Sugarbeet Production in the Imperial Valley

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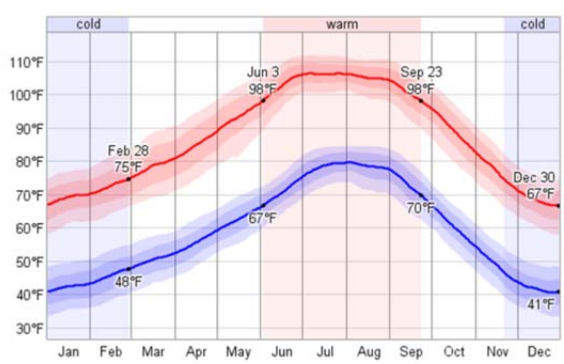
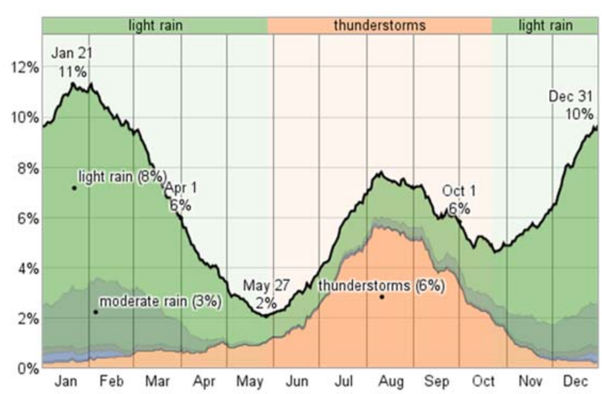
Coachella Valley, Salton Sea and Imperial Valley

Background. Sugarbeets have been grown in the Imperial Valley since 1932, shipped by rail to factories elsewhere in California. The current factory in Brawley was built by Holly Sugar Corporation at the end of the second world war and opened in 1947. Beets were processed at both the Brawley facility and shipped by rail to other factories in California until the early 1990s, when rail shipment became uneconomic. After a series of financial crises and bankruptcies, the Holly factory was acquired by Southern Minnesota Beet Sugar Cooperative in 2005 and is operated using the name Spreckels Sugar, the company that first established large-scale sugarbeet production in California in the 1890's. The factory in Brawley is the last one operating in California, where 11 factories have been constructed, operated and eventually closed since the first commercial sugarbeet factory was opened in 1870 near San Jose.

The Imperial Valley (IV) is a low desert ecosystem with mild, sunny winters and hot summers. It receives the most sunlight of any location in the United States.



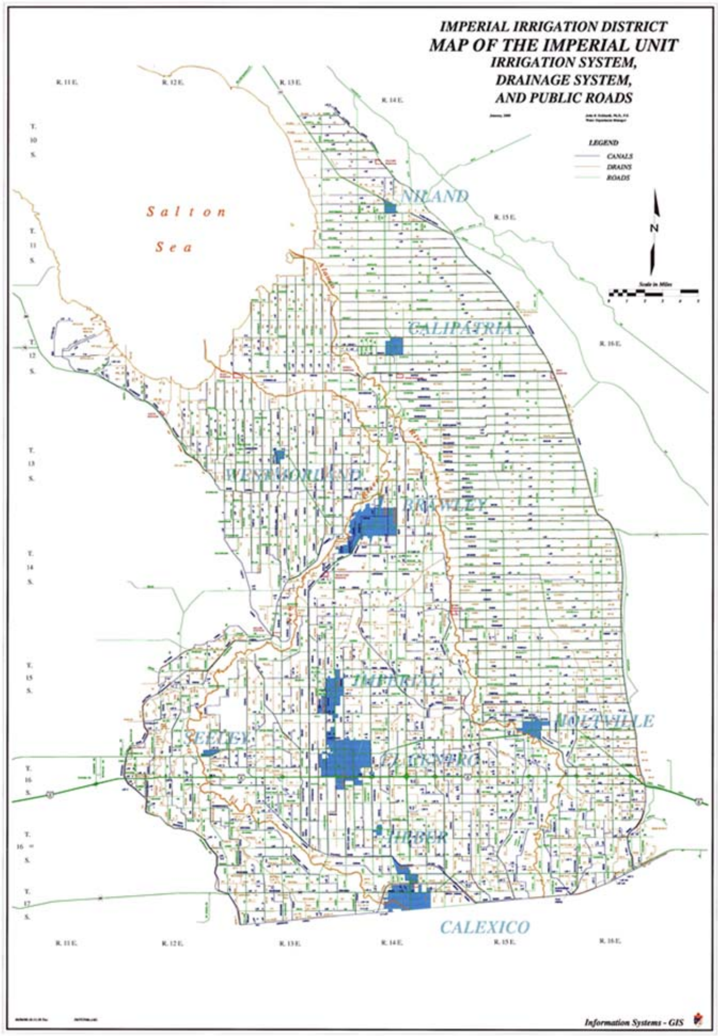
Daily average maximum and minimum temperatures and temperature ranges in the IV



