, which included 78 commercial fields located in the coastal valleys of central California, Hartz and coworkers^[2] reported average seasonal fertilizer application rates of 164, 17 and 23 lbs/acre N, P, and K,

respectively. The reported application rates for N ranged from 27 to 390 lbs/acre.

Leaf lettuce is harvested by ground packing or by a harvest machine and field-packed into

cartons^[9]. Iceberg lettuce is harvested by hand^[10].

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