State's Irrigation Districts

segment of California's agricultural economy increasing in importance as changes in the water payment complex evolve

Michael F. Brewer

About 2.5 million acres of California farm lands are irrigated—entirely or partially—with water made available by irrigation districts.

The irrigated area represents slightly more than half of the aggregate gross acreage of these districts. Although found in 32 of the 58 counties in the state, their region of greatest prevalence is the San Joaquin Valley. In the mid-1880's this area was the scene of the first organized agitation for a legal basis on which an irrigation economy could be built.

The Wright Act of 1887 and the Bridgeford Act of 1897 provided basic enabling legislation for the more than 150 districts that have been formed subsequently, of which over 110 currently are active. Of the 30 main types of public water districts in California today, the irrigation district is by far the most numerous.

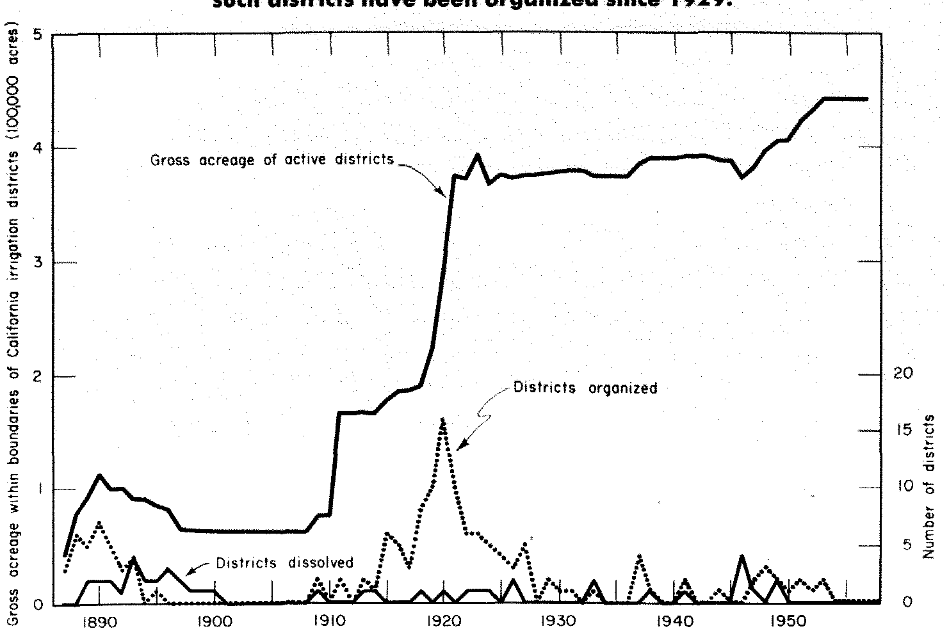
The public districts envisaged in the Wright and Bridgeford Acts were exclusively to provide irrigation water to members. However, during their 72 year history, the irrigation districts have expanded their activities. In 1919, the generation of electricity was added to their legal functions, and increasingly they have been supplying domestic water to members. Drainage, flood protection, and ground water management are additional activities.

Two types of district service or product are important to individual members. First, are those a member will receive—regardless of any desire by him to the contrary—once a district activity is initiated, or a certain structure is completed. Products such as flood protection or a stabilized ground water table, resulting from a water management program, are examples. In both instances, an initial district decision creates a flow of services. The quantity and incidence of the flow can not be altered readily by subsequent decisions of the individual.

The second type of service or product a member may receive includes those he may regulate in some way. A water supply, for irrigation or domestic use, and electricity are typically of this type.

The type of service provided by the district is reflected in the method of district boundary determination. Public water districts primarily providing their members with locationally fixed services often use a district boundary criterion of area of benefit. Irrigation districts providing services in addition to a water supply frequently use internal districts—primarily improvement and drainage districts—whose perimeters coincide with the area receiving the locationally fixed services. Such boundary demarcations influence the pricing practices of irrigation districts. An individual member, receiving both types of service, may be charged for the locationally fixed services through an improvement district organization, while his irrigation water supply is priced by the parent irrigation district.

