MECHANIZATION AND MEXICAN LABOR IN CALIFORNIA AGRICULTURE

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by
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Monographs in U.S.-Mexican Studies, 6

1981

Program in United States-Mexican Studies
University of California, San Diego Q-060
La Jolla, California 92093

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MECHANIZATION AND MEXICAN LABOR IN CALIFORNIA AGRICULTURE

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MONOGRAPHS IN U.S.-MEXICAN STUDIES, 6

Program in United States-Mexican Studies
University of California, San Diego

1981

Publication of this paper is made possible, in part, by a generous grant from the Rosenberg Foundation of San Francisco, California. The paper was presented at the Binational Consultation on U.S.-Mexican Agricultrual Relations held February 25-27, 1981 in San Diego, California and sponsored by the Program in U.S.-Mexican Studies at the University of California, San Diego.

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MECHANIZATION AND MEXICAN LABOR IN CALIFORNIA AGRICULTURE*

PART I:

INTRODUCTION

The social tension associated with rapid mechanization of vegetable and fruit production have recently been dramatized by two unprecedented events. A political association of small farm owners and farmworkers, the California Agrarian Action Project, filed a law suit against the University of California charging it with conducting research that principally benefits large growers and agribusiness corporations and displaces both small producers and farmworkers (Knickerbocker, 1979). Specifically, this action group denounced the existence of close economic ties between the university and agribusiness corporations as well as the university research funding policy whereby small agribusiness grants can divert large sums of public research money toward the interests of the large corporations. More recently, the United States Secretary of Agriculture abruptly cancelled all federal research funds supporting work on the development of labor saving technological innovations in California. This decision created the threat that state funds, which represent the bulk of research funding, could also be curtailed for the same reason.

These developments only illustrate the fact that mechanization in California agriculture has become an active political issue. For many years, California agriculture has relied upon abundant supplies of cheap

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*This monograph is part of a larger study directed through the PROTAAL Project of the Instituto Interamericano de Ciencias Agrícolas -- OEA and Ford Foundation. The larger study was co-authored by Alain de Janvry (Department of Agricultural and Resource Economics, University of California, Berkeley).

foreign labor, coming mainly from Mexico. As the rural labor market was maintained segmented from the rest of the economy, this allowed the mechanization of these specialty crops to be postponed. In 1964, when the use of Mexican agricultural labor became constrained by the end of the Bracero Program, a strong inducement was given to introduce mechanical harvesting techniques. Technological change thus became the focus of attention of growers, processors, and financial interests in defending the profitability of agriculture, as well as lobbying for favorable labor and economic policies.

The crisis which surrounded the end of the Bracero Program provides a particularly good opportunity to study the political economy of technological change in agriculture. In moving beyond the conventional theories, which remain at the superficial level of market phenomena, we discover active and concerted strategies of agricultural capital designed to resolve conflicts with labor both at the level of the labor market and of the labor process.

Of course such actions are conditioned by a number of factors, in particular: the physical nature of the crop and its susceptibility to mechanization or schemes of labor rationalization; the degree of organization of the industry, the concentration or cohesion; the availability of alternative supplies of labor; the extent of technological research supported by actors both within and without the industry; the political constraints under which decisions are made. This paper represents an attempt to begin to identify the various processes of technological change/labor rationalization in California agriculture, and to understand them in both an historical and conjunctural sense.

In the following sections, we first provide the historical background of social relations and productive forces in California agriculture, emphasizing the constant dialectic between the labor process, labor markets, mechanization, and the role of the State. We then present a number of case studies which examine the relation of technology to various labor strategies which arose during the crisis surrounding the end of the Bracero Program. We conclude with several propositions, derived from the empirical observations, which may serve to enrich the theory of the political economy of technological change.

PART II:

THE POLITICAL ECONOMIC CONTEXT: CALIFORNIA AGRICULTURE'S UNIQUE DEVELOPMENT AND THE CHOICE OF TECHNOLOGY

This section of the study presents an historical analysis of the evolution of California's unique agricultural system. Our purpose is to uncover the social processes, the political relationships, and the interaction of these with the changing economic structure to provide some insight into the dynamic forces that have shaped the agricultural system and the choice of technology. This historical perspective helps to provide an understanding of the role of social class as it operates directly in the private sector and indirectly through the public sector on the material base of the agricultural system. What becomes abundantly clear is that control over the supply of labor and the labor process is the crucial determinant of the forces shaping agricultural development in California. The supply of labor is not exogenously determined by random market forces, but rather is carefully manipulated by a combination of private and public actions. Only when agricultural interests were no longer able to exercise the degree of control over labor that was needed to maintain profitable production did it turn to the alternative of mechanization. Thus, the choice of technology is seen to be the result of a complex interaction of social, political, as well as economic factors.

The Unique Structure of California's Agriculture

California agriculture is unique in three ways. First, its land tenure is dominated by large holdings, and therefore production units are

generally larger than the farms elsewhere in the nation. Second, output per acre, measured in the dollar value of the crops, is greater than elsewhere. This owes to the productivity of land, in combination with the favorable climate for high value fruit and vegetable crops and availability of water for irrigation. Thus, California farms are not only larger, on average, in terms of acreage, but also in terms of the value of output. Third, California farms rely upon hired labor, rather than upon family labor for most of the work in the fields. Family labor has been used chiefly in management. Taken together, these three characteristics describe an agricultural system than can be termed "industrial" in that the farms resemble factories. Under this type of organization, ownership, management, and labor are clearly separated and well-defined activities, each performed by a different group. Perhaps nowhere else in the capitalist world does such a system of agriculture exist. The question is, why does California have such a unique system? That is the subject of the rest of this section.

These characteristics that make California unique are not of recent origin. Although our statistics on farms and farm size are rather sketchy when we look back more than 30 years, as the following two tables indicate, the basic patterns described above were observable in the earliest of our data. For example, Table II.1 shows that as early as 1900, California land was concentrated in very large holdings. Over 50 percent of the cropland was located on holdings of 1000 acres or more in 1900. In sharp contrast, Iowa, a family farm state in the midwest, had only one percent of its cropland in similarly sized holdings.

Likewise, the concentration of production in the largest farms was

TABLE II.1: COMPARATIVE AGRARIAN STRUCTURE CHARACTERISTICS: IOWA, CLAIFORNIA, UNITED STATES: 1900-1974

Structural Characteristics	1900	1920	1929	1939	1949	1959	1969	1974
Percent of farms over 1000 acres[a]								
Iowa	0.0	0.0	0.1	0.1	0.1	0.2	0.8	1.5
California	6.5	4.0	3.5	3.9	4.6	5.5	8.3	6.8
United States	0.8	0.7	1.0	1.5	2.0	3.6	8.0	7.0
Percent of farmland on 1000+ acre farms[a]								
Iowa	1.0	0.1	0.1	0.4	0.9	1.0	4.0	7.4
California	50.8	30.0	29.0	35.0	40.4	45.8	51.9	55.4
United States	5.0	5.5	6.7	9.9	15.7	19.9	30.5	33.7
Percent of farms in largest sales class[b]								
Iowa	7.1	n.a.	3.0	2.0	3.6	5.5	19.3	43.0
California	16.2	n.a.	10.0	6.8	14.0	21.0	27.3	38.5
United States	2.7	n.a.	1.7	1.0	2.8	4.2	12.8	20.7
Percent of total sales in largest class[b]								
Iowa	n.a.	n.a.	n.a.	16.0	19.0	24.0	54.0	77.8
California	n.a.	n.a.	n.a.	52.0	68.0	78.0	87.0	94.5
United States	n.a.	n.a.	n.a.	17.0	22.0	33.0	57.0	78.0
Value of land and buildings on larges class of farms ($1,000)[b]								
Iowa	2.8	35.6	19.7	12.6	69.0	114.2	187.4	321.0
California	9.8	26.1	25.2	16.3	170.9	395.8	675.1	789.5
United States	2.9	10.3	7.6	5.5	110.0	220.7	298.2	410.0

TABLE II.1, CONTINUED

Value of machinery and equipment on largest class of farms ($100)[b]								
Iowa	2.5	11.5	12.6	11.4	n.a.	n.a.	13.3	40.7
California	2.9	11.6	9.9	10.0	n.a.	n.a.	16.7	68.4
United States	1.2	5.6	5.3	5.0	n.a.	n.a.	13.1	27.4
Payment to hired labor (dollars/acre)								
Iowa	n.a.	2.60	1.79	n.a.	3.04	n.a.	n.a.	5.39
California	n.a.	19.12	20.00	n.a.	47.93	n.a.	n.a.	150.00
United States	n.a.	3.16	2.66	n.a.	8.72	n.a.	n.a.	16.45

[a]data refer to harvested cropland only, except for 1920, which is based on "improved" land.

[b]largest class is: 1920, $2,500 in sales; 1929 and 1939, $10,000; 1949, $25,000; all others, $40,000.

Source: U.S. Bureau of the Census, Census of Agriculture, (various volumes, 1900 to 1974).

much more pronounced in California than in the rest of the nation. In 1939, for example, 52 percent of the total farm sales were produced on the 7 percent of California farms that ranked in the highest economic size class. In Iowa, only 16 percent of sales were located on similarly sized farms, and these farms amounted to only 2 percent of all farms.

The importance of hired labor is also evident in the earliest of our data. In 1920, California farmers paid roughly ten times as much, per acre, for hired labor as did Iowa farmers. Table II.2 shows this relationship from a slightly different perspective. In this table we have divided total cropland by the number of workers, both hired and family. As can be seen, California uses much more labor, relative to land, than is typical of the rest of the nation. It can also bee seen that while the land/labor ratio is increasing in California at about the same rate as elsewhere, today California agriculture is still much more labor-intensive.

However, the overall trends mask important differences in the components of labor force. For instance, in California, over the past 40 years, we find a much more rapid displacement of family workers than in Iowa or the rest of the nation. Thus, while California employed more family workers per acre than Iowa in 1935, today it employs far fewer family workers per acre.

This tendency toward fewer workers is reversed when we look at the hired sector of the labor force, for here we find a dramatic reversal in California. Over the past thirty years, Iowa has generally maintained a land/hired labor ratio roughly ten times as great as that of California. But what is even more remarkable, in the face of all of the mechanical,

TABLE II.2: CROPLAND PER FARM WORKER BY ACRES: IOWA, CALIFORNIA, AND UNITED STATES, 1935-1978

Farm workers by category	acres per farm worker (percent change) 1935	1950	1960	1970	1978
All workers					
Iowa	61;(10)	67;(7)	72;(35)	97;(-2)	95
California	23;(9)	23;(4)	26;(28)	32;(16)	37
United States	29;(38)	50;(25)	56;(48)	74;(24)	92
Family workers					
Iowa	79;(9)	76;(9)	83;(34)	111;(4)	115
California	39;(31)	51;(31)	67;(81)	121;(26)	152
United States	33	49	69	100	135
Hired workers					
Iowa	465;(20)	560;(-1)	555;(36)	752;(-36)	520
California	54;(-10)	49;(-14)	42;(5)	44;(14)	50
United States	225;(-4)	215;(-13)	186;(54)	286;(0)	287

Source: U.S. Department of Agriculture, Agricultural Statistics, 1936, 1952, 1965, 1972, and 1979.

labor-saving technology that has come into use over the period, the land/hired labor ratio has actually been lowered in California. What this implies is that agriculture has become more hired-labor intensive in California over time, because of the increasing cultivation of crops requiring seasonal workers and also because of the substitution of hired for family workers. This latter tendency indicates a basic shift in the underlying structure of ownership and organization of California agriculture, as it moves towards increasing industrialization. Similar tendencies may be present elsewhere in the U.S. but they are not nearly as strong, especially in the family farm state of Iowa, where technology appears to have more or less equal impacts on both hired and family labor.

These unique characteristics of California agriculture require explanation, for if we are to understand the forces underlying the present mechanization of its production, we must first understand how it came to depend upon large-scale production and hired workers. The usual arguments of agricultural economists that farms have grown larger to meet the requirements of large-scale technology appears to be reversed in California where farms were large long before modern mechanical technology appeared. To find the answer to why this unique pattern developed, we first look at the land tenure patterns that emerged as California became a state.

Early Land Tenure

The patterns of land tenure of the present derive directly from the earliest patterns of landownership, dating from the time California was partitioned from Mexico and became part of the United States. The United States honored claims on California land made during Mexican rule.

Almost 14 million acres were originally contained in 813 different land grant claims; of this acreage, about 8.9 million acres (14 percent of the State's total land area) eventually were confirmed in land grants, many of which consisted of several thousand acres. Moreover, these "Spanish" land grants embraced the sites of all the major cities of today and most of the desirable arable land in the coastal and inland valleys. Naturally, this land became the object of considerable interest by land speculators, and so even when they were initially owned by Mexican nationals, within a very few years, American entrepreneurs had purchased most of the promising grants; and thus the first of the major land empires were established (Gates, 1975, pp. 159-160).

In addition to the Spanish Land Grants, there were other means by which individuals could obtain large holdings at low cost. California, on becoming a state, was entitled to receive a portion of the public domain in grants so as to finance its schools and other internal improvements. All told, the State received about 8.8 million acres from the Federal Government for these purposes (Gates, 1975, pp. 161-172). Limits were imposed on how this land could be distributed; no individual was supposed to buy more than a certain maximum acreage, generally this limit was 320 acres for most of the land, and 640 acres for some of the swamp land. However, these limits were not enforced, and with legislators frequently being the beneficiaries, very large acreages were assembled through fraud and corrupt practices. When such practices were challenged in the courts, they were condoned by judges who were strongly influenced by the legislature (see McWilliams, 1971; pp. 11-21).

The Federal Government also conferred large land grants directly

to individuals. For example, the railroads were given almost 20 million acres of California land in grants, on the agreement that they would sell the land to settlers at $2.50 per acre and use this money to finance to expansion of the transportation system. Although much of this land was eventually sold (at much higher prices) the railroads retained large tracts of land. A 1919 survey showed that Southern Pacific Railroad owned 2.5 million acres in Southern California alone and was the largest landowner in the state (McWilliams, 1971, p. 23).

The railroads were also successful in obtaining land given to the State that was supposed to go to settlers. By 1860, for instance, over 1.4 million acres of California's land grants were owned by railroads. In addition to the railroad land grants, the Federal Government also sold over 11 million acres of land to the public under the Homestead Act, which was intended to promote small-scale agriculture of 160-acre farms; however, very little of this 11 million acres found its way into such small holdings.

The results of these public as well as private land sales was a rapid monopolization of land. An 1871 survey showed that the 516 largest landowners owned 8.6 million acres (an average of 16,600 acres per holding) of the most fertile land in California (McWilliams, 1971, pp. 20-22).

Some of the individual holdings were truly amazing. Miller and Lux jointly amassed almost 700,000 acres in California, and through their control over water rights, they virtually owned still larger tracts. This firm employed 700 hired hands and their livestock herds were estimated at 50,000 to 100,000 cattle, 80,000 sheep, 8,000 horses, and 5,000 hogs in the 1880s. The annual income of the firm was in excess of $1.5 million

(Gates, 1975, pp. 172-173). Miller boasted that he could travel the length of California and never spend a night off his property. This example is but one of many; most of the State's prominent and politically powerful families initially achieved power and wealth from the process of accumulating large landholdings. Many of these holdings remain intact to this day, though the ownership may have since passed on to different corporations or individuals.

Evolution of Large-Scale Farming

Such land speculation and concentration of landownership through the manipulation of public land distribution policies was not unique to California, although it was certainly much more extreme than elsewhere. Thus while the predominant pattern of land distribution in the midwest was in family-sized parcels of 40, 80, and 160 acres, there were instances of large scale landholdings in many other states. What was unique about California was that the land speculators did not subdivide their holdings and sell them to settlers at high profit, as did their Midwestern counterparts (see Gates, 1975, p. 177). Instead, the large tracts of land were retained and farmed in very large units, right from the very beginning. This pattern contrasted sharply with that of the rest of the nation, where experiments with large farms, using hired rather than family labor, quickly gave way to family farming. In California, the large farms were dependent on hired workers to a much greater extent than on family labor; this dependence on hired workers marked the single most important difference between California and the rest of the nation, excepting the South which retained its heritage of slavery and plantations in the form of a system of share-cropping.

The question is, why was the land retained in these large tracts and not distributed to family farmers, as in the Midwest? Certainly there was a demand for the land by settlers who migrated to California from the East. However when they arrived in the State, they had great difficulty in finding affordable land to buy and settle. Indeed, struggles over the land by squatters and others who thought they owned the land were very common.

In one well publicized incident, Southern Pacific Railroad, after inviting settlers to begin farming and improving the land, evicted several thousand squatters who had expected to purchase the land. These evictions were challenged and upheld in the courts, and the efforts to evict the settlers led to a voilent confrontation known as the Mussel Slough Affair (see Norris, 1901). So the lack of small-scale settlement was not related to insufficient demand.

The answer to this important question of why the land was farmed in large units is that land in California could be more profitably farmed in large tracts (even before the advent of the labor-intensive, specialty fruit and vegetable crops) than it could in smaller, family-sized units. The reason a profit differential arose was hired labor could be employed at very low wages, and for only the periods of the year when needed. In general, these hired workers accepted lower wages and poorer working conditions than even family settlers were willing to accept (after all, the family could not unemploy itself after the season). As a result, owners of the large tracts were able to earn greater profits from farming the land or from selling it to others who would so farm it rather than from selling the land to settlers. That is, the land's value came to

reflect the relatively higher income potential created by cheap labor, and hence family-oriented settlers, intending to duplicate the Midwestern pattern of farming, were unable to afford the land (see Fuller, 1940). So if family settlers wanted to gain a foothold in California, they had little choice but to purchase as much land as possible and use hired workers for the non-management labor tasks of the operation. Those that did not adopt this pattern earned very low incomes and faced considerable incentives to sell their land.

The next obvious question is, why did the pattern of hired, cheap labor develop in California and not elsewhere in the nation? The answer to this is that at the critical point in California's development, large numbers of immigrant workers were coincidentally available for hire at very low wages and were willing to accept long periods of unemployment. Once this pattern was established, and landowners had a substantial stake in the continuation of the system, they were able to use their wealth to influence both the California and Federal governments to sustain this supply of workers. Because this is an important part of the analysis of the evolution of California's unique agrarian structure, we will discuss these state policies in more detail in the following pages.

A Brief History of Hired Labor in California

The first large farms utilized the native Indian groups which inhabited California at the time of its entry into the United States. Later, in the immediate aftermath of the gold rush period of the 1850s, hobos and others who had come to California from the East in unsuccessful efforts to find gold were forced into the fields in order to earn their food, at least until they could find better jobs in the growing urban

areas or could save enough to return to their homes.

Without doubt, though, it was the influx of Chinese workers in the late 1860s that established the pattern of large-scale agriculture on a permanent basis. (See Appendix to Part II for a discussion of the empirical support for this account.) The Chinese were imported to the State to do the very dangerous and difficult work of building the first transcontinental railroad through the Sierra mountain range; they were also used in the mining of gold and silver. With the completion of the railroad and the exhaustion of the mines, the Chinese found themselves without jobs and had to look elsewhere. Anti-Chinese sentiment was a growing force in the cities, as the Chinese were looked upon by white workers as a source of competition for work. Therefore, they were forced into the fields. Their ability to survive on a very low standard of living and their capacity for hard work made the Chinese extremely desirable workers for the owners of the large farms.

The availability of large numbers of Chinese workers also allowed California to begin shifting its crop production away from the less labor-intensive grain crops to the much more profitable and labor-intensive fruit crops. The extension of the railroads, linking the State with the Eastern markets, together with the development of new means of preserving fruit further encouraged the change toward specialty crops.