Probabilities of precipitation by month in the IV. Average precipitation is less than 3 inches per year

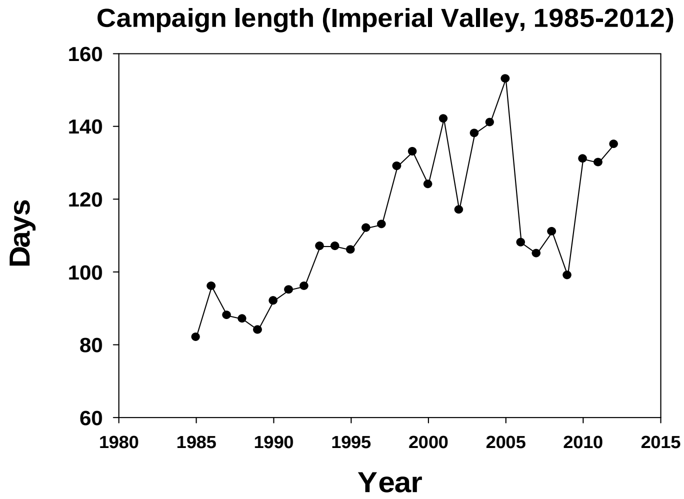
Soils are largely alluvial clay loams (fine and moderately fine formed via deposition by the Colorado River as it scoured its way west and south, including carving the Grand Canyon). There are also areas with wind-blown silts and sandier soils deposited by river/drainage channels. Most soils are high in pH and calcareous, with large amounts of naturally occurring gypsum. The Salton Sea to the north of the cultivated lands was formed by accident in 1905, when early flood flows overwhelmed the headworks under construction by the Imperial Irrigation District to divert the river. For two years, most of the flow of the river was diverted north and filled the Salton Sink, then dry. At its lowest point, the Sink is 270 feet below sea level, as is the farmed area in the IV. Since that time, the new Salton Sea has been maintained by drainage from farmland in the Imperial Valley. Most IV fields are tile drained at 6 feet in depth. Subsurface drainage maintains positive salt balances in the IV soils, which otherwise would salinize. Inflows to the Sea from all sources (primarily irrigation return flows) is equal to 1.36 million acre feet per year, which maintains its current size. It is increasingly saline and now more saline than the Pacific Ocean. The future of the Sea is the subject of an on-going political contest in California, that also involves the entire California River Drainage region and all the southwestern states affected.

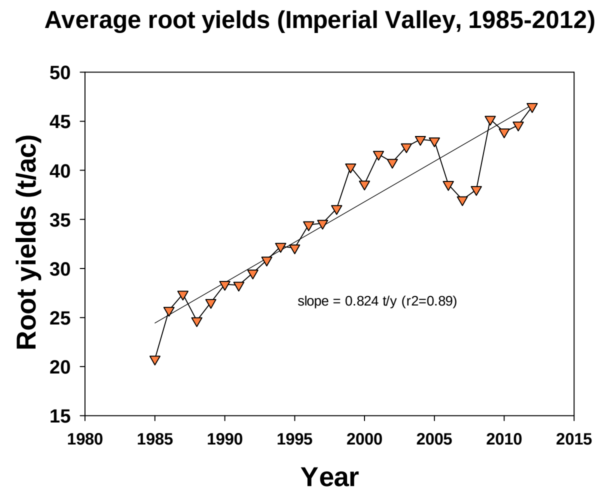
Water delivery to the Imperial Valley and power production is provided by the Imperial Irrigation District (IID), first organized in 1911. The All American Canal conveys approximately 2.6 million acre feet of water per year to 425,000 acres of farmland and 7 cities and towns. The canal runs along the Mexican border to the south. Water is then diverted through a series of canals northwards to towns and fields. Since the land slopes northwards towards the Salton Sea, little power is needed to move water. IID holds some of the most senior water rights to the Colorado River. The result for growers has been a relatively constant supply of water at low prices (currently $20 per acre foot) in comparison to most other irrigators in California. The relatively low cost of water, ability to rely on natural drainage, and commitments to supply water to the Salton Sea has meant that surface irrigation systems have been the most economical to use, and the majority of fields and crops are irrigated in this manner. Nevertheless, conservation measures have been implemented in recent years in response to pressures to divert water to southern California's cities and more recently to the efforts to revive the Colorado River Delta in Mexico. These include tail water reuse programs, canal lining, fallowing and limits on per acre deliveries to 4.5 ac ft per year, and water by-backs for reduced deliveries. Such pressures will continue and climate change may reduce the amount and reliability of water in the Colorado River itself, so the sugarbeet industry's research committee has initiated funding for research on drip irrigation systems, which offer promise to address both increased water use efficiency and a number of recalcitrant pest management and disease issues.