Irrigation districts in California, organized under enabling legislation of 1887 and 1897, grew relatively slowly until 1915. During the 1915–1929 period irrigation districts became successful and accepted institutions, providing farming communities with dependable water supplies. Seventy-five districts, with a gross acreage of approximately two million acres, were organized during that period and 24 such districts have been organized since 1929.



Payment Complex

The pricing device of an irrigation district—termed the payment complex—comprises a district assessment and a water toll. The assessment, comparable to a property tax, is levied annually and applies to virtually all privately owned land within the district boundary—urban, rural, dry-farmed, and irrigated. The water toll, on the other hand, is incident upon water users. Most frequently the water toll is applied to a volume unit base, such as the acre-foot, miner's inch, or designated rate of flow for a stated period of time. Some districts base the

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CALIFORNIA AGRICULTURE

Progress Reports of Agricultural Research, published monthly by the University of California Division of Agricultural Sciences.

William F. Calkins............. *Manager* Agricultural Publications

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BEANS

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pods are present. Normally, young pods are present on the plant before treatment is necessary. It is advantageous, if at all possible, to delay treatment until the presence of young lygus nymphs indicates that the eggs are hatching because the eggs are not affected by insecticides.

In the absence of field sampling, DDT or toxaphene dust applied thoroughly, usually will be adequate to protect the beans against the corn earworm and the lygus bug. Such treatments should be applied to Sutter Pinks between 40–45 days after planting; to Standard Pinks, 45–50 days and to California Reds, 50–55 days. After treatment the fields should be checked for adequacy of control and possible reinfestation prior to harvest.

Mites and leaf miners may occur in numbers sufficient to warrant suppressive measures, but generally are not too serious on pinks.

Many problems still remain to be answered but a careful grower can cope with bean insect and mite problems, and increase bean yield and quality.

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PENETROMETER

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the individual points suggested that the correlation probably would have been greater if the soil moisture range had been greater.

Differences between compaction treatments were highly significant. Penetrating compacted plots took 2½ times as many blows as penetrating noncompacted plots to an equal depth. When correlation coefficients were calculated, a highly significant positive correlation was found.

Two passes with the truck produced a compaction almost as severe as that caused by seven passes, probably because soil moisture content was near optimum for compaction. From bulk-density data it is apparent that compaction was greater in the surface foot of soil than in the second foot.

To study further the possibility of using a soil penetrometer to indicate a compacted soil condition, measurements were made on Chular sandy loam near Soledad. Soil-density core samples were extracted from the 6″, 12″, and 24″ depths. Soil moisture determinations were also made on the samples. The penetrometer was then driven 1′ and 2′ in five different locations around the area where density samples were removed. The density data and the five penetrometer measurements were averaged independently. Correlation between soil density and number of strokes required was again significant. Correlation with soil moisture was not significant at the rather narrow range existing at the time measurements were made.

Measurements were made at a third location on Sorrento clay soil near Tracy. In this study the penetrometer was used to estimate differences in soil compaction on plots on which ryegrass had been used as a winter cover crop. Plots, replicated three times, had been seeded to ryegrass the previous fall, and plowed under in the spring of 1958. The plots were then planted to tomatoes. Penetrometer measurements were made late in October, after the tomato crop was harvested. Differences were not significant in the first foot, but were significant in the second foot.

Results of these studies indicate that, under a given set of soil conditions, the penetrometer can be used to measure traffic-induced compaction. Furthermore, the pentrometer is relatively easy to use, no costly equipment is required, the data are immediately available, and samples need not be taken into the laboratory for analysis.

Variation in individual readings is considerable but the penetrometer will measure variations in degree of compaction. A large number of readings must be made for statistically valid data, but they are relatively easy to obtain.

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The above progress report is based on Research Project No. 1673-G.

IRRIGATION

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water toll component on area, usually the area irrigated by district water. Area tolls may be the same for all crops or may differ among them.

In planning agricultural production a district member faces the unavoidable fixed annual assessment. However, the water toll charge is variable, depending upon the quantity used.

An important characteristic of the payment complex is that neither of the components are determined by usual market forces. Both are administratively established by the board of directors of each irrigation district. This permits the payment complex to be used as a tool in connection with many district activities: to allocate the district's supply of water among uses and users, to finance district operations, and to implement programs of water management.