The pattern that resulted from this coincidental convergence of large landholding and availability of cheap labor was one that has remained to the present day. Crops such as wheat were quickly mechanized, and required little labor, although they still comprised most of the cropland. Indeed, California generally led the rest of the nation in

adopting modern labor-saving devices in the grain crops. At this early time, "mechanized" agriculture implied the use of multishare plows, horse-drawn reapers rather than hand reapers, and machine threshing of the grain, (rather than having horses trod on the grain). Later, California farmers pioneered the use of combines and tractors (Wik, 1975). The seasonal workers were reserved for the higher valued specialty crops, whose sharply peaked labor requirements could only be fulfilled by highly mobile Chinese workers who moved from farm to farm, as the harvest required.

This convenient arrangement between landowners and casual workers was threatened with the passage of the Chinese Exclusion Act of 1882 (Jones, 1970, p. 26). An alliance of urban labor groups and small farmers was successful in forcing legislation to prevent further immigration by people from China; the hostility toward the Chinese further encouraged many to leave the United States and return to China. Thus, the pool of workers from which California farmers could draw began to shrink after the mid-1880s. Deep economic depression of the 1890s helped them to adapt to this situation, for during this period, white workers unable to find employment in the cities were forced into the fields. Child labor was also used during this period. Moreover, the decade of the 1890s was characterized by economic depression in California's orchard crops, which had over-expanded and were faced with large losses; thus the demand for labor was somewhat lessened at a time of shrinking supply.

The prosperity of the large farms was renewed and strengthened late in the 1890s by the introduction of sugar beets, a very labor-intensive and profitable crop, and by the arrival of thousands of Japanese

workers who were recruited by California agricultural interests to take the place of the Chinese.

Like their predecessors, the Japanese proved to be hard-working and willing to accept very low wages and seasonal employment (see Appendix to Part II). Therefore the Japanese were immediately accepted and put to work. The addition of sugar beets had another important impact on the structure of California agriculture: the crop brought about an integration of the farm and the industrialized processing economies. Sugar refineries were located in rural areas, near the fields. These large factories required extensive highway networks, which provided incentives for other agriculturally oriented industries to develop. Sugar beet production encouraged the development of new labor-intensive crops that could utilize the labor when it was not required to produce sugar beets; for example, strawberry harvest occurs at a different season, so production of strawberries increased rapidly after the beginning of the 20th century (McWilliams, 1971, p. 91). Thus, by the turn of the century, "the farm tended to become a factory and farming became an industry.... some sixty or more crop industries had been established." (McWilliams, 1971, p. 91.)

The Japanese proved much less easily controlled than the Chinese. They brought with them their own organization, and effectively used this to win wage concessions (Ligth, 1972, p. 169). But what changed large landowner attitudes even more was the ability of the Japanese to set themselves up as farmers. They brought with them the knowledge of farming under very marginal conditions, and used this knowledge to buy or lease undesirable and cheap agricultural land, which was then improved and

profitably cultivated. In this way, the Japanese not only ceased to be accessible as hired workers, but also became competitors with fruit and vegetable producers. By 1918, for example, Japanese farmers cultivated more than 25,000 acres of rice, a crop they introduced to California (Poli, 1944, p. 9).

In response to the growing hostility of the general public to the Japanese, the U.S. negotiated a "gentleman's agreement" with the Japanese government to restrict further emigration to the U.S. (see Appendix to Part II). This did not stop Japanese immigration, however, for it was possible to go to Hawaii, Canada, or Mexico and then gain entry to the U.S. Not until the passage of the Immigration Act of 1924, which prohibited entry of any person of Japanese origin, did this immigration come to a stop.

Immigration may have been slowed down by another set of disincentives that arose with the passage of the Alien Land Acts of 1913 and 1919. This California legislation was intended to inhibit Japanese access to land and to prevent their escape from the agricultural labor pool. These acts may have been marginally successful, but the Japanese found ways to purchase land through their American born children, and continued to lease and rent land that only they, with their knowledge of intensive agriculture, wanted. In any event, after the first decade of the 20th century, the supply of Japanese workers to California farmers was gradually diminished, leaving the farmers in a position of needing a new source of cheap labor.

It was the rapid expansion of the California agricultural economy during World War I together with the diminishing number of Chinese and

Japanese workers that encouraged the last important groups of immigrant workers to the fields of California. Young, single, and male Filipino workers were imported in relatively large numbers and were used in asparagus and other stoop labor production. But by far the most significant new source of labor was from Mexico. The use of this source of labor increased rapidly during the very prosperous war years, and expanded even more during the decade of the 1920s, in response to the further intensification of agriculture, as cotton (a very labor intensive crop) was introduced and widely cultivated.

Until World War I, California farmers had been very reluctant to employ Mexicans, because they believed the Mexicans to be lazy and unreliable, especially in comparison to the Chinese and Japanese workers. However, farmers were willing to change their attitudes when they were faced with having to find their labor supplies in the traditional domestic labor markets, and so Mexican labor quickly became the dominant portion of the unskilled field labor during the 1920s and into the Depression years of the 1930s (see Appendix to Part II).

With the Depression, came the last important episode of the evolution of the unregulated agricultural labor market. A combination of drought, the introduction of the tractor, and New Deal agricultural policies served to destroy a substantial part of the South's sharecropper system of agriculture, and displaced thousands of farmers, many of whom were white. With the urban labor markets incapable of absorbing this labor, California became the direct beneficiary as thousands migrated to tis fields to pick cotton and fruit for wages of 15 cents per hour (wages of 35 cents per hour had been common in the late 1920s).

The influx of poor whites had the same impact as the influx of other immigrant groups, with some important differences. The whites brought their families and anticipations of becoming part of the mainstream economy. They were discriminated against by Californians, who regarded them as inferior; even though the immigrants were white they were treated as other racial minorities. However, the plight of these white farmworkers was given national attention by New Deal liberals, and special public policies were established; a variety of farm labor regulations and housing policies were implemented to reduce the worst effects of the agricultural labor system, over the active opposition of the agricultural interests.

The Second World War improved the employment opportunities for whites and all other groups, leaving a labor shortage in the fields. At this point, California began a new era in its agricultural development which lasted from the war years to the mid 1960s. What characterized this new period was the development of a cheap labor market explicitly regulated by government policy. In order to alleviate the supposed labor shortage of the war years, the United States government entered into a formal agreement with Mexico to supply sifficient unskilled workers to meet the "needs" of the specialty-crop farmers in California, Arizona, Texas, and elsewhere (Jones, 1970, p. 37). California employed most of these emergency workers; for example, 90 percent of the Mexicans brought to the United States in 1945 were employed in California.

The emergency program was ended in 1947, to be replaced by a series of annual agreements until the Korean War again provided an "emergency" situation that permitted California farmers to urge the

enactment of a more permanent relationship. These demands were met with the enactment of Public Law 78, popularly known as the Bracero Program, in 1951. Regulation of the field labor markets had some drawbacks from the farmers' point of view, for Mexico insisted on some safeguards for contract workers, including minimum standards for housing, pay, and perhaps most important, the guarantee of work. Under the Bracero Program, workers were recruited for specific crops and specific jobs; they could not be included in a general pool of labor intended for the use of any employer.

Nevertheless, in spite of these restrictions, California growers became dependent on this program and strongly supported it. Contract workers provided approximately 30 percent of all seasonal labor in California during the 1950s and 1960s; in some crops such as tomatoes, the entire seasonal labor force consisted of Bracero workers.

For reasons that we shall explore below, the Bracero Program became a political liability for the Federal Government, and over the strenuous efforts of California agricultural interests, the program was eliminated in 1964. The elimination of this program ended the era of the regulated labor market in California's agriculture, and presented farmers with an important crisis. If cheap labor could not be imported from Mexico, where would the seasonal labor force be found? If farmers had to compete with the urban labor markets, wages and working conditions would have to improve, thus threatening farmer and landowner incomes. Moreover, if the surplus supply of workers were to dry up, union organization, kept in check by the combination of the surplus and the vigorous efforts of the agricultural interests (and their allies in local govern-

ment), would become increasingly feasible.

In short, with the termination of the Bracero Program in 1964, the prospects for California agriculture seemed bleak. However, several new strategies were developed that allowed the continued profitable expansion of specialty-crop agriculture in the face of rising farmworker wages and improved working conditions; we will examine these strategies in more detail after first summarizing the important implications of this brief history of California's agricultural labor history.

The Importance of Immigrant Labor to California Agriculture

The logic of the relationship between labor and California's agrarian structure has been developed in detail by such writers as Fuller (1940), McWilliams (1971 and 1976), and Buroway (1976). In this section we wish to highlight some of the implications of immigrant labor in California.

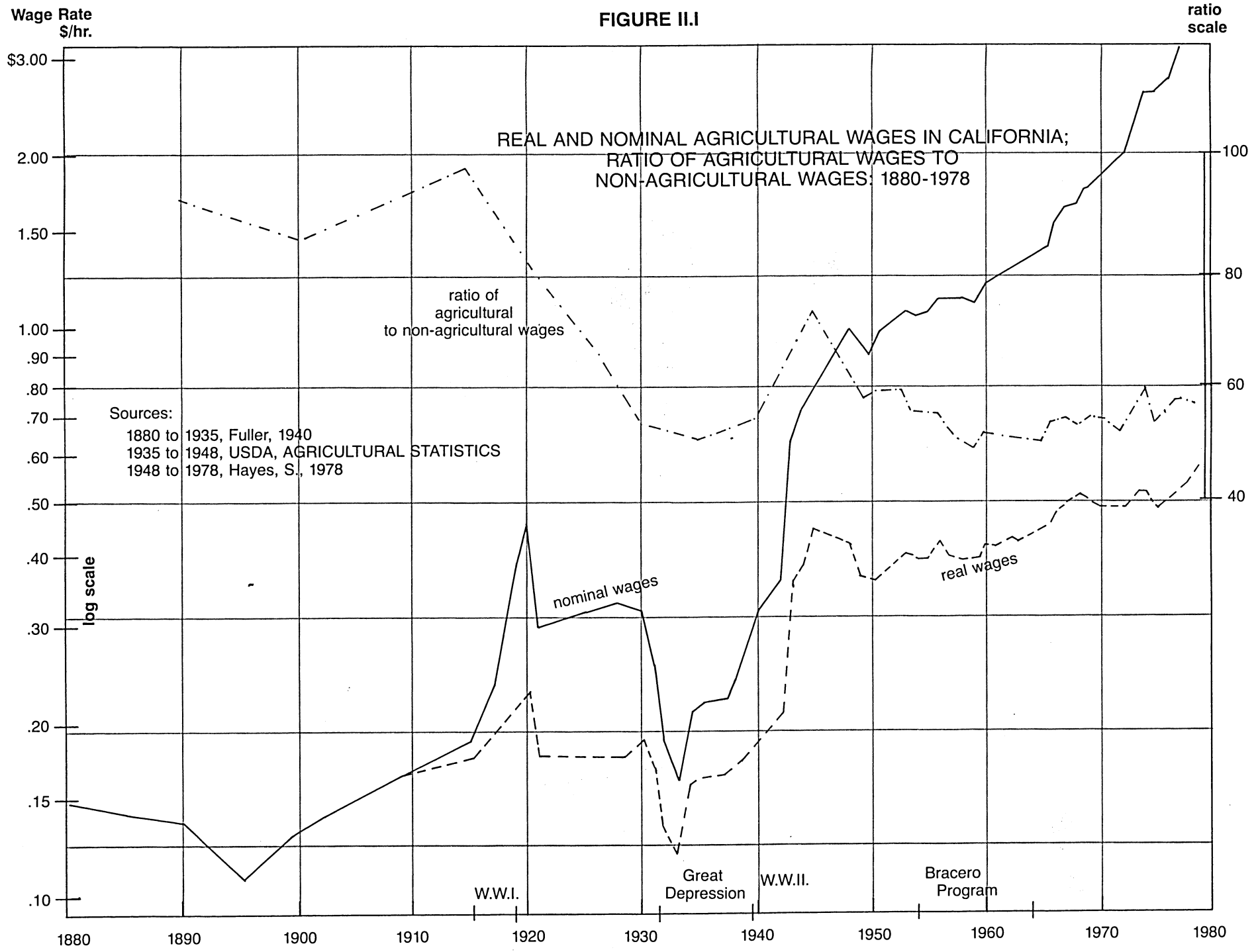
The essential characteristic of this supply of labor is its willingness to accept low wages, uncertain and temporary work, substantial periods of underemployment, and poor working conditions. Workers were not guaranteed employment, and when the work on one farm ended, it was up to the individual worker to find another job. Without a virtual army of individuals looking for such short-term employment, specialty crop production, which requires large numbers of workers for short, seasonal activities such as the harvest, would not have been able to expand. That is, the key to the successful development of highly profitable fruit, vegetable, sugar, and other labor-intensive crops was a labor supply of casual workers willing to work for very low wages.

The evidence of this manipulation of the labor supply can be seen in Figure II.1, which documents nominal and real wages (discounted for inflation) of farmworkers in California and the position of agricultural workers, relative to nonagricultural workers, expressed as the ratio of agricultural wages to those of similarly skilled workers in the rest of the economy. As can be seen, except for the very early years, farm wages have been very much below those of the non-farm economy. It should be recalled that the typical farmworker does not work full-time, whereas his counterpart in the nonfarm economy is likely to have much more stable employment. Thus not only are wages low in the farm economy, but also employment is much less stable in comparison to the nonfarm economy. This combination implies much lower incomes for farmworkers (see the Appendix to Part II).

Low wages were important in order to keep prices of the products sufficiently low to attract a large market. Growers as well as processors and distributors thus had a great stake in keeping labor costs as low as possible. Casual labor was necessary to keep the grower from having to pay the costs of workers when they were not needed. Had the grower been required to guarantee full-time employment, labor costs would have been much greater. Under such conditions, family farmers, using their own labor, could have successfully competed with large-scale producers. Thus the economic viability of large-scale farming, as well as the prosperity of the specialty crop agricultural production both required that the grower not be required to pay for workers when there was no work (McWilliams, 1976: 164-65).

The dependence on cheap labor became stronger with the passage of

FIGURE II.I


Wage Rate
$/hr.
ratio
scale
REAL AND NOMINAL AGRICULTURAL WAGES IN CALIFORNIA;
RATIO OF AGRICULTURAL WAGES TO
NON-AGRICULTURAL WAGES: 1880-1978
$3.00
2.00
1.50
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.15
.10
log scale
100
80
60
40
ratio of
agricultural
to non-agricultural wages
Sources:
1880 to 1935, Fuller, 1940
1935 to 1948, USDA, AGRICULTURAL STATISTICS
1948 to 1978, Hayes, S., 1978
nominal wages
real wages
W.W.I.
Great
Depression
W.W.II.
Bracero
Program
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980

time, for as Fuller points out, the cheapness of labor resulted in higher income to landowners and, as land exchanged hands, the value of this additional profitability was capitalized into the price of the land, hence:

> ....owners who have purchased their land at values already based upon the income received from the employment of cheap labor stand not to make large gains from the continued employment of cheap labor. On the other hand, if, after buying land capitalized on such a basis, real wages, ceteris paribus, commence to rise, the owner stands to suffer more than book losses. (Fuller, 1940, p. 19866)

In other words, landowners were committed to the maintenance of the system of cheap labor just to sustain their investment in the land. Any threat to the system was a threat to the wealth position of landowners. Given the magnitude of this wealth and its concentration, there were very strong incentives to see that the system was not disrupted.

The financial institutions understood this logic, for they loaned money to the large producers and secured the loans against the value of the grower's land. Any disruption of the labor system would have had negative impacts on the banks as well as on the landowners, the processors and distributors of the fruit, sugar, and other specialty crops. In short, the entire agricultural economy developed an economic dependence on the continuation of the cheap labor system.

From the perspective of maintaining the supply of cheap labor, it was crucial to find first-generation immigrants to do much of the agricultural work. Immigrants came to California with much different expectations, and from countries in which economic conditions were even more depressed than those of farmworkers in California. They were willing to accept the low incomes and hard work of farmworkers because of the difference in the nature of their socialization. In addition, because

immigrant groups were usually dominated by young, adult males, California was able to reap the benefits of a reproduction process that took place outside of the state. Producers did not have to be concerned whether farmworkers were being treated well enough to reproduce themselves, to have families and raise children. These functions took place in low-cost environments from which the adults were recruited. It was evidently easier for a single male to survive the uncertainties of migratory work patterns than it would have been for a family; thus wages could remain just high enough to allow workers to earn a sufficient amount to provide for their relatively low food and shelter requirements.

Of course, the costs of keeping this kind of labor supply were partially born by the non-agricultural sectors of the economy. Some charity and state-provided welfare helped to maintain the workers during the long periods of unemployment. In recent times, it has been convenient to have the labor force return to Mexico, where wages would buy much more food and shelter. The public sector need not bear the costs of helping to support unemployed farmworkers. Indeed, in their efforts to justify the continuation of the Bracero Program, California farmers sometimes pointed out that if they used domestic workers, the State would have to pay greater welfare costs.

It might be asked why farmworkers would not seek employment elsewhere, if working conditions and wages were more attractive in other sectors of the economy for similarly skilled labor. The answer is that eventually workers do look and find these jobs. However, because most of the workers are first-generation immigrants, they do not speak English and are ignorant of the alternatives. Perhaps even more important,

almost all groups have been subject to racial discrimination in the cities (de la Torre, 1980). We have seen that it was urban labor organizations that led the fight to exclude Chinese from the United States. Strong hostilities were also expressed toward the Japanese, Filipinos, and Mexicans. Even the whites who came during the 1930s were the object of such hostilities; the natives in California considered the "Okies" and "arkies" to be of a different category of humanity. The result of racial discrimination, unfamiliarity with the political, legal, and economic institutions, as well as ignorance of the opportunities for other kinds of work, all served as important barriers to the higher-paying, higher-income jobs outside of agriculture. (Some additional evidence of the existence of these barriers is presented in the Appendix to Part II.)

In short, the agricultural labor supply has been successfully sealed off from the rest of the domestic labor market. As Fuller has noted, the agricultural labor market is easily entered by anyone, but once part of it, escape is difficult (Fuller, 1968; see also Fisher, 1953).

The segmented nature of the labor markets, which helped to hold captive the immigrants in agriculture, is the key to understanding the maintenance of "cheap" workers. (The concept of "segmented" or "dual" labor markets has been given considerable attention by some economists; see, for example: Doeringer and Piore, 1971; Piore, 1975.) Had growers been forced to rely on domestic workers, it would have been very difficult, except during periods of deep economic recession in the cities, to keep workers in agriculture willing to accept the low wages and uncertain unemployment. Domestic workers would have been able to escape back into the higher income labor markets of the cities during periods of prosperity.

It is probably also true that domestic workers would have attempted to organize agricultural workers into unions, as they did in the rest of the economy. In fact, during the periods when whites were in the fields, (e.g. during the First World War and then during the Depression of the 1930s) there were significant efforts to organize workers, and strikes were common. While no permanent successes were achieved until the late 1960s in organizing farm workers, these earlier efforts presented agricultural interests with a considerable challenge. First-generation immigrants were much less likely to present these kinds of problems, although the Japanese were an exception to this rule.

In spite of the barriers that served to contain the agricultural labor market, there was a persistent tendency for the supply of agricultural workers to shrink, if not continually replenished by new immigrants. The reason for this need for renewal is that immigrants have been predominately single males and do not reproduce themselves. In the case of the Chinese, some immigrants were deported as a result of the Exclusion Act. Later, a series of policies tended to encourage the Japanese to return home. Thus there was little tendency of immigrants to replenish the pool. Moreover, as the immigrants themselves become adjusted to the conditions of the United States, they eventually develop sufficient mobility to escape agriculture (see Appendix). We have seen that the Japanese were perhaps the most successful of all groups in escaping farmwork within a very short time. Certainly there is a strong tendency for first-generation immigrants to adopt the standards and values of the mainstream society, and if they do have children, to see that the children do not remain in agriculture. As a consequence of these forces, there has been a continuing threat to

the farmers that they would lose the surpluses needed to maintain low wages and poor working conditions. Hence the search for new sources of immigrant labor is a continuing theme that we find to the present time in the growing interest in the development of a new Bracero Program or in the provision of an open border with Mexico.