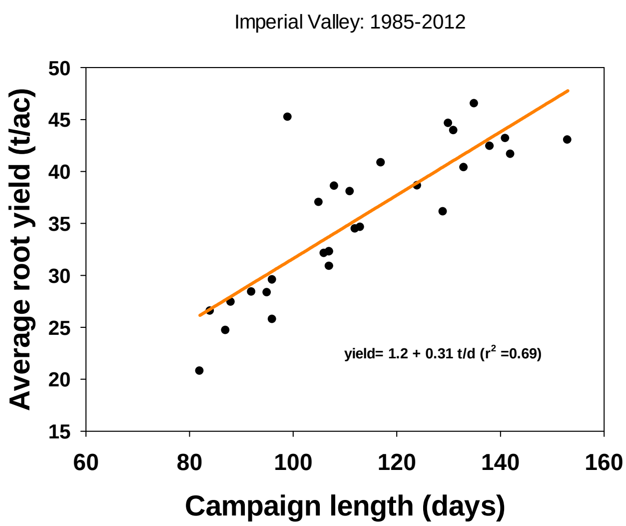


Canal system in the Imperial Irrigation District; source: IID (http://www.iid.com/index.aspx?page=112)

Sugarbeet production. Beets are planted from the middle of September to early October, and harvest begins approximately 180 days later starting in early April. Harvest is usually concluded in July, but there has been a tendency in recent years to extend the harvest later in the month, often running into August. This has occurred due to increasingly larger sugarbeet yields, and at times due to operating difficulties in the factory.







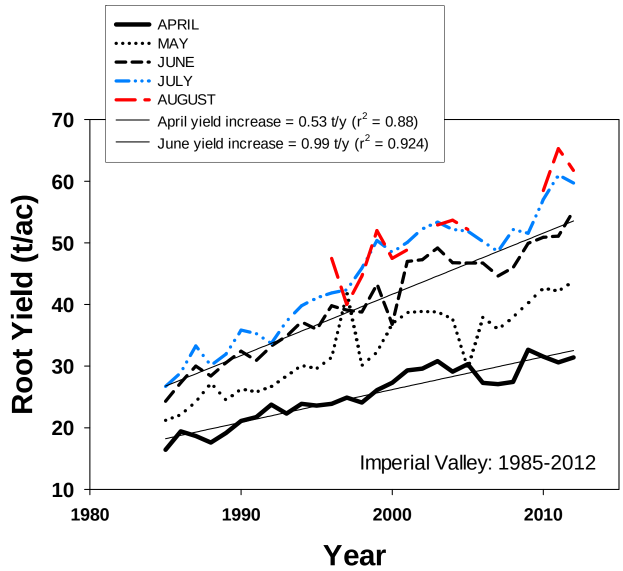
Changes in campaign length from 1985 to 2012 by year.

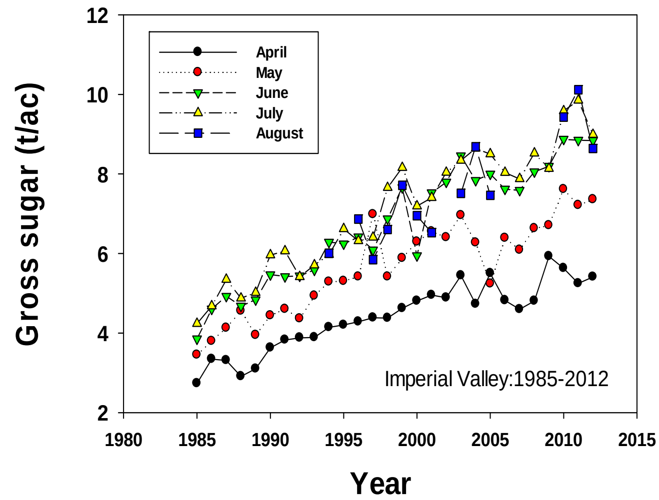
Correlation between campaign length and root yield