The payment complex has undergone considerable variation, both over time and among different districts. Changes in the district assessment may be seen by considering its three determinants: the area assessed within a district, its valuation for assessment purposes, and the rate of levy that is applied.

Between 70% and 80% of the gross district acreage in California has been subject to assessment since official state records were published in 1929. The percentage of assessed acreage fell off through the depression years but since 1942 there has been a gradual annual increase. Prior to 1940 land held under tax default deed by California irrigation districts materially reduced the area susceptible to assessment. Such tax held land amounted to 10% of the gross district acreage for the years 1935–1937.

The second determinant of the assessment component has shown an increase —in terms of both total assessed valuation and average per acre assessed valuation—during 1930–1956 period. The per acre average valuation for all irrigation districts in 1938 represented the low—less than $60.00 per acre—as opposed to a high in 1956 of $95.00. Different methods are used in valuing lands for district assessment, which results in considerable variation between districts. For example, in 1955, districts in the Sacramento Valley had an average per acre assessed valuation of $179.00, while the average was $100.00 for districts in the San Joaquin Valley, and districts in the South Coastal Plain averaged $643.00 per acre.

The rate of assessment levy—expressed in terms of dollars assessed per $100.00 of valuation—shows less variation. The average rate of levy throughout the state has decreased from $5.00 in 1930 to a low of $2.50 in 1940, and subsequently increased to slightly over $3.00 in 1955. Its difference between geographical regions also has been small. In 1955 Sacramento Valley districts averaged $2.91, those in the San Joaquin Valley, $3.58, and the Southern Coastal Plain, $3.91 per $100.00 valuation.

The water toll element of the payment complex also has undergone change. Because of the various bases used for the toll element, no direct statewide comparison is possible. However, receipts from district water sales give some indication. In 1930, water sales receipts from all districts comprised less than 25% of total district receipts but in 1955 this had increased to over 60%.

There is considerable difference in the relative importance of the water toll component of the payment complex between types of district. Districts engaging in the generation and sale of electricity, for example, have averaged only about 10% of their total annual receipts from water sales since 1930. Similarly, large districts—over 75,000 gross acres—also have had a lower than state average percentage of total annual returns from water sales receipts. Small districts, and those providing domestic water service, on the other hand, derived approximately 70% of their total annual income in 1955 from water sales.

The wide ramifications of the payment complex make it reflective of many interests internal to the district. The district administration is directly concerned with the pricing impact upon district solvency; the irrigator makes annual water use decisions on the basis of the district toll, a variable cost of water; and the membership at large is concerned with the water management programs of a particular district.

Broad social interests also attach to the pricing practices of districts with respect to the degree they facilitate or obstruct the most productive agricultural practices in California.

Changes in the composition and alignment of internal interests as well as in the economic context of California agriculture in the past have induced changes in district pricing behavior. Differences in this behavior between large and small districts, between those producing electric power and others, and the secular change in assessed valuation through and subsequent to the depression are examples. The payment complex has been a major instrument for district adaptation to such changes, and hence to their permanence and increasing importance.

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LIMAS

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cost rates per 1,000 pounds hauled tend to level off as distance from the plant increases. However, some additional costs associated with increases in the length of haul were not specifically evaluated. These include increased costs related to the more elaborate in-field cleaning and icing operations that must be performed as length of haul increases in order to avoid losses in grade yield and recovery.

Panel *C* shows the effect of the level of manual grade-out percentages on average total costs of processing frozen lima beans. Costs of manual sorting are governed by the quantities of defective and overmature beans that must be manually removed to make a particular grade specification and are largely controlled by the effectiveness of mechanical grading. However, losses in grade yield brought about by improper balancing of mechanical and manual quality grading operations could be substantial.

The proportion of total season volume packed in various size containers has an important effect on average total costs of processing lima beans by freezing. The average cost curves shown in Panel *D* illustrate this effect for plants packing various percentages of their total season volume in retail, institutional, and bulk styles. Unit costs per 1,000 pounds packed—for a given capacity rate of output—increase substantially as the proportion of total season volume packed in retail cartons increases, chiefly because of higher costs of retail packaging materials. The heavy lines in Panel *D* define upper and lower cost ranges as proportions of season volume packed vary from 100% bulk style to 100% retail style.