In summary, had California agricultural interests not been successful in maintaining the labor supplies and conditions of control, they would have been forced to compete with the nonfarm economy for labor, which would have meant much higher wages and improved working conditions. In the early days, when there were no machines, such labor conditions would have implied the development of a different kind of agricultural system, based on family labor. Such a development would have further implied a new land tenure system and locus of control over the profits produced by the resources of the State. Today, however, there are alternative solutions to higher wages and better working conditions. The large farms are able to substitute machines for workers, and thus, even though wage levels have improved somewhat in recent years, they no longer threaten the basic core of the agricultural economy in the same way they might have fifty years ago. We will thus explore the implications of mechanization in this general context of the labor system in Part III.

APPENDIX TO PART II

Because of the nature of the agricultural labor process, it is difficult to measure or quantify. There are thousands of farmers who employ labor, there are hundreds of thousands of individuals who do some amount of farm work during the year, usually on several farms for short work periods. Many of these farmworkers were the object of hostility by the mainstream society and hence tried to keep a low visibility. Today, many of the workers are apparently illegally in the U.S. and are even less interested in having their presence known. In short, even today, with all of the sophisticated survey procedures of the government, we do not have a very complete understanding of who performs farm labor, what they are paid, how long they work, how long they remain in agriculture, etc. It goes without saying that our understanding of the farm labor markets of the past decades must be even less complete, given the lack of any major effort to survey this labor force. We therefore must depend on partial surveys, on educated guesses, on incomplete government records, on testimony, etc., to gain an understanding of who performed the farm labor. That is the purpose of this appendix.

The Chinese

The first Chinese immigrants to California began arriving during the late 1840s, in response to work opportunities in the gold mines. Later they were recruited by the railroads to help in the dangerous work of completing the transcontinental railroad through the Sierra Mountains. The Census of Population indicates that by 1860 there were approximately

35,000 Chinese in California, of which 33,000 were male. Net immigration continued to increase the size of the population, so that by 1880 the population reached a peak of about 75,000. With the passage of the Exclusion Act, the population began to decline and by 1900 it was down to about 46,000.

While the Chinese never amounted to more than 10 percent of the State's population, there is considerable evidence that they contributed more than proportionately to the agricultural labor force. The Census of 1870 found that only 10 percent of those reporting agricultural work were Chinese, though this estimate very likely understates the importance of the Chinese, who may not have been accurately counted and whose contribution to the seasonal labor force may well have been greater. During the debates over the Chinese Exclusion Act we find references to "surveys" of the farm labor force indicating that the Chinese provided at least 80 percent of the seasonal labor. These studies may have confused the importance of the Chinese in some specific labor-intensive crops with their overall contribution to the entire agricultural system. Most believe that a reasonable estimate of the Chinese contribution in the 1880s was about 50 percent of the seasonal, hired labor force (Fuller, 1940, p. 131). The Chinese continued to play an important role, even after the Exclusion Act, though by the beginning of the 20th Century, they had become a minor part of the labor force.

The Chinese farmworkers performed the most difficult tasks that paid the lowest wages. Thus, while there is considerable testimony that they were paid a much lower wage than whites, at least part of this discount can be accounted for by the difference in the jobs taken. Fuller

believes that the discount in wages was less than 20 percent, when the nature of the work is taken into account (Fuller, 1940, p. 121). The most important advantages of the Chinese to their agricultural employers were that they would accept temporary and difficult work, perhaps at a lower cost than what white labor would have implied, and also, that the Chinese would accept much less expensive room and board. Fuller estimates that the Chinese cost one third less for room and board than their white counterparts (Fuller, 1940, p. 133).

The Japanese

While we lack precise information as to the number of Japanese in California, we know that in 1900 the Census found only 24,000 in the entire United States. By 1909 this number had increased to well over 100,000 of which it is estimated that about half lived in California (State of California, 1936, p. 20). Thus, these data indicate that the immigration of Japanese workers was substantial during the first decade of the 20th century. Because of growing anti-Japanese hostility, the U.S. government was forced to negotiate a "gentleman's agreement" with the Japanese government to stop further immigration from Japan. In return the U.S. promised to treat Japanese in the U.S. more fairly (Matsui, S., 1922, p. 73). This agreement effectively reduced immigration from Japan, but Japanese immigrants from Hawaii, Mexico and Canada continued to enter the U.S. until 1924, when the Immigration Act specifically excluded all Japanese immigrants. According to immigration records there were about 80,000 more Japanese migrating to the U.S. than away from it between 1904 and 1924. Most of the immigrants to the U.S. came from agricultural regions in Japan and naturally gravitated toward farming, at first as

farm workers and later as farmers. The motivation behind the decisions of most immigrants to come to the United States was to repay family debts (Ichihashi, 1932, p. 67). By 1909 it is estimated that as many as 30,000 Japanese were employed as laborers in California agriculture -- this probably represents the peak year for Japanese labor. A survey of 2,400 farms by the California State Bureau of Labor Statistics found that 47 percent of the hired labor force were white, 42 percent were Japanese, 4 percent were Chinese, 3.5 percent were Mexican, and 3 percent were other minorities (see Fuller, 1940, pp. 158-160). Japanese workers played particularly important roles in labor-intensive crops. Thus 86 percent of all labor in berry production was Japanese, as was 54 percent of all labor picking grapes, 66 percent of all labor in sugar beets, 47 percent of all vegetable labor, and 46 percent of all deciduous fruit labor (State of California, 1936, p. 24). It thus is very apparent that the Japanese had become an extremely important segment of the overall seasonal labor force by this time.

Just as with the Chinese, the Japanese were initially willing to accept lower wages in order to find employment. The U.S. Immigration Commission reported that Japanese wages were approximately equal to those of the Chinese, though substantially lower than those of whites (see Fuller, 1940, p. 165). Strong Japanese labor contractors were responsible for improving the wages of the Japanese, and by 1920 it is reported that white and Japanese wages were equal, although by this time the number of Japanese workers in the fields had been reduced to half the number working in 1909 (Fuller, 1940, p. 166; Matsui, 1922, p. 73).

The Mexicans -- Pre-1930

California farmers had rejected the Mexican as a possible source of farm labor on the grounds of his alleged unwillingness to work hard. The Chinese worker had always been held up as the ideal worker, and when labor shortages developed during World War I, California farmers went to Washington to plead for permission to begin importing more Chinese workers. They were unsuccessful in their efforts, and only then did they turn to Mexican workers. Mexicans had first been used by the railroads in the Southwest in building new roads. The primary advantage of Mexican workers was the low wages at which they were willing to work. In 1909, Mexicans were employed for $1.00 per day, cheaper than the going rate of $1.25 to $.145 paid to members of other races at that time (State of California, 1936, p. 26).

There are no reliable data on the rate of immigration of Mexicans to California, although according to a report to the State of California, the number of persons born in Mexico and residing in California grew from 7,000 in 1890 to 34,000 in 1910 to 89,000 in 1920 (State of California, 1936, p. 28). By 1930, the Census of Population indicated that over 368,000 persons of Mexican origin were living in California, making them the largest minority group with over 6.5 percent of the entire population. We do not know the proportion of workers employed in California agriculture; one indicator of the rising importance of Mexicans in agricultural labor comes from the changing ethnic composition of the labor camps run by California. In 1915, only 7 percent of all inhabitants of these camps were Mexican (State of California, 1936, p. 29). During the 1930s Mexicans were not needed in the fields and efforts were made to send them

back home. As we shall see, after 1942 the use of Mexican labor again became important to California.

The Post-War Labor Force

As pointed out at the outset, we lack detailed data on the composition of the agricultural labor force, even today. At the time of the termination of the Bracero Program in 1964, however, the State of California commissioned a detailed survey of the labor force in order to support its claimed need of continued Bracero labor. This survey was a systematic sample of the 1965 agricultural labor force -- this was the first year without large supplies of Bracero labor. Because this sample represents the only detailed analysis of this labor force, we present some of the important conclusions to illustrate the nature and socio-economic characteristics of the highly mechanized agricultural system that emerged after World War II.

Table A1 illustrates the important components of the labor force. As can be seen, of the entire hired labor force, the average employment of seasonal, temporary workers is roughly equal to the employment of permanent workers. It is this seasonal group that is of immediate interest, since it corresponds to that part of the labor pool with which this study has dealt. The seasonal workers can be subdivided into a relatively small number of workers who enter agriculture only at the peak season, in search of very temporary employment, and a larger group that searches for employment (often unsuccessfully) most of the year. The first group consists of students, housewives and others attempting to supplement a family income; the second group consists of individuals who are primary

TABLE A1: ANNUAL AVERAGE EMPLOYMENT OF FARM WORKERS, CALIFORNIA, 1951-1975

Year	Total	Farmers and unpaid family	*Hired workers* Year around	Temporary	Foreign contract
1951-1955	357,197	118,945	102,872	107,873	27,146
1956-1960	349,580	105,575	105,573	96,485	48,242
1961-1965	318,240	93,880	91,970	106,928	30,551[a]
1966-1970	293,840	83,156	93,440	116,950	n.a.[b]
1971-1975	284,320	72,500	97,237	114,580	n.a.

[a]Average over four years, 1961-1964, since Bracero Program ended December 31, 1964.

[b]n.a. = not applicable

Source: State of California, Farm Labor Report, 1975 (Sacramento, 1976).

wage earners, whose only activity is farm labor, and who depend on their earnings for survival. This latter group we can call the "full-time" seasonal labor force.

During the years of the Bracero Program, an important part of this seasonal labor force was made up of contract workers from Mexico. As can be seen from Table A1, a relatively large portion of the labor force came from this source. However, the true importance of Bracero labor is understated in this table, because Bracero workers filled a very specific role in the overall labor process. That role was to fill the peak demand for labor, which lasted only a short period in any single crop. Therefore, if we were to look at the importance of Braceros at the peak week in California, we would find that Braceros supplied roughly 85 percent of peak harvest labor in tomatoes; 67 percent of peak labor in strawberries; 69 percent of peak harvest labor in lettuce; 43 percent in melons; 72 percent in lemons; and important percentages of orange, celery, sugar beet, grape, asparagus, and cotton labor requirements in 1963 (see Table IV.2). Not only does Table A1 fail to indicate the true importance of the Bracero worker to California agriculture, but it also gives a distorted view of the number of workers that actually participate in the industry. That is, because the numbers on this table refer to the average annual employment, they miss the peak employment and they fail to capture the importance of seasonality in the labor process. These numbers refer to the number of jobs, not to the number of individuals employed over the year. Because a job is arbitrarily defined as a given number of hours of available work per month, or per year, there may be several individuals holding that "job" which is, in fact, a series of short term employments

on several different farms, each performed by a different person. Thus, while the table indicates that only 30,000 foreign contract workers were employed in California in the early 1960s, the actual number of individuals involved was at least 100,000 workers.

Further evidence of this discrepancy between the number of jobs and the number of workers is found in the 1965 survey of the farm labor force which found that about 742,000 individuals reported some farm employment in that year, while the total hired labor force averaged only about 225,000, with a peak employment of 380,000 during the period of one week. Thus in general there are roughly two to three workers for each job.

Table A2 helps to disaggregate the composition of the labor force according to the nature of the commitment to farm work. Of the 742,000 reporting some employment in 1965, those earning $100 or more totalled 486,700. Of this group, 176,500 had less than three months of full employment in agriculture. Many of these individuals with less than three months employment wanted more work than they found. If we subtract from this number those who were students or who derived more than 50 percent of their income from non-farm sources, we still find over 56,000 who depended entirely on agriculture for income. Virtually all of the members of this group could be considered underemployed, since they would have accepted more work, had it been available.

The remaining portion of the full-time seasonal labor force consists of those who were employed for more than three months, but not permanently, who depended on agricultural work for most of their income. This group totalled roughly 271,700 in 1965 (including the 56,000 underemployed workers discussed above).

TABLE A2: EMPLOYMENT AND EARNING CHARACTERISTICS OF THE CALIFORNIA FARM LABOR FORCE, 1965

Description of work force category	Median California earnings (dollars)	Size of labor force	Percent of all workers	Man weeks contributed (thousands)	Man weeks contributed (percent)
All reported workers[a]	*b*	742,300	100.0		
Less than $100 farm earnings		255,600	34.4	250	2.0
More than $100 farm earnings	1,388	486,700	65.6	12,440	98.0
All workers surveyed (full employment)	1,388	486,700	100.0	12,440	100.0
Less than 3 months	510	176,575	36.3	1,007	8.1
3-10 months	2,250	198,184	40.7	5,045	40.6
More than 10 months	4,255	111,941	23.0	5,388	43.3
All Mexican-American and Mexican workers (full employment)	1,472	218,200	45.8	5,037	40.5
Less than 3 months	512	78,660	36.1	455	9.0
3-10 months	2,350	100,840	46.2	2,760	55.0
More than 10 months	4,051	38,700	17.1	1,812	36.0
All Anglo, Filipino, and other workers (full employment)[c]	1,320	262,812	53.8	6,403	50.5
Less than 3 months	500	97,587	37.1	552	8.6
3-10 months	2,100	91,984	35.0	2,275	35.5
More than 10 months	4,365	73,241	27.9	3,575	55.8
All students (full employment)	443	83,300	17.1	462	3.7
Less than 3 months	430	68,970	82.8	369	79.9
3-10 months	1,800	13,430	16.1	51	10.4
More than 10 months	2,500	900	1.1	45	9.7
All migrant workers, intra- and interstate (full employment)	1,624	145,000	30.0	3,404	26.8
Less than 3 months	630	37,120	25.7	257	7.5
3-10 months	2,450	90,680	62.4	2,354	69.3
More than 10 months	3,865	17,200	11.9	793	23.2
Workers with less than $1,000 California earnings		201,980	41.5	1,838	14.5
Mexican-American and Mexican		84,225	41.7	629	34.2
Anglo, Filipino, and Black		117,755	58.3	1,209	65.8

TABLE A2, CONTINUED

Workers with $5,000 and more California earnings	36,989	7.6	1,784	14.1
Mexican-American and Mexican	9,500	30.0	452	25.4
Anglo, Filipino, and Black	27,489	70.0	1,332	74.6
Workers reporting partial employment[d]	372,812	76.6	1,000	8.0
Total available labor force (full employment)[e]	486,700	100.0	20,140	100.0
Less than 3 months	66,500	13.7	532	2.5
3-10 months	124,600	25.6	4,645	23.2
More than 10 months	295,600	60.7	14,963	74.3

[a]The survey was based upon state disability records. Not all workers are recorded in these records because employers may not accurately report all hired workers; nevertheless, this is the most complete source of information regarding the number of individuals hired.

[b]Blanks indicate no data available.

[c]The percentages of these ethnic groups in the total labor force are as follows: Anglos, 43.7 percent; Blacks, 3.3 percent; Filipinos, 3.4 percent; other Oriental, 2.1 percent; and American Indian, 1.3 percent. Therefore, the estimates of this group refer only to the Anglo farm workers.

[d]The definition of partial employment is any week worked three days or less. All but 23.6 percent of the workers surveyed had, in addition to full employment earnings, some amount of partial employment, though most of it was less than two months (only 14 percent of all workers reported more than two months of partial employment). Earnings from this employment are included in the median income estimates given in the first column of the table.

[e]These estimates are based upon labor force participation rates, that is, the number of weeks of the year the individual worker reported himself in search of work.

Source: Advisory Committee on Farm Labor Research, The California Farm Labor Force: A Profile, Report to the Assembly Committee on Agriculture, prepared by Cheryl Petersen (April, 1969).

The significance of this analysis is clear in the income data of Table A2. The earnings of those with between three and ten months' full employment in agriculture were $2,250 in 1965. Comparable earnings for similarly skilled workers in the nonfarm sector averaged about $5,000 in 1965. The rural poverty level was set at about $3,000, so by these two standards, farmworkers were very poorly paid. The 1965 survey also provides evidence on family income, which differs from individual earnings in that families may have more than one wage earner. Of those families surveyed, which excluded students and housewives, who did not head up families, 41 percent had incomes less than the $3,000 poverty level.

Table A3 provides some information on the socioeconomic characteristics of the farm labor force. Thus, in comparison with the nonfarm labor force, farmworkers are older, with over 60 percent over the age of 35, as compared with 55 percent for the nonfarm sector. Farmworkers are much less educated; median years of education of farmworkers was 7.3 years, as compared with 12.4 years for the rest of the state. Interestingly, the 1965 survey found that neither literacy nor previous training in the specific job had any impact on earnings; if skills can be equated with previous training and experience, we can conclude that skill had little effect on farm earnings (of course, on a piece-rate basis the more experienced workers, who can work faster, may earn more, but this is not reflected in the wage itself). This socioeconomic data indicates the continued dependence on minorities in California agriculture, and particularly on foreign-born workers, even after the termination of the Bracero Program.

Finally, the 1965 survey provides a short analysis of the job

TABLE A3: SOCIOECONOMIC CHARACTERISTICS OF THE FARM LABOR FORCE IN CALIFORNIA, 1965

	Percent		Percent
Sex		*Household Status*	
Male	78.1	Head of household	42.0
Female	22.0	Member of household, but not head	42.4
		Lives alone	15.6
Ethnicity		*Family size (number of persons)*	
Anglo	43.7	1	30.1
Mexican-American	45.6	2	18.4
Black	3.3	3	12.1
Filipino	3.4	4	12.5
Other Oriental	2.1	5-6	15.4
American Indian	1.3	7-8	6.6
		9-10	3.4
		11 and more	1.5
		Median size	2.2
Age		*Family wage earners*	
Under 20	22.9	1	71.0
20-24	12.1	2	23.5
25-34	16.5	3	3.1
35-44	19.2	4 or more	2.4
45-54	12.5		
55-64	11.9		
65 and over	5.0		
Median age: 34 years			
Education		*Family income distribution*	
None	5.6	Less than $1,000	7.5
Grades 1-7	32.5	$1,000-1,999	14.5
Grade 8	13.0	$2,000-2,999	18.9
Grades 9-11	16.9	$3,000-3,999	20.2
Grade 12 or higher	14.6	$4,000-4,999	13.9
Still in school	17.3	$5,000-5,999	9.3
		$6,000-6,999	6.1
		$7,000-over	9.6
Median years of education for those out of school: 7.3 years		Median income: $3,444	

Source: Advisory Committee on Farm Labor Research, The California Farm Labor Force: A Profile, Report to the Assembly Committee on Agriculture, prepared by Cheryl Petersen (April, 1969).

histories of the low-income workers within the agricultural labor force. Table A4 summarizes this data for a three year period, with the following results:

Of those remaining in the California labor force, all but about 15 percent remained in agriculture after three years; another 17 percent dropped out of the California labor force altogether.

Second, of those remaining in agricultural employment, roughly 55 percent continued to remain in the low-income (less than $3,000 total earnings) sector after three years. For most of those who improved their agricultural incomes, the increase was of a marginal magnitude.

Third, very small percentages of those remaining in the active California labor force moved into the nonfarm labor markets, and of those who did make this transition out of agriculture, many (46 percent of the Mexican-American, and 25 percent of the whites) did not improve their earnings.

Last, those with the greatest propensity to leave agriculture were the youngest members, and those improving their earnings the most were also the youngest members, especially young white workers. Generally, a larger fraction of the white workers who left farmwork found high wage employment than did Mexican-Americans. This is consistent with the notion that minorities are more likely to be trapped in farmwork because of barriers such as racial discrimination.

But, even if it is difficult for most workers to leave agriculture, the survey indicates that more than 30 percent of the initial low-income workers were no longer engaged in agriculture after three years. This means that just to maintain its size, at least ten percent more workers must be brought into farmwork each year.