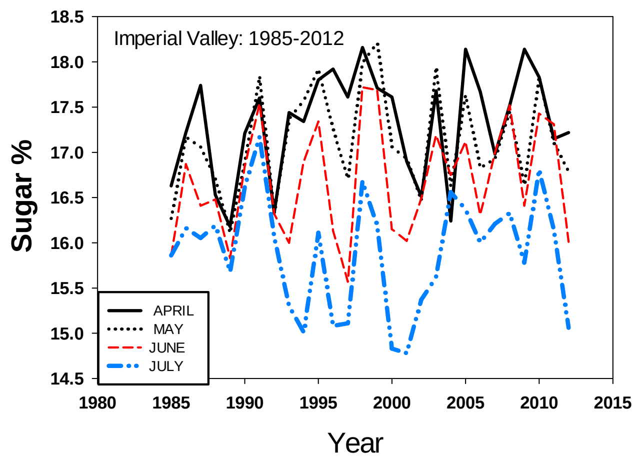
Changes in average root yields per year

(CBGA and Spreckel's Sugar data)

Harvest campaign length has tended to increase over the last 25 years, but is not solely responsible for increased yields over that period. Due to a variety of factors, sugarbeet growers have been able to increase tonnage during the spring period (April to June) at a greater rate than from establishment in fall to start of harvest in April. The performance of new hybrids has contributed to yield increases, including improved rhizomania resistance, reduction in losses to lettuce infectious yellows virus starting in the early 1990's, better and wider selection of herbicides for the control of weeds, the adoption of newer style harvesters allowing for harvest from moister soil, permitting irrigation closer to harvest, better management and timing of late season irrigations during the hottest weather, improved seed quality and stand establishment practices, and a partial shift to production on better quality soils in recent years due to the profitability of beets, have all contributed to larger yields.







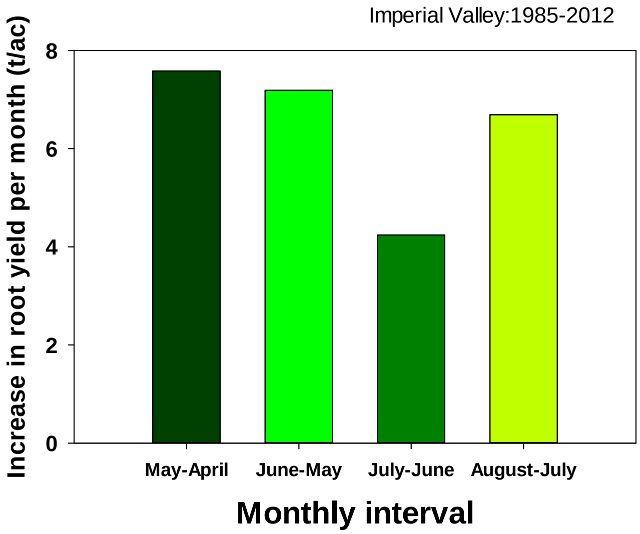
Root yield trends by month

Sugar percent trends by month

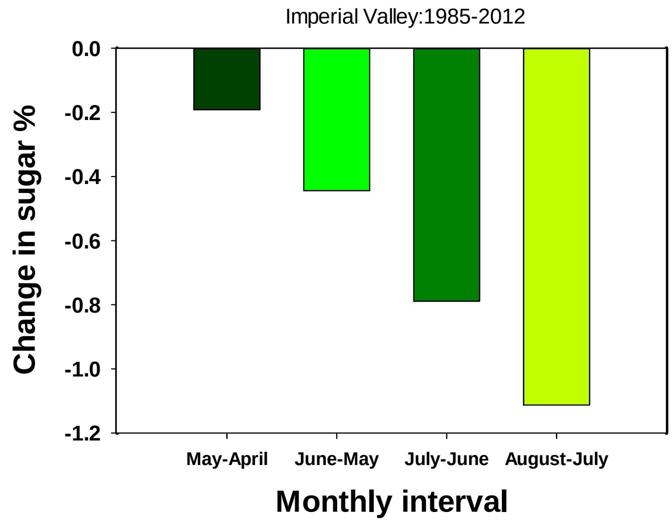
Gross sugar yield trends by month

(Spreckels Sugar data)

During the same period, sugar concentration in roots has remained relatively stable, so increased root yields have been primarily responsible for increased sugar yields.



Changes in root yields averaged by month from the start of harvest in early April



Changes in sugar concentration (%) per month from the start of harvest in April

The rate of increase in root yield and the fall off in sugar percentage both increase with time. This is due to increasing temperatures resulting in several disadvantages as the season progresses. Temperatures, especially night time temperatures, and correlated respiratory sugar losses increase as the season progresses, the costs of insect pest management and correlated losses increase, damage from nematodes and root rots becomes more common, especially in July and August. To operate the factory for a long enough season, late season inefficiencies and costs (especially water use) must be tolerated. Besides future genetic improvements (including the use of transgenic traits), the most likely technology that could help reduce losses late in the season and improve overall efficiency may be the adoption of drip irrigation technology.