The cost relationships have been based on selected values of the variables affecting costs of frozen lima bean processing. Actual costs in individual plants will be different if other values of the variables are applicable, but the nature of the effects will in general be as represented in the panels.

Although many lima bean freezing plants in California have achieved a relatively high degree of efficiency, the selection of more efficient techniques and movement toward increased hours of operation per season and larger plants could lead to further cost reductions. While many of the savings could be achieved in the short run, some of the cost reduction possibilities involve changes in plant and facilities and design which may be economical only as existing facilities are worn out and replaced manence and increasing importance.

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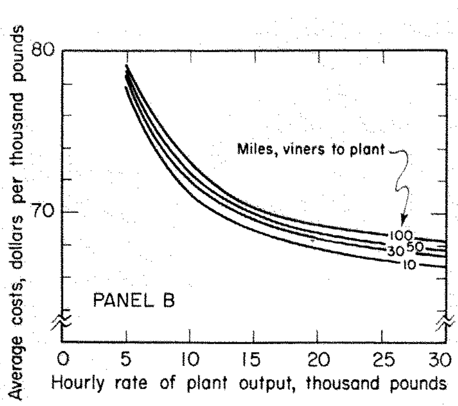
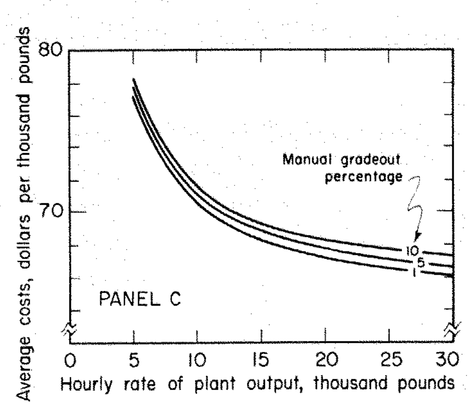
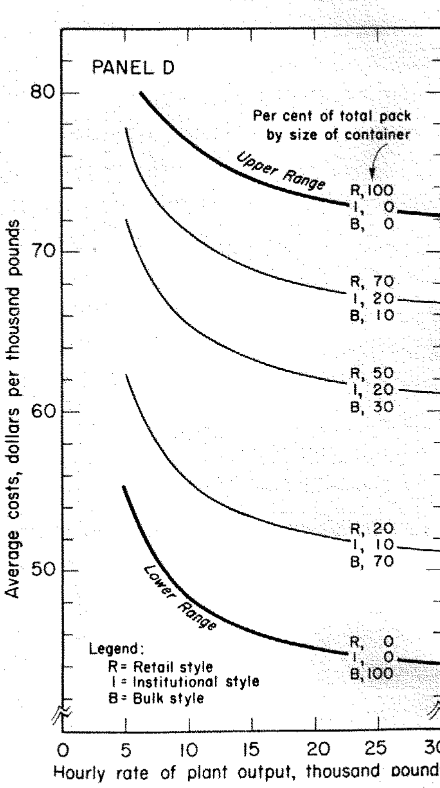
This brief article is based on a detailed report, "Economic Efficiency in Assembly and Processing Lima Beans for Freezing," which is available without cost from the Giannini Foundation of Agricultural Economics, 207 Giannini Hall, University of California, Berkeley 4.



The effect of distance of haul—viners to plant—on average total costs in relation to selected lengths of haul and capacity output rates in lima bean freezing plants operating 500 hours per season. Costs based on an average manual grade-out of 5%; 70% of the total season volume is packed in retail cartons, 20% in institutional cartons, and 10% in bulk bags or cases.



The effect on average total costs for 1%, 5%, and 10% levels of manual grade-out in lima bean freezing plants operating 500 hours per season. Costs based on an average distance of haul—viners to plant—of 10 miles; 70% of the total season volume is packed in retail cartons, 20% in institutional cartons, and 10% in bulk bags or cases.



Average total costs of processing lima beans for freezing in plants packing different percentages of their total season volume in retail, institutional and bulk styles for a 500-hour operating season. Costs based on an average distance of haul—viners to plant—of 10 miles; and an average manual grade-out of 5%.