TABLE A4: LOW-INCOME FARM WORKERS EMPLOYMENT AND EARNINGS HISTORIES: MEXICAN AND ANGLO WORKERS, SELECTED AGE GROUPS, 1965-1968

	Mexican-American and Mexican				*Anglo*			
	All	Under 24	24-44	45 and over	All	Under 24	24-44	45 and over
Total number of each group in sample	413	123	163	127	192	37	59	96
Percent in each group	100.0	29.0	40.0	31.0	100.0	19.0	31.0	50.0
Total percent of each age group of low-income worker in 1965[a]	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent remaining in low-income farm work after three years	29.1	15.5	34.0	36.1	28.0	16.2	16.7	40.2
Percent in short-term agricultural employment earning less than $1,000 after three years	12.9	17.1	9.3	13.4	14.4	10.8	20.0	12.4
Percent in farm work employment earning more than $3,000 after three years	26.0	24.4	31.5	20.5	21.7	18.9	23.3	21.6
Percent remaining in all kinds of agricultural employment after three years	69.0	56.9	74.8	70.1	64.1	45.9	60.0	74.2
Percent in low-income (less than $3,000) nonfarm employment after three years	6.8	11.4	3.1	7.1	3.7	10.8	5.0	0.0
Percent in nonfarm employment earning more than $3,000 after three years	8.7	15.4	8.6	2.4	13.4	32.4	13.3	6.2
No longer in California labor force after three years	16.5	16.3	13.6	20.5	18.7	10.8	21.7	19.6
Percent who improved their income after three years	34.7	39.8	40.1	23.0	35.1	41.3	36.6	27.8

[a]The sample of farm workers was selected from the larger sample surveyed in 1965 as reported above. The definition of "low-income farm worker" used to determine the sample was individuals earning more than $1,000 but less than $3,000. Female workers, students, and nonfarm workers doing occassional farm work were excluded.

Source: California Department of Human Resources, The Low Income Worker in the California Farm Labor Force, a supplement to Advisory Committee on Farm Labor Research, The California Farm Labor Force: A Profile, Report to the Assembly Committee on Agriculture, prepared by Cheryl Petersen (April, 1969).

In summary, this evidence supports the contention that there exist important barriers between labor markets, even between markets for unskilled labor. Agricultural workers have been successfully partitioned into a very low-wage, low-income market; escape is possible, but only a relatively few do find higher wage employment outside of agriculture. Of those who do escape, more than fifty percent improve their earnings; a significantly higher percent improve their earnings than is true of the group that remained in agricultural employment. It should be recalled that the period of this analysis, 1965 to 1968, was characterized by increased labor organization, improving wages in agriculture, and presumably, better employment opportunities, given the tight labor conditions that characterized the termination of the Bracero Program. In other words, this should have been a period of relative prosperity for agricultural labor; the depressed incomes and underemployment conditions are therefore all the more profound.

PART III:

THE ROLE OF THE STATE IN CALIFORNIA'S AGRICULTIRAL DEVELOPMENT

It is evident that the creation of the agrarian structure within California over 130 years ago was not a spontaneous event; it depended upon a series of deliberate public policies, forst pertaining to land distribution, later to the perpetuation of the supply of cheap labor and finally to the development of labor-saving technologies. The brief history we have examined above shows that the policies influencing the evolution of California agriculture have been carefully designed to protect the interests of those who were the beneficiaries of the large landholdings, initially given away by the State, through corruption and fraud. Even in the few instances where the agricultural interests were unable to prevent unfavorable policy, such as evidenced in the loss of the Chinese and the Bracero labor, there were favorable state policies that helped to ameliorate any adverse consequences. Thus, Mexican labor was allowed to enter the country at a time when all other kinds of unskilled labor were excluded by immigration laws. The termination of the Bracero Program came at a time when mechanization, designed by State institutions, was able to compensate for this loss in certain crops. The following summary gives a more detailed account of how some of the State policies influenced the direction and organization of California agriculture.

Policy Before World War II

We have already mentioned the corruption of the land grant policies that permitted the accumulation of large holdings and the failure of the courts to enforce the laws as written. California enacted land tax policies that were favorable to holding land out of use, which encourage speculation. The courts and the local law enforcement were willing to back up the interests of the large owners when they were challenged by squatters, as illustrated in the Mussel Slough Affair. Later, after 1902, and especially during the post 1932 period, the federal government further helped large landowners in California by providing heavily subsidized irrigation projects which helped to alleviate the overdraft of underground acquifers and to bring additional land into production, most of which was held by a few large corporations (see LeVeen, 1979).

But what was more important to the development and prosperity of large-scale agriculture were the many policies adopted to ensure farmers adequate supplies of labor. Prior to the emergency programs of World War II, the government took a relatively passive approach to the regulation of labor supplies and the private sector was primarily responsible for ensuring a steady flow of workers to the fields. However, the intervention of the State was still extremely important in a variety of ways. For example, the Alien Land Acts were policies intended to force the Japanese to remain in the agricultural labor markets by preventing the Japanese from becoming farmers. Immigration policy was frequently modified to serve the interests of farmers. In 1917 and 1918, during a war-induced labor shortage, the head tax and other provisions used to control the immigration of Mexican workers to the United States were removed,

allowing an additional 20,000 to come to California (State of California, 1936, p. 41). The Immigration Act of 1924, which served to close the United States to unrestricted immigration, especially of the unskilled, continued to allow unskilled Mexican workers access to the labor markets of the Southwest. It was during the Depression that measures were taken to close the United States to Mexico and to force the repatriation of Mexican nationals no longer needed in the United States (Hoffman, 1974). Again, when shortages arose in wartime, the federal government intervened to set up the emergency program that procured the needed workers from Mexico. Then,finally, public policy established the Bracero Program that was to provide the needed labor during the immediate post-war period.

Another form of public policy that supported grower interests concerned the State's role in keeping the labor force disorganized and non-unionized. Organization efforts occurred sporadically; one of the first major efforts took place when, in 1913, the International Workers of the World (I.W.W.) organizers helped to begin a strike on a large ranch in Wheatland. Local law enforcement officials, in attempting to stop the strike by arresting two of its leaders, found themselves in a violent confrontation in which several strikers and officials were killed. The California National Guard was called out, and several hundred I.W.W. leaders were arrested all over the state. Laws were enacted to prevent the "wobblies" from holding meetings and disseminating materials. The strike was quickly ended (McWilliams, 1971, chapter IX).

During the Depression years, when large numbers of whites were in the fields, strikes became frequent and many were violent. Between 1933 and 1939 there were 150 separate strikes in California agriculture,

and 30 others in the processing and refining sector; 65 of these involved incidents of violence (U.S. Congress, 1940). One important response to this increasing threat of union organization was taken by the State Chamber of Commerce. In 1933, it convened a "citizens' committee" on agricultural labor problems. The membership of this committee included, in addition to the grower interests, representatives from Pacific Gas and Electric Co., the Southern Pacific Railroad, The California Packing Corporation, and the Bank of America. Out of this committee grew the Associated Farmers. Funds were raised in support of the group from all of the important agricultural interests and also from other large corporations, such as Standard Oil of California, the utilities, and American-Hawaiian Steamship Co. (Chambers, 1952).

The function of the Associated Farmers was created to engage in "direct action" against the strikers, which usually meant violent confrontations. These groups of vigilante farmers almost always operated with the support of local law enforcement agencies, and even provided the local sheriffs with lists of men who could be called upon during emergencies to serve as deputies. In this way, force could be applied against strikers, but in a strictly legal fashion (Jamieson, 1945).

The 1940 La Follette Committee Hearings (of the U.S. Congress, 1940) into the problems of farmworkers are full of stories describing the close working relationship of the Associated Farmers with local law enforcement agencies to prevent union organizing activities. These probably illegal associations between local government law enforcement and vigilante groups were effective in thwarting the efforts to organize in the fields.

However, even more significant public policy that helped agricultural interests was the exclusion of agricultural labor from the National Labor

Relations Act of 1935 (known as the Wagner Act), which was enacted to protect the rights of workers to organize unions. Moreover, all subsequent efforts to include farmworkers under this legislation have been successfully defeated by large agricultural interests. This exclusion has been crucial in preventing organizers from gaining access to the fields and gives management the upper-hand in the decision of whether, when, and how elections for union representation might be held. Finally, farmworkers are denied protection from employers who might take reprisals, should they become active union organizers.

Though the exclusion of agricultural labor from protective legislation has little justification, two arguments have been advanced in its defense (see Fuller, 1973). First, going back to the myth of an agricultural ladder, it is argued that a special relationship exists between farmer and hired hand; that the hired hand is really doing an apprenticeship, and will eventually become a farmer himself. This concept of upward mobility may have been based on real experience in the family-farm states of the Midwest, but not in California (see Hatch, 1975). Second, it is argued that because of the great vulnerability of management to labor during harvest periods, traditional bargaining relationships, designed for other, less vulnerable industries, would be unfair to agricultural management and to the consumer, who would be deprived of essential commodities.

Neither of these justifications can be defended in terms of the principles that the 1935 labor legislation embodies, and both illustrate the double standard that exists with regard to the different labor markets. Thus, while it was important to rationalize labor-management relationships in the highly monopolized sectors of the industrial economy, it was not of

overriding national importance that agricultural workers be included in the new social contract between capital and labor. Large agricultural interest groups, such as the American Farm Bureau Federation, were willing to support the emerging labor legislation during the 1930s with the pragmatic agreement with organized labor that it would not insist on including agricultural labor (Berger, 1971).

In addition to the direct support from government policy given to the agricultural interests, there were other less obvious forms of government support that aided the various agricultural industries in controlling labor. Perhaps the most important of these policies was the Capper-Volstead Act of 1922 which allowed the establishment of agricultural cooperatives that would be free of corporate tax requirements and not subject to anti-trust laws. In California, the passage of this law encouraged the formation of several very large cooperatives of growers; for example, Sunkist quickly became the largest marketer of oranges, while other crops were similarly cartelized (see McWilliams, 1971). Cooperatives were intended to give small producers greater bargaining power in opposition to the processing and retailing sectors. To some extent, this goal was realized, perhaps to the detriment of the smaller growers, who were squeezed out by the larger growers dominating these cooperatives. From the perspective of the farmworker, this development had another result. Once the various crops were organized around central associations, it became much easier to coordinate the hiring of labor and most important, to establish uniform wage rates. Along with the greater organization came centralized hiring services controlled by the employers in a given region for each crop. Wage rate fixing was overt and never challenged; Fisher

describes this practice as "organized noncompetition," (Fisher, 1953, p. 97-98).

In short, government policies had the effect of allowing the consolidation and organization of capitalists after 1922, and this further hindered the power of labor. Moreover, the organization of capital extended beyond the field. To illustrate, when a member of the Grower-Shipper Vegetable Association of Central California attempted to individually settle with a union in 1936, the Association sent out letters to all of the lumber and ice companies asking them to refuse to supply the lettuce grower with needed supplies for the harvest; the grower was thus unable to harvest his crop, and was forced to accept the Association as its bargaining agent (Glass, 1966, p. 83).

Implications of the Bracero Program and its Termination for Understanding the Role of the State

As we noted above, the Bracero Program (including the temporary wartime measures of the 1940s) represented the entry of the State into the regulation and management of cheap labor for agriculture. Public Law 78 was enacted in the early 1950s and, over the strong objections of California agricultural interests, terminated in 1964. Table III.1 indicates the annual peak employment of foreign workers brought into the U.S. between the years 1942 and 1967. As can be seen, most of these workers came from Mexico, through this program. Its termination was an important event for California agriculture, for it meant the loss of a source of cheap labor, upon which it had become very dependent. Why did an apparently powerful political interest lose in its efforts to maintain its control over the supply of foreign labor, and what does this event imply about the nature of political power and the role of the State?

TABLE III.1: ANNUAL PEAK EMPLOYMENT OF FOREIGN WORKERS ADMITTED FOR TEMPORARY JOBS IN U.S. AGRICULTURE, BY NATIONALITY, YEAR, AND MONTH, 1942-1967

Calendar Year	All Foreign workers[a]		Mexican		British West Indies		Canadians		Japanese		Filipinos	
	number	*month*	*number*	*month*	*number*	*month*	*number*	*month*	*number*	*month*	*number*	*month*
1942[b]	4,200	Sept	4,200	Sept								
1943	36,289	Sept	36,289	Sept	13,114	July						
1944	66,573	Sept	65,097	Sept	24,101	July	1,475	Sept				
1945	94,210	July	65,421	July	28,789	July	3,635	Sept				
1946	45,354	July	45,354	July	24,157	Oct	4,926	Sept				
1947	96,840	June	36,840	June	10,026	Aug	6,254	Sept				
1948[c,d]	40,000	Oct	35,600	Oct	8,000	July	5,400	Sept				
1949[d]	85,600	Oct	74,778	Oct	6,480	Aug	1,998	Oct				
1950[d]	89,100[e]	Oct	70,700	Oct	8,300	July	2,500	Oct				
1951	130,104[e]	Oct	121,600	Oct	13,900	June	2,300	Sept				
1952	139,437	Oct	125,473	Oct	12,257	July	5,200	Oct				
1953	171,128	Oct	159,174	Oct	11,954	Oct	5,700	Oct				
1954	202,626	Oct	194,534	Oct	11,732	Feb	6,276	Sept				
1955	240,841	Oct	232,297	Oct	9,851	Dec	6.686	Sept				
1956	290,156	Oct	276,893	Oct	11,257	Dec	6,648	Sept	390	Oct		
1957	272,435	Oct	260,522	Oct	12,199	May	7,200	Sept	990	Sept	33	Oct
1958	284,835	Sept	274,525	Oct	11,674	Jan	6,876	Sept	1,200	Sept	25	Oct
1959	308,168	Sept	291,515	Sept	10,978	Dec	8,491	Sept	1,560	Dec	30	Jun-Dec
1960	246,675	Sept	234,171	Sept	11,645	Dec	8,026	Sept	1,830	Dec	30	Jan-Apr
1961	220,934	Oct	208,511	Oct	12,174	Dec	8,561	Sept	1,780	Jan	0	-
1962	127,032	Sept	111,414	Sept	13,834	Dec	8,722	Sept	1,440	Apr	120	Dec
1963	105,454	Sept	90,142	Sept	14,887	Jan	8,442	Sept	1,260	Aug	120	Jan-Oct
1964	92,784	Sept	82,140	Sept	15,062	Dec	7,812	Sept	1,240	July	120	Jan-May
1965	23,698	Sept	16,650	Sept	14,929	Jan	4,223	Sept	870	Jan	60	May-June
1966	12,169	Sept	7,760	Sept	8,835	Dec	3,529	Sept	194	Apr	0	-
1967	12,531	Oct	6,124	Oct	9,015	Dec	3,854	Sept	0	-	0	-

TABLE III.1, CONTINUED

[a]The monthly peak of total foreign workers does not necessarily coincide with the monthly peak for each nationality.

[b]Data from 1942 through 1947 were obtained from reports prepared by the U.S. Department of Agriculture.

[c]Data from 1948 through 1967 compiled by the Bureau of Employment Security, U.S. Department of Labor. (1948-52 figures based on special administrative reports; 1953-66 figures based on In-Season Farm Labor Reports; 1967 figures based on weekly reports of regional directors, Office of Farm Labor Service.)

[d]1948, 1949, and 1950 data on monthly foreign-worker employment are estimated from incomplete reports.

[e]Although Puerto Ricans are not foreign workers they are included in these totals.

SOURCE: Farm Labor Development, February 1968, U.S. Department of Labor, Manpower Administration, Washington, D.C., p. 13.

These are important questions to which we now turn.

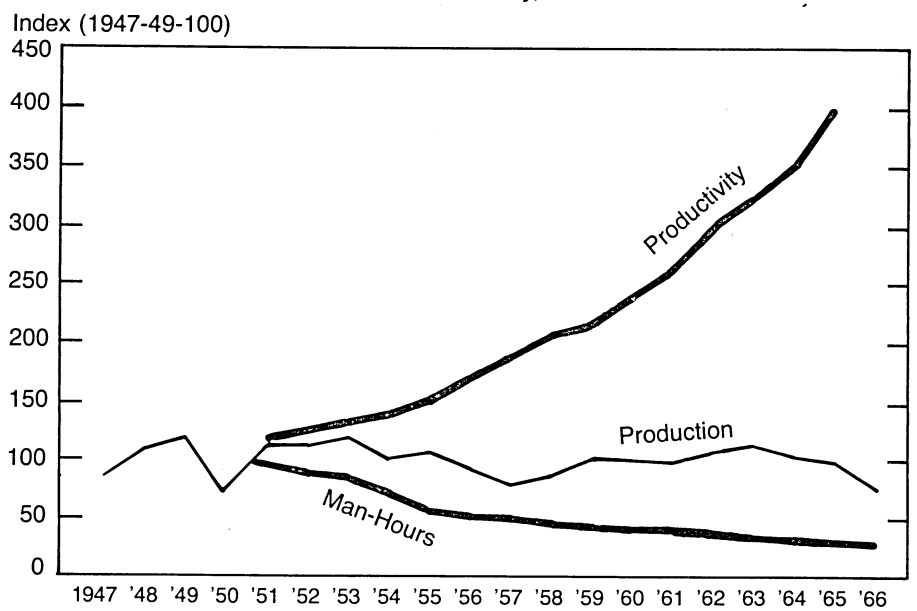
California farmers and other concerned economic interests were united in their opposition to any change in the nation's agricultural labor immigration policy, for, as we have discussed above, the expansion of specialty-crop agriculture and the very structure of the agricultural system, as well as the distribution of wealth it created, appeared to depend on the continuing availability of cheap labor. In this section, we will briefly examine the reasons why the Bracero Program was terminated, and then we shall discuss some of the ways in which agricultural interests responded, one of which was to press for the mechanization of some of those crops that were most dependent on this labor. Why did the federal government cease supporting California growers? Hawlye (1966) suggests that as a result of the successful mechanization of the cotton harvest, states such as Texas no longer found the Bracero Program vital to their economic survival. Thus, by the early 1960s, many of the traditional allies of California growers no longer had much of a stake in the program. Therefore, California, which was unable to mechanize its crops as fast as other regions, was caught by the impact of uneven development. The material basis for the continuation of a blatant class policy was gradually eroded.

The data appear to bear out Hawley's hypothesis. In the early 1950s, 8 percent of the cotton harvest was machine harvested; by 1964, 78 percent was so harvested (see Figure III.1). When the Bracero Program began in 1951, there was little organized opposition in Congress. Some labor groups were nominally opposed, but their concerns went unheeded during most of the decade of the 1950s. Agriculture had long been considered a sector apart from the rest of the economy, and the Bracero

Figure III.I

Chart 1.

COTTON
Index of Production, Productivity, and Man-Hours

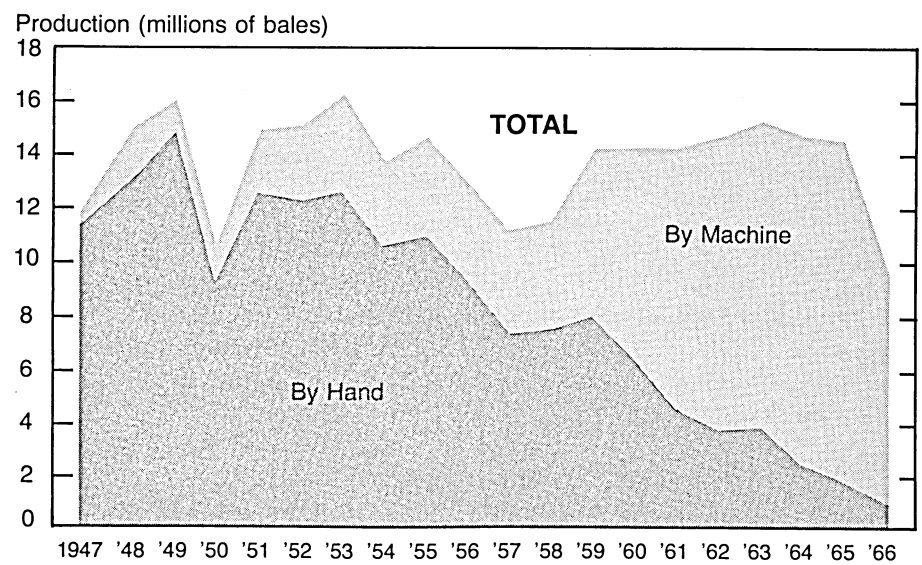


U.S. Department of Agriculture

Economic Research Service.

Chart 2.

COTTON PRODUCTION
By Method of Harvest



U.S. Department of Agriculture

Statistical Reporting Service
Agricultural Marketing Service

Program merely perpetuated old policies and old ideologies.

The Labor Department took an increasingly strong stand in favor of the protective provisions of the Program during the late 1950s. Perhaps cotton mechanization was stimulated by new restrictions imposed on the use of labor by U.S. growers. The Department also made public statistics showing that the Bracero Program was not widely used by farmers, even within those regions dependent upon it (e.g. only 2 percent of all U.S. farms employed such labor). Such statistics further supported the opponents of the program.

But very important to this struggle was the material shift of the Bracero Program, from concentration in cotton, which was grown all across the South and especially in Texas, to concentration in specialty crops in California. Tables III.2 and III.3 show the shift of Bracero labor out of cotton and away from Texas, and the continued heavy dependence of California and certain vegetable crops, especially lettuce and tomatoes.

Therefore, while the Texas legislators were strong supporters of the program at its inception, by 1961 they could afford to take a more principled and hard-line stand against the reformers in the Department of Labor who wanted to make the program more humane. Thus, "...representative George Mahone of Texas contended that his constituents could not operate under the new restictions of the law; they would rather have no program at all" (Craig, 1972, p. 70). The Senators from Texas even voted against extending the program. The Californians, of course, were willing to compromise with the Department of Labor in order to extend the program. California interests did not have sufficient influence to win these compromises. In a sense, the California case had become too "unique."

TABLE III.2: PERCENT OF ALL MEXICAN CONTRACT WORKERS IN SELECTED STATES, SELECTED YEARS, 1945-1962

	1945	1949	1952	1955	1959	1960	1961	1962
State								
Texas	0	44	27	50	45	39	40	15
California	63	8	28	27	34	36	34	60
New Mexico	0	17	11	4	n.a.	n.a.	n.a.	n.a.
Arkansas	0	16	12	7	0	0	0	0
Arizona	n.a.	n.a.	8	4	0	0	0	0
Washington	6	0	*	*	0	0	0	0
Idaho	5	0	*	*	0	0	0	0
Oregon	4	0	*	*	0	0	0	0
All Others	22	23	14	8	21	25	26	25
Total	100	100	100	100	100	100	100	100

n.a. = data not available

* = insignificant number

Sources: 1945-1955: H. Anderson, A Harvest of Loneliness (Berkeley, California: University of California Press, 1964), Table 9, p. 29.

1959-1962: R. Craig, The Bracero Program (Austin, Texas: University of Texas Press, 1972), pp. 130, 181, 182.

TABLE III.3: PEAK EMPLOYMENT OF FOREIGN WORKERS IN THE UNITED STATES, NUMBER AND PERCENT OF TOTAL EMPLOYMENT, BY SELECTED CROP: 1959-1964

Crop	1959		1960		1961		1962		1963		1964	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Lettuce	n.a.	n.a.	n.a.	n.a.	12,000	81.1	9,500	70.0	11,200	72.0	9,900	78.0
Strawberries	8,700	7.5	8,800	6.1	10,000	14.1	10,200	12.0	9,600	9.0	n.a.	n.a.
Melons	n.a.	n.a.	n.a.	n.a.	6,100	43.5	6,600	42.0	6,700	37.0	n.a.	n.a.
Asparagus	4,100	25.3	4,300	22.3	4,000	16.0	4,300	21.0	4,800	22.0	n.a.	n.a.
Cotton	187,100	27.9	133,500	21.4	121,900	21.1	25,900	6.0	16,200	4.0	14,300	5.0
Tomatoes	38,000	43.5	35,800	36.6	34,400	68.4	44,800	41.0	34,100	70.0	38,100	86.0
Sugar Beets	16,600	28.9	17,000	31.6	15,100	28.1	13,600	24.0	12,400	21.0	n.a.	n.a.
Citrus Fruit	n.a.	n.a.	n.a.	n.a.	13,600	37.0	13,100	33.0	10,100	28.0	n.a.	n.a.

"n.a." means no data available.

Source: U.S. Department of Labor, Bureau of Employment Security, Farm Labor Developments, various issues.

As the restrictions on the Bracero Program encouraged the mechanization of production of cotton, they had the eventual impact of changing the very determinants of the policy process. This dialectical process was probably not consciously anticipated by the participants in the policy process, but it still serves to underline the importance of understanding the dynamic interactions between the material development of the different parts of the agricultural system, on the one hand, and State policy on the other.

Bach (1978) suggests a different explanation for the enactment and then termination of the Bracero Program. According to this view, the federal government found itself facing a difficult situation in the late 1940s. As a consequence of Depression policies restricting Mexican worker access to the U.S. economy, illegal immigration to the U.S. from Mexico was growing very rapidly. Organized labor viewed this development with great alarm, for it perceived illegal workers as a source of competition that would reduce bargaining power. If the government chose to neglect this problem, it faced serious political challenges from an increasingly powerful labor movement. Capitalists, especially in agriculture, were not anxious to change these conditions; the influx of workers through annual agreements and illegal arrangements were excellent means of augmenting the unskilled pool of agricultural labor.

If the government gave in to labor, it would offend powerful agricultural interests. The political solution was to appease labor through a strong effort to prevent illegal entry, while at the same time, to develop a formal program intended to channel labor to those sectors of the economy where it did not threaten organized labor. This was accomplished through the Bracero Program, which directed unskilled foreign workers to agriculture, which was not an arena of labor organization. Nominal safe-

guards were built into the program to prevent the displacement of domestic agricultural workers, but these were ineffective and largely domestic. Agricultural wages generally declined with the imposition of the program, relative to wages elsewhere in the economy.

However, the Bracero Program was closely observed by its enemies, and within a few years was the subject of considerable criticism (Turner, 1965). As a result, the program became a symbol of government helping wealthy, powerful corporations at the expense of the powerless farmworker. The myth of the hard-working farmer ceased to provide a protective cover for this difference in the treatment of labor, and as the ideological cover was eliminated, it became impossible for many of the friends of agriculture to continue supporting the policy. Therefore, the program was terminated. But there is, according to Bach, another important fact in shaping the policy toward immigrant workers. The termination of the Bracero Program did not eliminate the importation of workers from Mexico, it only drove the process underground. That is, illegal immigration replaced a regulated immigration scheme, and the situation of the late 1940s was reinstated. Bach thus contends that illegal immigration did increase dramatically after 1964.

The significance of this argument is that the termination of the Program can be seen as an effort by the State to appease political interests without in fact damaging the position of important agricultural interests. According to Bach, illegal workers were more desirable than Braceros because they had no rights and could be more easily controlled. At the same time, their use would be more difficult to document and track, so organized labor would not have any easy target to shoot down. Thus, ironically, even though California interests may have fought for the continuation of the Program, in the long run they were benefitted by its elimination.

Interestingly, the cycle would appear to have made a complete revolution, for now illegal workers are entering the rest of the labor markets, and their presence has again aroused the opposition of organized labor, just as in the late 1940s. As a result, there are substantial pressures in Congress to institute a new Bracero-like program, for the same purpose of channeling the workers to those sectors of the labor market that are least organized politically to protect themselves. However, this may be more difficult today because of the much greater awareness of the issue by all segments of the labor force, and especially because of the existence of the United Farm Workers Union.

Bach's analysis of the Bracero Program implies that policy-makers consciously opted for the relacement of a regulated labor importation policy by an illegal importation policy. Given the strenuous efforts by California agriculture to prevent the termination of the Program, this kind of conscious decision process seems difficult to accept. Policy does not necessarily follow a well-charted course; the solution to a problem frequently becomes the problem for the future. There is little evidence that policy-makers or California interests anticipated the large increase in illegal workers, or if they did, that these workers would be capable of replacing Bracero workers.

However, Bach's analysis is very useful in illustrating a very important dynamic property of contemporary State policy, namely, the need to accommodate new and increasingly powerful non-capitalist interests in the form of organized labor. As a result of the development of a politically influential labor movement, largely because of New Deal policies, it is no longer possible to neglect the impact of government

policies on labor, especially when the direct interests of the organized sector of labor are threatened by the policies.

Bach's analysis further suggests that the way the State was able to accommodate organized labor was by redirecting the threat toward the sector of labor that was not organized and therefore not as important to union leaders. In doing this, it was important for both agricultural and labor interests alike that the new Bracero Program be justified by some accepted ideological cover. This ideology was that the Program did not displace domestic workers and was structured with safeguards to protect foreign workers from exploitation. However, once this ideology was destroyed by other analysis, some of which came from the government itself, the Program could no longer be accepted.

In summary, the dynamics of present-day political economic processes toward agriculture depend on several important factors and their interaction. On the one hand, we have seen that the changing material base, itself influenced by past government policies as well as by market conditions, was an important determinant in shaping the choice of policy toward California agriculture. Second, we have seen that the creation of new political policies designed to cope with the political and economic crises of that era had introduced a new set of influences on the policy process which have implications far beyond the struggle for higher wages and working conditions in organized industries. And last, we have seen that there are important ideological aspects of policy. Agricultural policies are generally justified within a context that stresses the hard-working, small, independent farmer. Agricultural labor policies were justified on the grounds that agriculture was different from the manu-

facturing sector, and that policies should take into account the needs of the agriculture. This idology serves to protect the unequal distribution of the benefits of policy; but when the ideology is shown to be what it is then policy must be changed. In a democratic system, the State cannot be widely perceived to be helping one class at the expense of others. This does not mean, however, that the new policies will be more equitable, only that they will be more easily rationalized.

In Conclusion

This brief history of agricultural policy shows that until the 1960s and the termination of the Bracero Program, the preferred method of State intervention into the California agricultural economy was through manipulation of the supply of labor. However, when political conditions made this course difficult to follow in the 1960s, other alternatives, including involvement of the State in the mechanization of production, were adopted. This is not to say that mechanization was of no interest before the end of the Bracero Program, for some labor intensive crops had been mechanized by that time, including cotton and sugar beets. Interestingly, the private, not the public, sector was the main impetus behind this mechanization. Moreover, mechanization of cotton and sugar beets did not require complex packages of inputs, including new plant varieties, so mechanization of these crops was, in large measure, an extension of the principles of engineering already worked out for the grain crops by the private sector. With the specialty crops of California, however, the private sector was less capable of developing new labor-saving technologies -- the potential markets for this kind of

technology were small and regional (unlike cotton and sugar beets, which are grown by thousands of farmers all over the nation), and required a much more complex package of inputs to support the mechanical devices in such crops as tomatoes and lettuce. This kind of mechanization research demanded the coordination of public and private sectors. Therefore, with the termination of the Bracero Program, the pressure for publicly-subsidized mechanization research intensified and other developments were instituted to enable the rapid adoption of new kinds of labor-saving devices. The important point is, these devices were not preferred to cheap labor; they were demanded only when forces outside of the control of California agricultural interests successfully closed off the preferred policy options.

PART IV:

AGRICULTURAL ADJUSTMENTS TO THE TERMINATION OF THE BRACERO PROGRAM

We have argued that the important mechanization of the canning tomato harvest was adopted as a strategy after it became evident that control of the labor supplies could not be maintained. However, to further develop this hypothesis, we now examine a variety of responses to the termination of the Bracero Program in other labor-intensive crops. Not all crops could be mechanized; indeed, even in crops that were susceptible to mechanization, alternative labor policies were preferable to adoption of mechanical picking devices. Therefore, the mechanization of the tomato harvest will be shown to be simply one of many methods of adapting to the new era of higher wages and less abundant labor supplies.

An Overview of the Utilization of Labor After the Bracero Program

With the termination of the Bracero Program came the first successful efforts to organize agricultural labor since the 1940s, and as a result, wages began to improve, both absolutely and relatively in comparison with the rest of the economy. The United Farm Workers Union staged a successful boycott of the table grape industry in 1967 and 1968, and signed union contracts in increasing numbers. Labor organizing efforts spread to all regions and sectors of the California agricultural economy. Yet, in spite ofthese obvious signs that growers were losing their control over the labor process, agriculture continued to prosper and the projection of specialty crops continued to expand. Table IV.1

TABLE IV.1: CALIFORNIA SPECIALTY-CROP AGRICULTURE SEASONAL HAND-LABOR REQUIREMENTS, 1963-1976

	Total hand-labor hours worked		Hand-labor supplied by Braceros	Change in hours	Change in hours per unit output	Total acres	Change in acres	Change in yield	Change in output
	1964	1976	1963	1963-1976	1963-1976	1976	1963-1976	1963-1976	1963-1976
	(1,000 hours)		*(percent)*	*(percent)*	*(percent)*	*(1,000)*	*(percent)*	*(percent)*	*(percent)*
Almonds	2,249	2,609		16.0	-62.8	260.9	166.3	16.1	210.7
Apricots	4,860	2,093		-57.0	-50.0	27.9	-22.5	11.5	-13.6
Cherries	3,510	2,267		- 4.1	-36.0	13.0	20.4	21.7	46.5
Grapes (raisin)	21,533	20,120		- 6.6	- 8.0	237.7	- 4.4	6.3	1.6
(wine)	5,990	11,382	1.8	90.0	-12.7	270.8	125.8	- 4.4	117.1
(table)	4,565	3,349		-26.7	- 2.2	63.2	-24.0	- 1.6	-24.9
Lemons	7,798	4,750	66.7	-39.1	-56.6	47.5	2.5	37.1	40.7
Oranges (naval)	9,559	11,040		15.5	0.0	114.9	-10.2	13.6	2.1
(valencia)	6,129	9,826	22.8	60.3	0.0	82.8	22.0	33.3	81.6
Peaches (canning)	11,400	5,976		-47.6	-46.4	49.8	-16.7	16.0	- 3.3
(fresh)	6,630	4,926		-25.8	0.0	21.7	-40.5	16.0	-24.7
Pears	3,455	3,375		- 2.5	- 7.3	37.5	14.3	- 7.7	5.3
Plums	3,509	4,199		19.7	0.0	24.7	2.1	17.5	19.9
Prunes	6,020	1,040		-82.7	-83.0	74.3	-13.6	10.0	- 5.0
Walnuts	3,611	2,380		-34.0	-71.3	169.7	36.3	67.6	129.0
Asparagus	8,448	1,344	29.1	-84.1	-69.2	32.1	-56.6	6.6	-48.9
Carrots	4,826	330	9.0	-93.2	-94.2	23.1	27.3	18.2	50.0
Celery	2,622	3,686	34.6	40.6	- 6.0	19.4	40.6	3.6	45.7
Lettuce	16,200	11,395	25.9	-29.7	-55.9	156.1	30.0	22.5	59.3
Melons (cantaloupes)	10,824	7,067	8.3	-34.7	-18.5	37.0	-30.0	33.3	- 6.4
(watermelons)	800	441	5.7	-49.9	-20.3	9.8	-39.0	2.6	-37.2
Tomatoes (processing)	17,451	9,450	48.0	-45.8	-79.1	269.8	109.0	21.1	153.4
(fresh)	5,120	4,500		-12.1	0.0	29.8	- 6.2	20.0	11.8
Strawberries	17,150	30,780	4.1	79.5	0.0	10.8	10.2	66.6	83.7
Cotton	7,300	5,076	0.0	-30.5	-50.0	1,128.0	54.5	- 3.0	48.9
Sugar Beets	5,929	3,420	3.4	-42.4	-40.0	285.0	20.3	40.0	68.4
TOTAL	196,902	167,292	15.7	-15.1	-40.1	3,496.3	33.8	11.5	49.1

TABLE IV.1, CONTINUED

[a] less than one percent; [b] weighted average

SOURCES: Cols. 1, 3, 4, and 5: E. Thor, et al. California Agricultural Labor Requirements and Adjustments, University of the California, Division of Agricultural Sciences, September 1964. Cols. 2, 4, and 5: Kumar, et al. "Estimates of the Impact of Agricultural Mechanization Developments on In-Field Labor Requirements of California Crops," in Technological Change, Farm Mechanization and Agricultural Employment, University of California, Department of Agricultural Sciences, July 1978. Cols. 6-9: California Statistical Abstract, State of California, 1964 and 1977.

shows a comparison between the use of hired hand labor hours in 1963 and 1976. As can be seen, total use of labor declined, even though output increased by 50 percent in these labor-intensive crops. Indeed, labor per unit or output declined by 40 percent during this period. Evidently, growers were finding ways of accommodating the rising wages of workers, especially in crops such as tomatoes, lemons, and lettuce, which had been highly dependent on Bracero labor and which all exhibit major reductions in the use of labor per unit of output.

What lies behind these dramatic changes are a series of adaptive responses by the growers to the changed labor conditions. These responses vary from crop to crop, but they have in common the quality of allowing growers to maintain control over the labor process and retain the profitability of producing these crops.

The responses to the challenge posed by the new labor situation were varied and innovative. Agricultural economists had been advocating the benefits of "labor rationalization" schemes since the second World War (Fuller, 1944). Now these ideas were given serious consideration. The labor process in lettuce and in some citrus harvest was reorganized to improve productivity sufficiently to justify the higher wages implied. The new emphasis in these crops was to provide continuous employment for a relatively few highly productive workers, who, in return, would be provided with higher wages and benefits. The schemes have served to stabilize the labor force, to reduce the number of workers needed substantially, and to improve output at least as fast as wages have risen.

The cost of these schemes has been the creation of an environment favorable to labor organization, and unionization has been given added

impetus. Over the longer run, union demands for better working conditions as well as higher wages may force labor costs up faster than productivity can be increased, and the only alternatives then will be to find new ways of improving productivity through the use of labor-saving technology or to break the power of the unions; both alternatives are currently being pursued. Much of the interest in a renewed Bracero Program is related to the desires of growers who want to undercut the United Farm Workers Union.

Strawberry growers have avoided some of these labor problems by devising new patterns of production in which farmworkers were converted into sharecroppers; in this way, some of the potential conflict between labor and management was defused, though the ultimate control over the profits of the production process was still in the hands of the large landowners and packer/shippers.

In some crops labor rationalization was either not feasible or more costly than mechanization. Where mechanization was less costly, such as in sugar beets and canning tomatoes, the adoption of labor-saving innovations was pursued with vigor as the Bracero Program came to an end. Mechanization not only freed growers of their dependence on a lost source of cheap labor, but also changed the patterns of labor utilization, allowing the use of an entirely different secondary domestic labor force, consisting of women and youth. Therefore, wages of those who continued to be employed in tomato production were kept low. Moreover, because mechanization tended to eliminate the higher skilled picking jobs, the displaced domestic pickers became part of the labor pool for other crops, and therefore mechanization of tomatoes had

indirect benefits for those crops that did not mechanize. Interestingly, California agriculture became more labor-intensive during the aftermath of the Bracero program, in part because of the complex impacts of mechanization on the utilization of labor. The introduction of the tomato harvester had widespread impacts which allowed growers to retain their control over the labor process in the face of a shrinking supply of workers.

In some crops, neither mechanization nor labor rationalization was feasible. Lemons, lettuce, and strawberries all have particular characteristics that make them susceptible to rationalization schemes, but those crops, such as asparagus, that cannot be easily adapted to a different pattern of labor use and cannot be harvested by machine faced very great obstacles with the loss of the Bracero Program. In the case of white asparagus, the crop ceased to be produced in California, as competition from other cheap labor countries eventually encouraged the canners to move their operations out of the state.

Because these adaptive responses to the new conditions of the 1960s are very useful to understanding the evolution of the labor process and because they illustrate the nature of the choice between mechanization and other forms of control available to California, we now turn to a more detailed analysis of the changes that have occurred since 1964 in several of the most important specialty crops.

Adaptive Response #1: Sharecropping strawberries

California has long been a leading producer of strawberries in the United States. Set back by a loss of sharecropper labor during

World War II (Japanese sharecroppers, the mainstay of the system, were interned in concentration camps), the industry revived with the advent of freezing technology and the use of Mexican Bracero labor in the 1950s. Production reached a peak of 243 million pounds in 1956 (see Table IV.3). Prosperity was short-lived, however, as the export of frozen strawberries from Mexico to the United States was also begun in the mid-1950s. This had the effect of reducing production for processing in California by more than half in the three years from 1956 to 1959 (see Table IV.3). The 1956 level was not regained in total production until 1968, and in processing volume until 1977.

The imminent demise of the Bracero Program in the early 1960s created a crisis atmosphere in the strawberry industry, which had become highly dependent on Mexican contract labor that provided 70 percent of peak harvest employment in 1952 (Table IV.2). One survey of 17 large growers found that Mexican contract workers accounted for 95 percent of total picking hours in 1963 and 91 percent in 1964 (California Strawberry Advisory Board, 1965).

At the same time, there was no immediate prospect of mechanizing the harvest, which represents well over 50 percent of total cost. The extreme fragility of strawberries, the practice of harvesting plants for more than one year, and the long season of continuous picking combined to make strawberries one of the most difficult crops to mechanize. Some work had been started at the University of Illinois on mechanical harvesting, but in California there was little in the way of impending labor-saving innovation on the drawing boards. Plant breeders were only starting to modify the plant to withstand mechanical harvesting in 1965;

TABLE IV.2: NUMBER OF BRACEROS EMPLOYED AT PEAK AND PERCENT OF TOTAL PEAK EMPLOYMENT, CALIFORNIA, BY CROP

Crop year	Cotton (chop)	Tomatoes	Lettuce	Cantaloupes/ melons	Oranges (Valencia)	Lemons	Sugar beets (thinning)	Asparagus	Stawberries	Snap beans
1958										
Braceros	2,640	44,280	7,160	2,600	2,200	6,900	4,560	5,050	13,390	1,570
% of total	14%	82%	92%	44%	39%	80%	61%	50%	47%	23%
1959										
Braceros	2,900	37,140	6,880	2,370	3,400	7,240	4,120	5,780	8,750	2,040
% of total	14%	83%	94%	43%	43%	80%	50%	57%	49%	29%
1960										
Braceros	3,260	37,210	6,440	3,200	2,990	7,110	3,940	5,520	10,000	2,620
% of total	15%	85%	85%	56%	48%	80%	51%	55%	56%	35%
1961										
Braceros	2,580	34,960	6,260	3,990	1,770	4,210	3,010	4,600	10,320	3,600
% of total	14%	80%	82%	44%	33%	67%	44%	50%	61%	40%
1962										
Braceros	2,300	46,240	5,900	3,940	1,970	5,460	2,820	4,380	11,880	4,120
% of total	13%	86%	78%	45%	36%	76%	47%	48%	71%	n.a.
1963										
Braceros	1,700	38,100	6,140	3,720	2,880	3,530	2,670	4,890	10,500	2,350
% of total	10%	85%	69%	43%	62%	72%	49%	56%	67%	31%
1964										
Braceros	n.a.	37,870	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
% of total	n.a.	89%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

n.a. = data not available

SOURCES: 1958-1962, Division of Agricultural Sciences, Seasonal Labor in California Agriculture, University of California (1963); 1963, Idem, California Agricultural Labor Requirements and Adjustments, University of California (Sept 1964); 1964, E.Thor and J.Mamer, "California Canning Tomatoes: 1965 Labor Situations," University of California, Berkeley, July, 1965 (mimeographed).

TABLE IV.3: CALIFORNIA STRAWBERRIES, 1950-1978

Crop year	Harvested acres	Average yield	Total production	Fresh product	Processing product
		(pounds)	*(1000 pounds)*	*(1000 pounds)*	*(1000 pounds)*
1950	5,700	14,260	81,280	47,724	33,558
1951	6,900	12.770	88,113	54,317	33,796
1952	8,400	13,680	114,912	68,162	46,750
1953	9,400	16,270	152,938	71,712	81,226
1954	10,900	14,630	159,467	71,577	87,890
1955	14,000	11,910	166,740	64,400	102,340
1956	19,000	12,800	243,200	88,500	154,700
1957	20,000	10,800	223,560	118,260	105,300
1958	17,000	12,400	210,800	97,800	113,000
1959	13,000	12,900	170,280	96,280	74,000
1960	11,000	13,400	156,780	85,780	71,000
1961	11,000	17,800	204,700	132,500	72,200
1962	10,000	20,900	219,450	143,450	76,000
1963	9,000	24,300	238,140	154,040	84,100
1964	9,000	25,400	228,600	141,100	87,500
1965	8,000	21,500	178,500[b]	107,500	71,000
1966	7,000	22,800	177,800	117,300	60,500
1967	8,000	26,100	208,800	148,100	60,700
1968	8,000	33,700	289,800	213,200	76,600
1969	8,000	32,000	268,800	202,400	66,400
1970	8,000	34,000	289,000[b]	215,400[b]	73,600
1971	8,000	36,500	303,000	235,000	68,000
1972	7,000	36,500	284,700	226,400	58,300
1973	8,000	39,500	320,000	226,700	93,300
1974	8,000	43,000	382,700	277,600	105,100
1975	10,000	38,000	380,000	270,900	109,100
1976	10,000	39,000	421,200	281,100	140,100
1977	11,000	45,000	522,000	343,600	178,400
1978	12,000	40,000	526,000	386,100	129,900

[a]Excludes 25.2 million pounds not harvested or marketed because of economic conditions

[b]Excludes 10 million pounds not harvested or marketed because of economic conditions

SOURCES: 1950-53, California Crop and Livestock Reporting Service, Vegetable Crops in California: Acreage Production and Value, August, 1957; 1954-59, Idem, California Vegetable Crops: Acreage Production and Value, August, 1962; 1960-63, Ibid., August, 1968; 1964-68, Ibid., August, 1973; Ibid., July, 1978; Ibid., August 1979.

it took over 15 years to breed a tomato that could be mechanically harvested (Peterson, 1964; University of California, Berkeley, 1963, pp. B-161 ff.).

Finally, the competing growth of strawberry production in Mexico was based on the construction of freezing plants, affiliated with large U.S. firms (some of which had left California) in the Bajio area. These plants enjoyed tremendous cost advantages, paying, in 1965, $1.56 per day for labor, about one tenth of the U.S. wage. Moreover, sugar was subsidized in Mexico and cost only 5.6 cents per pound, less than half the U.S. cost (U.S.D.A., Foreign Agricultural Service, 1966, p. 8). Such advantages led to increasing exports of strawberries to the United States and Canada, both markets previously dominated by California. (Feder, 1977, pp. 104-105).

These three factors, the end of Bracero labor, a lack of labor-saving technology, and growing competition from Mexico, convinced many observers that continued production of strawberries in California was highly problematic. For example, a University of California publication stated:

> the general conclusion is that the large growers would probably cease to produce strawberries because of the lack of mechanical equipment available to replace the hand labor necessary. It would be greatly reduced if seasonal labor was not available. A much smaller industry built around small family and tenant-type operations would probably develop. Fruit would be produced primarily for the fresh market.
>
> (University of California, Berkeley, 1963)

As a result, several strategies were evolved to cope with the impending crisis. First, operating through their state marketing order,[1] strawberry growers donated substantial sums of money to the University

of California at Davis for research on yield-increasing technology. An average of $48,506 per year was given to the University from 1959 to 1973 (Fujimoto and Kopper, 1978, p. 1334). For this money, the industry achieved one of the highest yield increases of all crops in California since the early 1960s (see Table IV.1). California's recent average of 20 tons per acre (some growers achieve more than 50 tons per acre) compares with a U.S. average of about 3 tons per acre and Mexican yields of from 6 to 8 tons per acre (Well, 1980, p. 59; Feder, 1977).

Second, many growers in the early 1960s moved toward recruiting more "green card" Mexican workers.[2] A survey of some southern California growers found this to be the consensus strategy in 1965 (California Strawberry Advisory Board, 1965). Farther north, in the Salinas and Pajaro Valley, where the bulk of strawberries are grown, recruiting Mexicans

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[1]The California Strawberry Advisory Board, established in 1955, is a state program, provided for by law when a specific percent of the voting farmers agree to establish a marketing order. The purpose of such an order is to allow producers of a particular crop to collectively undertake research, advertising, data gathering and analysis, quality control standards and occasionally, supply controls. Marketing orders have been permitted by both state and federal law since 1937; the enabling legislation was justified on the grounds that producers of specialty crops required some provisions to aid in the orderly marketing of their crops. Specialty crops, with the exception of milk, do not enjoy price-support provisions, such as those available to corn, wheat, cotton and other major field crops. Although marketing orders are not intended to restrict the flow of the commodity to the market, quality controls are permitted, and these serve the same purpose. Marketing orders generally support their activities through taxes on all producers of the related crop.

[2]A "green card" is the document that allows a non-U.S. citizen to reside legally in the United States. While the strategy elaborated in what follows is no doubt true, it ignores the extent of undocumented workers employed in the U.S. This omission is largely related to our ignorance about the numbers of individuals involved. Hence the term "green card" could probably just as well read "Illegal" throughout.

from border towns or from Los Angeles barrios is not as feasible an option as it is for those in the southern part of the State, so growers resorted to more permanent relationships. Miriam Wells describes this strategy:

> ... As the Bracero Program came under increasing fire in the late 1950s, some of the smaller growers began to take additional measures to ensure reliable workers. Having established trusting and mutually profitable relationships with particular Braceros because of their repeated employment and the personal contact possible on small farms, some growers agreed to sponsor Braceros for American citizenship. At that time, sponsorship was relatively easy and quick, involving primarily a written guarantee of future employment. (Wells, 1980, pp. 19-20).

This strategy has continued up to the present time among smaller growers in the north. They hire the same core group of workers every year and they attempt to provide as long a season as possible for the workers, even growing other complementary crops to extend the length of employment. They hire many workers who want to return to Mexico from November through January and they recruit through kinship and village networks. This paternalistic relationship has earned the growers considerable loyalty from the workers (Wells, pp. 34-36).

Third, attempts were made by all growers to reduce the numbers of workers. Recruitment of a more stable labor force was partially aided by the introduction of piece rates. Growers had been paying hourly wages to ensure careful picking and high quality fruit, and because the braceros were rather easily coerced into whatever speed was desired. But they discovered that by hiring skilled workers, establishing more personal and interdependent relationships, and paying incentive piece wages they they could achieve the same result with many fewer workers.[3] Total man-

[3]This sample of growers had paid Braceros $1.00 per hour in 1964. In 1965 they paid $1.25 per hour, then $1.40 with an option for a piece rate at $1.10 per hour plus 25 cents per crate. Piece rate workers were making over $2.00 per hour. In later years, the industry shifted entirely to a straight piece rate per crate.

years of employment in strawberries fell from an average of 4,563 in 1961-1964, to 2,695 in 1965 (California Farm Labor Panel, 1965). (Part of this was also due to the decline in acreage and smaller harvest.)

Finally, larger growers have returned to sharecropping their land. Sharecropping was the norm in California strawberry production until World War II. But whereas in earlier periods a sharecropping family was generally able to perform all of the labor on their land, with the very high yields and more involved cultural practices of new strains of strawberries, sharecroppers have had to hire labor for irrigation, weeding, and especially for harvesting. Thus, sharecropping is even more of a labor strategy in its new reincarnation.

This strategy is doubly important because of union activities in agriculture. Organizing by the United Farm Workers (UFW) touched strawberries in the Salinas area in 1970, but only the largest grower in California has ever signed a contract with the union. However, the UFW successfully organized lettuce workers in the same area, and each new lettuce contract tends to set the wages and benefits for skilled strawberry workers (Wells, 1980, pp. 22-25).

To counter the rising wages associated with this "primary" agricultural labor, a strategy of sharecropping provides indirect access for the largest growers (those most susceptible to union organizing) to "secondary" labor, i.e. the undocumented Mexican immigrants. The sharecroppers (mostly former Mexican-American farmworkers) have 3 to 5 acres and are financially responsible only for the buying boxes and baskets and for paying field labor (Wells, 1980, p. 32; Mines, 1980, p. 92). Gross returns are split 50-50 with the landlord, who provides all other

inputs, including spraying. The sharecroppers then hire low-wage labor through kinship or other networks. Richard Mines reported that in the two cases involved in this research, "... the labor force was principally inexperienced, Indian-speaking people from immature migrant communities in Oaxaca" and all were in the United States illegally (Mines, 1980, p. 92).

Thus, the potential for unionization has been greatly reduced, particularly as the UFW considers sharecroppers to be farmers and not farmworkers. Also, the large growers have reduced their exposure to the union, as they are no longer responsible for hiring the labor. Through these various strategies, an extremely labor-intensive crop without a mechanical alternative has been able to restructure its labor force in such a way as to regain its pre-eminent position in strawberry production in the Americas.

Adaptive Response #2: Labor rationalization in lettuce

Iceberg lettuce is grown year-around only for the fresh market. The industry is dominated by a small number of grower-shipper firms which employ labor crews to move from the southern regions of Arizona and the Imperial Valley to the northern regions of the San Joaquin and Salinas Valleys. Harvesting goes on for almost the entire year. The industry appears very risky in any one year, but extremely profitable over the long run to those who can withstand the yearly fluctuations of price and profit (Friedland, Barton, and Thomas, 1978). In the early 1950s, lettuce packing was moved from the packing sheds directly into the fields as a new technology was adopted known as vacuum cooling. This technology was more labor-intensive but reduced costs by substituting Mexican Bracero

field hands for the unionized Anglo shed workers.

But the labor force was not entirely made up of Braceros, and the first major agricultural labor strike in California since the 1930s broke out in the Imperial Valley lettuce harvest in 1960. Use of Braceros to break such strikes came under great criticism. In 1961, the Bud Antle Corporation, one of the largest grower-shippers, signed a contract with the Teamsters Union to avoid having to deal with more radical labor groups (Friedland, Barton, and Thomas, pp. 54-55).[4] The increasing militance of workers led lettuce growers to find ways of reducing their dependence on labor, even before the end of the Bracero Program.

The University of California, following the lead of the University of Arizona, launched a lettuce mechanization program in 1962. Faced with the imminent loss of Bracero labor (lettuce used 70 to 80 percent foreign workers in the harvest in the early 1960s -- see Table IV.2), the university decided that the only effective course of action would be the development of a harvesting machine that could selectively harvest individual plants. It was determined that it would not be possible to develop a strain of iceberg lettuce that would ripen uniformly, as had been accomplished with tomatoes. This meant that the nature of the harvester would be unique, since all previous harvesters have been based on the harvest of a uniformly ripened crop (Kelly, 1964, p. 7).

Engineers developed a mechanical harvester within two years and a commercially licensed test model was in the field by late 1964 (Shaw, 1964, p. 97). But the machine was not adopted for several reasons.

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[4]Antle was widely denounced by California growers for his willingness to make agreements with any union, and he was thrown out of a number of agricultural organizations; see Friedland, *et al.*, 1978, pp. 54-55.

First, the extreme complexity of the sensor/selector device ensured a high cost and constant repair problem for the operators.[5] Second, no tested machines had been produced by 1965, in contrast to the extensive commercial production of the tomato harvester at a similar stage in its development. Third, the high cost of the machine was not only a large capital investment, but led to higher labor costs than current labor-intensive methods (Thor, Goueli, and Hutchens, 1965). Fourth, this high relative cost was largely attributable to a failure to successfully mechanize the trimming of lettuce, which the hand harvesters accomplished simultaneously with cutting. This would lead to a serious problem of handling the lettuce once the machine had harvested it. Finally, an alternative strategy of recruiting and further rationalization of the labor force had proved feasible. This last and decisive point is explained more fully by Friedland, Barton, and Thomas:

> As the Bracero Program came under increasing criticism, grower-shippers of lettuce ... began to explore means to convert their former braceros into legal immigrants to the United States.... This involved the conversion of the bracero lettuce harvesters into 'normal' U.S.-based workers through a process of obtaining green-cards for them.... The probabilities are that lettuce growers became sponsors of braceros as immigrants, selecting those braceros who had demonstrated reliability in their work and encouraging them to apply for immigrant status. By 1966, the transition from braceros to green-carders was apparently complete and the present form of crew organization emerged.[6]

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[5]The first selector was a pressure sensor with an electronic memory, according to R.E. Griffen, *et al.*, in "Progress in Selective Harvesting Lettuce," California Agriculture, Vol. 18, no. 4 (April 1964), pp. 2-3. However, this device failed to win grower acceptance, so a gamma-ray, density sensor was developed -- see University of California, Division of Agriculture Sciences, Research on Agricultural Mechanization, Berkeley, 1966. USDA researchers have more recently developed an x-ray sensor.

[6]This is the same strategy as was discussed in strawberries, and as will be discussed below in citrus. Again, this particular formulation, while evidently true to a certain extent, ignores the extent of undocumented workers.

Such a strategy of labor rationalization through the use of legal immigrants was feasible in lettuce but probably not in tomato harvesting because the number of lettuce harvesters was much lower than the number of tomato harvesters (6,000 as opposed to 40,000), and because lettuce harvesting involved more skill and entailed year-round work (Friedland, 1980, p. 206). Tomato growers could not afford to undertake the costs of this kind of program, for each worker represented much less potential profit and could not be made to be as productive through re-organization and the use of piece-rate wages.

Of particular note in this green-card strategy of the lettuce industry is that it called upon the State to provide the same workers as before, only under a different type of policy. As we have seen above, Robert Bach argues that the Bracero Program itself was a response of the State to permit unskilled workers to enter certain of the U.S. labor markets, while preventing illegal immigrants from threatening the labor markets of newly organized manufacturing workers (Bach, 1978). Thus, when the Bracero Program was no longer tenable, some agricultural interests were able to exploit a different set of labor policies. While the green-card policy was perhaps less desirable than the Bracero Program, because it required higher wages and carried with it an implicit threat from the increased dependence of capital on a permanent and more skilled and potentially united labor force, nevertheless the program has apparently worked. As can be seen from Table IV.1, the amount of labor per unit of output in lettuce declined 55.9 percent between 1963 and 1976 and the mechanical lettuce harvester remains unadopted.

Of course, this strategy contains its contradictions, as a stable

and highly paid lettuce labor force was one of the first groups to be unionized (Friedland, 1980, p. 206). Subsequent strikes and boycotts have led growers to fund further work on mechanization, and now the machine has become an important factor that labor must take into account in its efforts to improve wages and working conditions.

Adaptive Response #3: Labor rationalization in lemons

The use of Bracero labor in citrus was extensive, as can be seen from Table IV.2; therefore the termination of this program presented lemon growers with a profound challenge. Lemon harvest crews have almost always been organized through grower associations and farm labor contractors. During the 1930s, workers were paid 28 cents per hour plus a certain additional amount per box picked (approximately 14 cents) (Smith, Seamount, and Mills, 1965). The advent of World War II and its drain on the agricultural labor supply (mainly indirectly through employment in war-related industries) brought on strikes over wages from 1941-1943. The University of California was called upon to devise an incentive pay system, and it was introduced in late 1944 in Ventura County, which has accounted for about one-half of California lemon production (Ibid., p. 16).

This "Tree Production Incentive Wage System" was a straightforward application of Frederick W. Taylor's scientific management principles. Similar piece-rate systems have been widely employed in manufacturing and in cotton and sugar beet harvesting. The basic approach was to study the rate of picking and its relationship to height

of trees, yield of orchards and other variables, and then to devise a piece-rate schedule which varied with the daily variation in such factors. Overall, however, the schedule was designed to yield, in any one year, a certain average hourly wage to an "efficient" worker (see Table IV.5). The introduction of this system in 1944-1945 raised the rate of pick by about 40 percent and lowered the number of workers by about 29 percent. From 1947 to 1964 the rate of pick increased an additional 24 percent per worker, implying a 19 percent decrease in the number of workers required (Ibid., p. 54). Fewer workers lowered the overhead cost of growers while an increased rate of pick raised the earnings per hour of the remaining workers, but most important, there was no increase in the overall costs of labor to the grower.

The industry became heavily dependent on Bracero crews during the 1950s. These crews were organized by grower associations and directed by packing houses. In the late-1950s, some 70 to 80 percent of the peak harvest workers were contract Mexicans (see Table IV.2). In the early 1960s, lower prices for lemons coupled with rising costs, brought negative returns to growers (as is evident in Table IV.6). As a consequence, acreage in lemons declined. Therefore, the end of the Bracero Program came amidst a larger crisis in the industry which was already forcing growers to find ways to increase the efficiency of workers. (Note that nominal wages rose about 25 percent from 1960-1964, after remaining constant for 13 years -- see Table IV.4 and Table IV.5.)

Mechanization was not an alternative. The University of California tested some tree shakers for lemons, but the machines produced three to

seven times as much unmarketable fruit as did hand picking (University of California, 1967, p. 3). As a result, attention focused on raising the rate of pick and limiting the total peak number of workers used. This strategy had several aspects.

First, attempts were made to develop more permanent employees. Many of the Bracero workers returned every year, but contracts ran for only six weeks at a time and the workers moved from place to place (Smith, Seamount, and Mills, 1965, p. 46). In place of the Braceros, the associations hired green-card workers through Public Law 414. The necessity of this was already clear by 1963 (University of California, 1963, p. b-66). These workers, returning every year to work for the same association, became highly experienced and efficient.

Second, the incentive pay system was retained, but a minimum wage was instituted (Rosedale and Mamer, 1974, p. 10). New workers were given a two month "training" period. If they could not raise their productivity enough to earn more than this minimum wage, they were considered "unqualified" and not rehired (Ibid., p. 13).

Third, many non-wage benefits were instituted such as paid vacations, health plans, education, and unemployment insurance. In 1978, almost 2,000 citrus harvest workers were covered by employer-sponsored health and life insurance programs (Hayes, 1978, p. 69). All of these programs contributed to stabilizing the work force.

Fourth, an attempt was made to provide year-round work. Lemons ripen over a considerable period of the year, and can be left on the trees even longer, even after they are ripe. The harvest can thus be spread out with proper planning, eliminating much of the need for a

TABLE IV.4: CALIFORNIA AND ARIZONA LEMONS, 1950-1951 TO 1977-1978

Crop year	Bearing acreage	Non-bearing acreage	Total acreage	Total production	Cost of picking and hauling
	(thousands of acres)			*million cartons*	*dollars per carton*
1950-1951	55.4	8.6	64.0	27.0	.37
1951-1952	54.8	9.1	63.9	25.8	.39
1952-1953	54.6	8.7	63.3	25.4	.40
1953-1954	54.4	8.8	63.2	32.6	.37
1954-1955	54.9	8.7	61.6	28.2	.40
1955-1956	54.2	12.1	66.3	27.0	.39
1956-1957	52.8	15.4	68.2	32.8	.38
1957-1958	53.2	17.2	79.4	34.6	.38
1958-1959	54.7	16.0	79.7	34.4	.38
1959-1960	56.2	14.0	79.2	36.4	.37
1960-1961	55.8	10.1	65.9	28.6	.41
1961-1962	56.0	5.8	61.8	33.4	.39
1962-1963	52.8	4.4	57.2	26.0	.42
1963-1964	53.5	2.8	56.3	38.0	.46
1964-1965	50.0	3.0	53.0	28.4	.55
1965-1966	47.4	9.1	56.5	31.5	.55
1966-1967	46.5	12.6	59.1	35.8	.54
1967-1968	46.9	10.9	57.8	33.7	.55
1968-1969	48.7	14.3	63.0	31.6	.59
1969-1970	47.1	18.8	65.9	31.0	.60
1970-1971	50.4	22.4	72.8	32.9	.66
1971-1972	52.0	24.9	76.9	33.4	.62
1972-1973	55.6	26.2	81.8	44.4	.70
197301974	64.6	21.0	85.6	35.6	.74
1974-1975	64.9	20.2	85.1	58.8	.83
1975-1976	67.7	21.7	89.4	35.2	.92
1976-1977	68.2	18.1	86.3	52.0	1.00
1977-1978	67.9	15.0	82.9	52.2	1.16

SOURCES: Sunkist Growers, Statistical Information on the Citrus Fruit Industry, 1967.

Sunkist Growers, Inc., Citrus Fruit Industry Statistical Bulletin, 1975; also, *Ibid.*, 1979.

TABLE IV.5: AVERAGE HOURLY EARNINGS OF (BRACERO[a]) CREWS IN LEMON PICKING, VENTURA COUNTY, CALIFORNIA, 1943-1966.

Year	Hourly Rate
1943	$0.50
1944	0.75
1947	0.95
1954	0.94
1955	0.94
1956	0.95
1957	0.95
1958	0.99
1959	0.96
1960	1.01
1961	1.07
1962	1.12
1963	1.20
1964	1.30

[a]after 1954

SOURCE: Smith, et al. (1965), pp. 17, 28, 33, 36, 54.

TABLE IV.6: AVERAGE GROWER INCOME, CALIFORNIA LEMONS[b]

Crop Year	Income/acre
5 year average	
1934-1938	$113
1939-1943	117
1944-1948	72
1949-1953	235
Annual income per acre	
1954	99
1955	132
1956	20
1957	27
1958	-63
1959	-31
1960	-22
1961	-41
1962	281
1963	87
1964	97
1965	161
1966	220
1967	281

[a]refers to income, per acre; on-tree crop value, less cultural costs.

SOURCE: Sunkist Growers, Statistical Information on the Citrus Fruit Industries (annual).

seasonal peak labor force. When not harvesting lemons, workers can be trained to prune the trees, a highly skilled activity that in the past was done by different workers. Training programs were developed to teach the harvest workers to do the pruning work, and hence extend their employment over a longer period.

Finally, research efforts were focused on increasing the rate of pick. Better picking bags were invented; time and motion and energy studies were done to eliminate the most exhausting parts of the job; mechanical picker position systems were invented to eliminate ladders (Rosedale and Mamer, 1974; University of California, 1966, pp. 8, 17).

A study of one growers' association of 300 growers found that the total number of pickers employed decreased by more than one-half between 1966 and 1972, while the number of boxes picked remained constant (see Table IV.7). Wages increased by more than 50 percent during the same period, keeping up with piece rates in other California crops. Costs per box picked and harvest costs per box both increased less than 20 percent over the same period, which represented a much slower rate of increase than overall farm wages (which increased 26 percent), or the rate of increase of prices paid by farmers for produced inputs (which increased 42 percent), or the Consumer Price Index (which increased 33 percent) (Rosedale and Mamer, 1975, pp. 30-31).

The success of the citrus growers' strategy is largely attributable to the centralization of labor management, much as in lettuce production. This centralization has a long history in citrus, but the recent intensification of labor rationalization has further reduced the citrus grower to a mere investor, dominated by his "cooperative" association (Friedland, Furnari, and Pugliese, 1980, p. 24).

TABLE IV.7: EVIDENCE OF LABOR RATIONALIZATION IN LEMONS: LABOR USE AND LABOR PRODUCTIVITY IN THE COASTAL GROWERS ASSOCIATION

Year	Pickers employed	Total man-hours	Average days worked/worker	Total boxes picked
1965	8,517	1,286,000	17	4,358,000
1966	6,611	1,833,000	31	7,172,000
1967	5,188	1,849,000	40	8,615,000
1968	3,870	1,614,000	46	7,591,000
1969	3,585	1,342,000	42	6,585,000
1970	3,483	1,316,000	47	6,261,000
1971	3,757	1,594,000	50	7,100,000
1972	3,335	1,599,000	55	6,950,000

SOURCE: Rosedale and Mamer (1974), p. 19.

We should pause here in our survey of various labor strategies to consider the plausibility of the recruitment of the "green card" workers who have figured so importantly in both the history of lettuce and lemons. How was recruitment of this kind of labor possible? First, relatively small numbers of workers were involved (in contrast to the earlier large use of Braceros in cotton, sugar beets, or tomatoes). Second, the immigration laws of the early 1960s provided employers with relatively easy access to such labor. Eric Thor and John Mamer offered the following description of the strategy in 1963:

> An apparent alternative source of labor is the Mexican who enters under immigrant visa -- the so-called 'green card" worker. His entry comes under the provisions of the Immigration and Nationality Act, usually referred to as Public Law 414. As Mexico does not come under immigration quota, there is no maximum restriction on the number who may enter. The citizen of Mexico who seeks entry as a permanent worker-immigrant is required, as a condition of obtaining his visa, to have a letter from a U.S. employer offering employment, but neither party thereby enters into an actual contract relationship. Following entry into the U.S., the immigrant is free to seek employment as he moves about as he chooses. Many of those who enter under the immigrant provision have previously been Braceros. In contrast to the contracted Bracero, the immigrant may bring his family, and it appears that a substantial proportion do so.
>
> The provisions for immigrant entry under P.L. 414 have been in existence since 1951. However, it has only been in very recent years that the magnitudes of entry have reached significant levels. This recent build-up in the volume of immigrant movement is due in part to increasing interest of U.S. farm employers in this source of labor and to the development of systematic channels of approach for offering employment and recruiting of workers...
>
> It is estimated that by July 1, 1961, as many as 50,000 permanent immigrants from Mexico had been added to the U.S. farm labor force, with 22,000 being in California. In line with the recent upward trend, it appears that the number of green card immigrants in the California farm labor force at the 1962 peak was 30,000 to 35,000...
>
> Under the present administrative regulations relating to P.L. 414, the obtaining of immigration visas by Mexican citizens is relatively easy and depends primarily upon the holding of an offer of employment. The volume of entry is related directly to the level of interest and activity by U.S. employers or intermediaries (visa consultants) in obtaining labor from this

> source. If interest and activity continue to increase and if administrative regulations remain as they are at present, it appears highly probable that P.L. 414 entries will continue to mount.
>
> (University of California, 1963, pp. 20-23).

That such a strategy was indeed subsequently pursued was suggested by California Senator George Murphy, who estimated that there were 35,000 more green card workers in 1965 than in 1964 (Murphy, in California Tomato Grower, 1966, p. 6). But green card workers could legally take any job once they were in the United States. Their use thus implied a relatively high wage for agriculture and led to the sort of labor rationalization schemes pursued in lettuce and lemons. The importance of this relationship is its example of the complex interdependence of the labor process, technology, and State policies affecting the migration of labor.

The special nature of green card immigrants limited their use in California agriculture to those sectors that could employ high-wage labor rationalization. For those crops that could not undertake such schemes, other strategies were necessary, such as the use of illegal immigrants (whose existence was also dependent on State policy) who were more appropriate to low-wage work, mechanization of labor activities, or the elimination of the crop altogether. Strawberries and many other crops now make use of large numbers of undocumented workers; sugar beets and tomatoes (which will be discussed below) are crops that employed the mechanization alternative; and (white) asparagus is an example of a crop that could not successfully adapt to the new labor conditions and therefore was eliminated. We examine this case next.

Adaptive Response #4: White asparagus leaves California

Asparagus has been grown commercially in several regions of the United States since the last century, but California has been the leading producer, accounting for about fifty percent of U.S. production in the mid-1960s. There are two types of asparagus, white and green: green asparagus is eaten fresh, frozen, or canned; white asparagus is only canned, and U.S. production has been located entirely in the San Joaquin Delta region of northern California. Canned white asparagus constitutes the major portion of world trade in asparagus.

Asparagus is a perennial crop and requires a large investment in three years of cultivation before it is first harvested. Plants last from 8 to 20 years. Asparagus is also a very labor-intensive crop, both in the field and at the cannery or packing shed (Del Monte, 1963). Harvesting must be done every day once the season begins. Workers walk through the fields examining the spears, cutting the marketable ones with a knife. Other workers then collect the asparagus and "sled" it to packing sheds. Green spears are cut only slightly below ground, while for white spears, the dirt is mounded and the spears cut 8 to 10 inches below the surface. White asparagus cutting is obviously a more difficult task than harvesting green asparagus. A similar disparity exists in the cannery, for the white spears must not only be trimmed and sorted like the green, but also peeled as well (International Trade Center, 1979). Approximately four times as much labor is required to process a can of asparagus as a can of peas or tomatoes (U.S. Tariff Commission, 1973, p. 25).

These high costs of production have made asparagus one of the dearest vegetables. For example, in 1962, U.S. processors paid an average

of $20 per ton for sweet corn, $28 for tomatoes, $85 for green peas, $104 for snap beans, and $251 for asparagus (Del Monte, 1963). Since the early 1960s, U.S. consumer prices for fresh asparagus have risen at least as fast as any other vegetable, and canned asparagus prices have risen more rapidly than all other processed fruits and vegetables (U.S. International Trade Commission, 1976, p. A-41).

The end of the Bracero Program in 1964 was a crisis period for the California asparagus industry. Some 10,000 workers had been employed in harvesting this crop, about half of which were Braceros (see Table IV.2). The Braceros were used most extensively in cutting white asparagus, grown only for canning and accounting for practically all of the U.S. exports of canned asparagus (U.S. Tariff Commission, 1973, p. 37).

The presence of Mexican contract workers acted to hold down wages. As we seen in Table IV.8, piece-rates remained constant through the 1950s, rose to a new plateau in the early 1960s, then took off in 1965. Of particular note is the disparity between white and green asparagus piece-rates. White asparagus harvesting was paid at a lower rate until after the Bracero Program, even though it was much more difficult to harvest white asparagus.

Attempts to mechanize the asparagus harvest has been underway for many years, originating during World War II, and located primarily in California. Efforts in the 1940s on white asparagus culminated in a harvester built in San Jose in 1951, under contract from the California Asparagus Advisory Board (Kepner, 1965; Kepner, et al, 1966). The machine was not economical however, and the Bracero Program rendered it superfluous. It was resurrected in 1964 by the University of California at the instigation of asparagus canners and growers and it was tested for

TABLE IV.8: CALIFORNIA ASPARAGUS, 1950-1979

Crop year	Harvested	Total production	Total processed	Canned white	Canned green	Frozen	Recommended piece rates (per 100 pounds) cutting & sledding green for canning	white for canning
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
	(acres)		*(1,000 cwt.)*				*(dollars)*	
1950	71,700	1,792	1,160	631	434	20	n.a.	n.a.
1951	70,900	1,560	1,107	482	532	94	n.a.	n.a.
1952	69,400	1,527	977	525	348	103	n.a.	n.a.
1953	69,200	1,522	917	405	346	166	n.a.	n.a.
1954	72,400	1,520	1,035	417	500	117	n.a.	n.a.
1955	76,700	1,918	1,490	685	642	161	n.a.	3.25
1956	76,200	1,829	1,212	528	390	287	n.a.	3.25
1957	75,800	1,895	1,132	450	472	197	n.a.	3.25
1958	76,300	1,831	1,188	641	408	140	n.a.	3.25
1959	77,800	1,867	1,200	473	486	239	n.a.	3.25
1960	73,500	1,911	1,280	466	548	266	3.75	3.25
1961	66,000	1,980	1,376	653	445	278	4.10	3.80
1962	66,600	1,998	1,420	694	450	273	4.10	3.80
1963	65,900	2,043	1,429	703	458	251	4.10	3.80
1964	65,400	1,831	1,246	632	340	296	4.10	4.10
1965	54,900	1,537[a]	900[a]	304	352	247	4.50	4.90
1966	51,900	1,609[b]	1,148[b]	444	343	361	4.95	6.15
1967	50,200	1,406	880	119	399	358	n.a.	n.a.
1968	46,700	1,494	896	188	361	346	n.a.	n.a.
1969	44,700	1,296	760	129	379	251	n.a.	n.a.
1970	42,900	1,330	651	405[c]		246	n.a.	n.a.
1971	43,000	1,376	781	348		343	6.75	8.00
1972	45,700	1,554	850	372		478	7.00	8.00
1973	45,000	1,260	600	378		222	7.00	8.00
1974	44,100	1,279	671	524		147	8.00	10.00
1975	38,200	1,070	413	157		256	8.00	*d*
1976	33,900	1,254	529	177		352	n.a.	*d*
1977	30,300	1,121	560	204		356	n.a.	*d*
1978	28,000	784	255	115		140	n.a.	*d*
1979	26,400	924	444	235		333	n.a.	*d*

n.a. = data not available

TABLE IV.8, CONTINUED

[a] Excludes 120,000 cwt. not harvested or marketed because of economic conditions.

[b] Excludes 91,000 cwt. not harvested or marketed because of economic conditions.

[c] No longer broken down by type. White asparagus production insignificant.

d = not applicable.

SOURCES: Cols. 1-3: California Crop and Livestock Reporting Service, California Vegetable Crops, various issues.

Cols. 4-6: Idem, Vegetables Processing: Asparagus for Processing, annual issues.

Cols. 7-8: U.S. International Trade Commission, Asparagus: Report to the President, Investigation No. TA-201-4 Under Section 201 of the Trade Act of 1974, Publication No. 755, Washington, D.C., January, 1976.

two years (Ibid.). Results indicated that the machine had possible applications under the right field and economic conditions, but by 1967 white asparagus production had declined substantially, and the machine was never adopted commercially. Interestingly, the proto-type machine appears to have been about as successful as the early tomato harvesters, but unlike the asparagus harvester, the tomato harvester was widely adopted at about the same time.

A harvester for green asparagus was also developed, but non-uniformity of the stand made it uneconomic for harvesting spears; it reduced marketable yield by over 40 percent (University of California, 1963, p. B-96). A sled-type harvester had been used by the late 1960s in Michigan and New Jersey, but only for green asparagus pieces, intended for canning, not for the fresh market. The adoption of this machine in these states appears to have resulted from problems in recruiting labor (U.S. Tariff Commission, 1973, p. 24).

As a representative of the California Asparagus Growers Association summarized in 1972: "Over 16 different mechanical harvesting systems were developed and tested and hundreds of thousands of dollars expended in other research and development. Based on the results to date, no break-through is now apparent or expected in the reasonably foreseeable future." (Ibid., p. 115). But in recent years, work has begun on breeding uniformity into the asparagus plant, a precondition for the successful mechanization of tomatoes, and perhaps a basis for the eventual use of the machines in asparagus (U.S. International Trade Commission, 1976, p. A-102).

Without mechanization and without the Braceros, wages for white

asparagus harvesting jumped 20 percent in 1965 and another 25 percent in 1966, as growers struggled with the Filipino workers who had long been an important harvest labor force in California for green asparagus. At the same time as this struggle was occurring, the Taiwanese began growing and canning white asparagus for export to Western Europe, the major source of demand (Ibid., p. A-50). In West Germany, for example, where the United States accounted for 76 percent of canned asparagus imports in 1964 and Taiwan only 1 percent, by 1971, the roles were reversed, with Taiwan supplying 95 percent of the imports and the U.S. supplying less than 1 percent (Ibid., P A-82).

White asparagus production, the most labor-intensive of the two varieties, was essentially eliminated from the U.S. by the early 1970s (see Table IV.9). In recent years, the major producer and canner of white asparagus, Del Monte, has moved its production and canning operation to the Bajio region of Mexico, and now exports both white and green canned asparagus to the U.S. (Ibid., P. 56, 57). Fresh and frozen asparagus is also imported from Mexico. Del Monte is not the only major U.S. corporation to move to this region of Mexico.

This history is an excellent example of the potential for rapid structural change and dislocations under crisis within the evolving framework of a new international division of labor. If Taiwan had not imported U.S. technology in 1963 and begun an export-oriented industry, California might have successfully mechanized the crop over the few years after the Bracero Program and become even more entrenched in the production of this crop, as occurred in canning tomatoes. Of course, the low level of technology and labor-intensity of asparagus canning was,

TABLE IV.9: U.S. CANNED ASPARAGUS, 1945-1974

Crop year	U.S. production white	U.S. production green	Exports green and white	Imports
August		*(million pounds)*		
1945-1949	n.a.	n.a.	6.1	-
1950-1954	n.a.	n.a.	12.2	-
1955-1959	53.7	114.6	34.9	-
1960-1964	67.8	132.8	56.7	-
1965-1969	23.9	142.1	24.3	1.1
1970-1974	n.a.	133.6	5.0	7.7
Annual				
1960	51.6	134.7	51.2	-
1961	67.6	127.7	44.3	-
1962	74.3	137.3	64.1	-
1963	80.3	136.2	62.2	-
1964	65.1	126.9	61.7	-
1965	30.6	137.8	46.4	-
1966	44.0	140.5	29.0	0.6
1967	12.0	143.1	18.9	2.5
1968	18.6	143.2	15.7	0.9
1969	14.4	144.9	11.5	1.5
1970	6.3	133.3	7.5	2.5
1971	n.a.	129.7	4.5	5.4
1972	n.a.	137.1	3.8	9.4
1973	n.a.	135.6	4.1	12.5
1974	n.a.	132.1	5.1	8.8

n.a. = data not available
- = data negligible

SOURCE: U.S. International Trade Commission, Asparagus: Report to the President on Investigation No. TA-201-4 Under Section 201 of Trade Act of 1974, Publication No. 755, Washington, D.C., January, 1976, p. A-24.

and is, a barrier to such an outcome, and it should also be contrasted to the capital-intensity of much of current tomato processing. Uneven development in many factors produces differential outcomes in any historical conjuncture.

Adaptive Response #5: Continued mechanization of sugar beets

Sugar beets represent a different sort of example from the other crops we have considered, for the mechanization of harvesting was already completed in California during World War II and in the United States by 1958. But this partial mechanization is important to consider in comparison to other crops and to other phases in the production cycle of sugar beets.

Already at the turn of the century, mechanization of ground preparation, planting, and cultivation were well-advanced, but spring blocking and thinning and fall harvesting were very labor-intensive. To fill these large labor requirements, the sugar companies themselves recruited overseas labor (Taylor, 1967, p. 21). They would pit different races of workers against one another to break strikes and hold down wages. This domination by the refining companies pervaded the industry, for the refiners also provided the growers with seeds and extension personnel to supervise the production of the crop, and it appears they eventually made the decision to mechanize the harvest (Arrington, 1967, p. 12; Mamer, 1958).

Hand harvesting of sugar beets was one of the most arduous of all agricultural tasks. This led farmers to experiment with harvest machines even in the 1920s. But as with so much else in agriculture, the

State came to play a key role:

> The important step toward developing such machines... came in 1931, when the California Agricultural Experiment Station and the Bureau of Agricultural Economics of the U.S.D.A., cooperated in a study of the mechanization of sugar beet growing and harvesting...After 1938...grants from the U.S. Beet Sugar Association helped finance a more intensive research program. (Rasmussen, 1967, p. 32)

Blackwelder Manufacturing Company, later to produce the University of California's tomato harvester, worked with the University of California to develop one of the first successful sugar beet harvesters in 1940 (Blackwelder, 1964, p. 106). Still at the prototype stage, the machine was pressed into use because of war-induced labor scarcity. In 1942, sugar beet acreage in California dropped from 170,000 acres to 70,000 (Bainer, 1969, p. 232). The next year, "growers accepted processed seed that approached single germ units and the crude commercial harvester available by 1943 and the processor accepted the poorly topped beets. The result was the harvest became fully mechanized by the end of the war" (Ibid., p. 232). This was clearly a decision of the processors and can be partly attributed to government war price guarantees (Rasmussen, 1967, p. 33).

Adoption across the country was not as rapid: in 1944 only 7 percent of the harvest was mechanized across the U.S., only 12 percent by 1945, and 100 percent by 1958. 1958 was also an important year for the cotton harvester adoption, and the resultant decline in the use of Braceros in both cotton and sugar beets lessened the national significance of this program, as we have seen above.

This mechanization in sugar beets shifted that crop's peak demand for labor back to spring thinning. In California, considerable numbers of

Braceros were still imported for this purpose, even after the mechanization of the harvest. Machines were developed to thin the beets, but they lowered yields beyond economic consideration. Much greater hope was placed on precision planters. Extensive mechanical seeding arose after the war with the development of the monogerm seed, finally perfected in 1956. This development, by itself, greatly reduced the need to thin but it also raised the possibility of precisely planting the seeds, thereby eliminating thinning altogether.

Thus, the end of the Bracero Program found growers of sugar beets well under way toward total mechanization. The number of Bracero workers needed to thin sugar beets in California had declined from 4,560 in 1958 to 2,670 in 1963 (see Table IV.2). At the same time, acreage had increased by more than 50 percent with the removal of planting restrictions in 1962.

But it was not so much the adoption of mechanical thinning or precision planting that eased the transition, as it was the fact that sugar beet thinning required labor during the period of the year when there was little other demand for labor. Mechanization of the harvest removed sugar beets from the overburdened fall labor market, which was the peak for seasonal workers. Workers were more readily available during the spring, when beets are thinned. In fact, the large influx of illegal Mexican immigrants in the 1960s slowed the adoption of new machinery or herbicides, so that by 1976 fully 40 percent of the thinning and 90 percent of the hoeing were still done by hand (Kumar et al., 1978, p. 195).

One last point of importance should be noted. Sugar beets are grown all over the state by growers of varying size, but, in particular, they are grown in rotation with tomatoes and hence have the following desirable characteristic:

> ...beets were a uniquely desirable crop from an agronomic point of view. The sugar was sold to humans, the tops and pulp and molasses fed to animals, and the roots remained in the soil to enrich and condition it. Since the sugar was a mixture of water, sunshine, and air, the beet took nothing from the soil that was not returned in the form of manure from the animals which ate its by-products. The seven-foot taproot and the myriads of feeder roots broke up the soil, aerated it, and helped it drain and retain moisture. Beets were an "ideal" crop for rotation with grains, vegetables, or other crops which tended to exhaust the soil. Moreover, beet culture required deep plowing and careful preparation of the soil, leaving the soil in excellent condition for the crops which followed. Studies made both in Europe and the United States showed that the yields of other crops were increased when raised in proper rotation with beets. The beet was viewed as particularly adpated to the West because it was not competitive with wheat and corn, lent itself to diversification and stock feeding, improved the land, and provided the farmer on irrigation projects with the cash to meet his payments and to buy new equipment.
>
> (Arrington, 1967, pp. 11-12)

The importance of this lies in recognizing that California tomato growers were also beet growers, and hence had experienced the mechanization of a formerly labor-intensive harvest in the 1940s. Similarly, the approaching mechanization of thinning (or precision planting) sugar beets, the recent mechanization of the cotton harvest, and the already completed mechanization of potatoes, canning peas and green beans, spinach, and all other small grains could only encourage the more progressive tomato growers to pursue a mechanical strategy. Their situation in this respect is in marked contrast to the fruit growers and the growers of perishable vegetables for the fresh market, where no significant mechanization had occurred. The rapid diffusion of the tomato harvester in California and

the support of certain large growers in its invention were particularly affected by these earlier experiences, and it is to this case which we now turn.

PART V:

THE MECHANIZATION OF CANNING TOMATOES

In the preceding section we discussed the labor strategies of agricultural capital in five labor-intensive crops as a response to the end of the Bracero Program: the lettuce and lemon growers turned to labor rationalization schemes; the strawberry industry saw the recreation of sharecropping; sugar beet growers extended the mechanization already underway; and white asparagus production disappeared from California.

The following discussion of the development, adoption, and consequences of the tomato harvester is presented both in greater detail and in contrast to these other crops. Its adoption must be understood as a response to crisis, but also as only one of several possible responses. Too often the tomato harvester has been analyzed in isolation from the context of its development. The purpose here, then, is to explore the unique nature of tomato harvest mechanization and, in particular, to understand its relation to the labor market and labor process, and the role of the State in altering and mediating this relation.

The Development of the Mechanical Harvester

Labor shortages and strikes during World War II led to a re-evaluation by the University of California Department of Agriculture Engineering of the desired direction of new mechanization technology. Because of its heavy dependence on seasonal harvest labor, the canning tomato industry was placed high on the list of priorities for the pro-

TABLE V.1: CANNING TOMATO PRODUCTION STATISTICS FOR CALIFORNIA, 1950-1976

Year	Harvested acreage	Yield	Total Production	Farm gate price	CPI deflated price	Real grower costs
	(1000 acres)	*(tons/ac.)*	*(1,000 tons)*	*(dollars per ton)*		*(dol./ac.)*
1950	75.50	12.70	958.5	23.50	32.59	n.a.
1951	148.30	14.90	2,209.7	30.20	38.82	245.62
1952	112.90	16.10	1,817.6	25.50	32.08	292.29
1953	83.00	17.00	1,411.0	22.90	28.59	332.56
1954	79.50	16.90	1,343.6	20.40	25.34	343.83
1955	116.00	17.10	1,988.4	22.80	28.43	374.65
1956	151.50	18.30	2,772.5	22.70	27.89	421.92
1957	128.70	15.70	2,020.6	21.90	25.98	345.21
1958	152.90	17.20	2,629.9	22.70	26.21	392.92
1959	129.70	15.40	1,997.4	21.80	24.97	357.88
1960	130.00	17.30	2,249.0	23.40	26.38	425.31
1961	146.80	15.80	2,319.4	30.10	33.59	400.97
1962	177.20	18.20	3,225.0	27.60	30.46	475.97
1963	129.00	19.10	2,463.9	25.40	27.70	508.84
1964	143.00	21.00	2,002.5	25.40	27.23	576.38
1965	122.80	20.10	2,460.3	35.40	37.46	582.17
1966	162.50	19.30	3,136.3	30.00	30.86	505.71
1967	186.70	17.10	3,192.6	38.70	38.70	449.68
1968	231.30	21.20	4,903.6	35.20	33.78	512.32
1969	154.00	21.90	3,372.6	27.20	24.73	520.46
1970	141.30	23.80	3,362.9	25.20	21.67	533.74
1971	163.70	23.70	3,879.7	28.00	23.08	529.19
1972	178.90	25.30	4,536.2	28.00	22.35	559.92
1973	218.90	22.30	4,861.4	35.00	26.30	512.67
1974	249.90	23.40	5,847.8	56.80	38.46	522.53
1975	299.20	24.30	7,270.5	55.60	34.49	546.27
1976	233.80	21.70	5,066.5	47.40	27.88	n.a.

n.a. = data not available

SOURCE: Brandt, *et al.* 1976; Table A12, p. 111.

vision of an alternative to hand-harvest techniques (Bainer, 1969). At the same time, a farsighted plant breeder at the University, J. Hanna, began to work on a machine-harvestable tomato. In 1949 he approached the agricultural engineers with his progress and they drew up a design for a mechanical harvester. They determined that the tomato plant would have to be much more drastically redesigned, however, and so work continued, mainly on the plant breeding aspect, for the next ten years.

Early in the 1950s, Hanna interested the California Tomato Growers Association in his work, and they gave him some small grants (e.g. $1000 in 1956) according to the California Tomato Grower (1965), the major journal of the industry. However, the Bracero Program provided a ready supply of seasonal labor at a constant wage during the entire decade of the 1950s, and the machine appeared rather futuristic and irrelevant to most growers. In 1959, public discussion and action in the U.S. Congress first made it apparent that the Bracero Program might not survive, and the most progressive tomato growers began examining the machine alternative more closely. The growers association granted the University's researchers more money for a "crash program," and the engineers put a prototype in the field during the same year.

From 1959 through 1964, a process of testing, redesign, and evaluation of the mechanical harvester continued at an intense rate among a small group of the larger growers, the machinery companies, and the University. During the same period, the seed companies joined with Hanna to improve the tomatoes he had developed over almost 20 years of work.

The Bracero Program was not renewed after 1964, but some Mexican contract laborers were allowed into the California tomato harvest in

1965, as a transitional measure. The years 1965 to 1968 witnesses the rapid adoption of the machine, but what was adopted, it must be emphasized, was not entirely satisfactory, because the breeding of the tomato was not complete: the available machine harvestable tomatoes were still not sufficiently tough and did not ripen uniformly enough to prevent large losses of yields. It was not until after 1970 that these problems were overcome.

Mechanization as a Labor Market Strategy

Tomatoes were a very labor intensive crop to harvest by hand, and California canning tomato growers had come to be almost entirely dependent of Bracero labor in the 1950s. In the last years of the program, they constituted from 80 to 90 percent of the peak laborers in the harvest. From World War II until 1965, never less than 65 percent of the California canning tomato harvest labor force was foreign immigrant workers, whether legal or illegal (California Tomato Grower, 1965). This disproportionately heavy dependence on migrant harvest labor exemplifies the problems which arise from the uneven development of technology within and among crops.

The uneven development of technology within crops is usually manifested by the partial mechanization of planting and cultivating well before the mechanization of the harvest. This unequal mechanization among stages of production and an accompanying increased specialization of production together tend to increase the seasonality of labor needs. Increased seasonality (i.e. a sharper peak in the demand for temporary workers) implies a division of labor requirements between, on the one hand, family and permanent labor for continuous activities (maintenance, supervision, mechanized work and management tasks) and, on the other

hand, a migratory labor force for harvesting. Uneven development of technology thus may accentuate the dependence on very temporary and low-wage workers.

Canning tomatoes provide a particularly good example of this process of uneven development, since they required such a large number of workers for the harvest, but required far fewer workers for the planting and cultivation of the crop. The age-old pattern of agricultural development in California, in which immigrant labor was used for the non-mechanized aspects of production was thus accentuated by the continuing development of technology. A migratory pattern of seasonal labor utilization had, over the years, become reduced to the brief importation of Mexicans for a short harvest period.

Similar structures are evolving in many parts of the world. Much of the history of California agriculture is characterized by this duality and by the contradictions inherent in attempting to reproduce the migratory labor force. These contradictions have been reinforced by the uneven development of technology among crops.

This uneven development is not only a consequence of social, economic, and political factors, but also of scientific forces. Some crops are inherently more difficult to mechanize than others, since they require biological and cultural change as well as engineering innovations. Which of these crops are mechanized results from a social process of inducement, and this, in turn, depends on the social importance of the crop and the inducement efforts of groups associated with the crop.

The mechanization of selected crops may destroy migration patterns by eliminating jobs in one crop that had been an employment

link between jobs in other crops in the same region (California Agrarian Action Project, 1977; Hightower, 1978, p. 32). For example, in the early 1960s, in Santa Clara County, California, an attempt to mechanize the prune harvest was resisted by local growers because they believed it would become more difficult to obtain workers to harvest other fruits in the area e.g. apricots (Curley and Thor, 1964). A second example of the same phenomenon is given by Bainer, who points out that the rapid adoption of the cotton picker in California brought about a serious labor problem for Central Valley raisin and wine grape producers. Grapes and cotton are grown in the same general area and the labor normally picking the cotton comes two or three weeks early to pick the grapes. With cotton mechanized, the workers did not show up in as large numbers to pick the grapes, causing growers considerable problems. As a result, efforts to develop a mechanical grape harvester were begun immediately. This is a good example of how the process of uneven technological development works. Mechanization in one crop leads to mechanization in other crops, through the indirect impacts on the labor force (see Bainer, 1969, p. 232).

The sheer numbers of workers involved in tomato harvesting -- 30,000 to 50,000 -- made the Bracero Program more critical to this industry than to all other California crops combined. However, the large numbers also tended to preclude a labor rationalization or green card strategy, as was used in some of the other crops. Tomato growers had hired Braceros mainly through labor contractors or temporary associations set up only for that purpose. Many growers did not plant tomatoes every year. Thus they did not have the small, tight-knit groups necessary

to undertake systematic labor recruitment and management.

The alternative possibility of the canning tomato industry following the example of white asparagus and leaving the United States for cheap labor regions of other countries was raised as a very real threat at the time the Bracero Program was being considered for termination. Del Monte and some other firms had recently set up operations in Mexico, and it was widely believed that if wages rose high enough to attract domestic laborers, the crop would move to Mexico. Interestingly, California interests appear not to have anticipated the continued migration of illegal workers after the end of the Bracero Program.

The fear of rising wages was based on recent labor organizing in California agriculture. The Bracero Program had held wages virtually constant throughout the 1950s (Hayes, 1978, pp. 64-65), and had frustrated efforts to organize workers. Imported workers were overtly used to break strikes in the late 1940s, and this strategy was attempted again, with some success in the early 1960s. But wages began to rise after 1958 as organizing among farmworkers finally began to be successful. A series of strikes in 1960-61 reached the tomato fields, convincing growers that the end of the Bracero Program was sure to be accompanied by serious labor struggles and rising wages (Mines, 1974). This view was confirmed by the successes of organizers after 1964 and by the 26 percent jump in wages in 1964-65 (see Table V.2).

Hence the availability of the machine and a reasonably tough tomato, early successes by a few large growers to adopt the mechanized harvest, the difficulties of the alternative labor strategies, the rising evidence of labor organization and higher wages, and the possible

TABLE V.2: SELECTED PERFORMANCE MEASURES ASSOCIATED WITH THE MECHANICAL TOMATO HARVESTER AND WITH RAW PRODUCT HANDLING IN CALIFORNIA, 1960-1976

Year	Raw tomato production	Adoption rate of mechanical harvester	Harvest season work units		Farm wage rate	
			Total[a]	Per ton harvested	California tomato worker[b]	U.S. farm worker[c]
	(1,000 tons)	*(percent)*	*(1,000 weeks)*	*(weeks)*	*(Index: 1960 = 100)*	
1960	2,249	0.0	341.4	.152	100	100
1961	2,319	0.5	367.4	.158	105	103
1962	3,225	1.3	403.2	.125	96	105
1963	2,464	1.3	308.7	.125	101	108
1964	3,003	3.5	378.5	.126	104	113
1965	2,468	20.0	267.4	.108	131	118
1966	3,136	70.0	288.6	.092	138	126
1967	3,193	80.0	247.8	.078	135	139
1968	4,904	92.0	292.5	.060	155	150
1969	3,373	98.0	182.1	.054	168	166
1970	3,363	100.0	155.2	.046	169	179
1971	3,880	100.0	182.2	.047	178	187
1972	4,526	100.0	206.8	.046	178	197
1973	4,861	100.0	208.4	.043	233	215
1974	5,848	100.0	248.1	.042	235	247
1975	7,271	100.0	252.6	.035	270	267
1976	5,066	100.0	195.6	.039	293	292

[a]Harvest season extends from July 1 through November 15. The figures represent seasonal harvest labor.

[b]Index is based on weighted wage rate for harvest season tomato workers.

[c]Index is adjusted for seasonal variation.

SOURCE: Brandt, French and Jesse (1978), p. 35.

demise of the industry all contributed to make mechanization appear as the only alternative when the Bracero Program ended in 1964.

Adoption of the Harvester

The development and rapid adoption of the tomato harvester must be seen in terms of the interrelated efforts of all segments of the California canning tomato industry. The larger growers, through the California Tomato Growers Association, the University of California, the seed companies, the machinery companies, the banks and the canners all played important roles. But where the University's research was the crucial factor in the machine's development, processor acceptance was the essential prerequisite for adoption.

Although some small independent processors were always interested in mechanical harvesting, little encouragement was given the program by the major firms until the early 1960s; it was not until the mid-1960s that Del Monte began conducting research on new tomato varieties (Del Monte Shield, 1964). The division within the industry over this innovation is exemplified by one group of canners who paid higher prices for machine-harvested tomatoes as the Bracero Program ended, thereby hoping to encourage the adoption of the machine, and another group who tried to lower prices (California Tomato Grower, 1966 and 1980).

An important step in the adoption of the tomato harvester was the decision by major canners to accept the machine-harvested tomatoes. This decision implied conversion of tomato receiving facilities to handle bulk containers, increased washing and sorting operation, greater problems with quality control, different hours of operation, and many other changes.

Since almost all tomatoes were grown under contract, and since every contract specified the type of seed to be used and quality limitations, adoption could not have occurred without the consent of processing firms. (It should be added that while some of the processing was done by grower-controlled cooperatives, they constituted a small minority of all processing capacity, so the support of the large proprietary canners was very important to the survival of the industry.) In this sense, the end of the Bracero Program after 1964 was really more of an impetus to canners to withhold their support of the machine in favor of Bracero labor that no longer existed.

Once the processors decided to go over to machine-harvested tomatoes, adoption of the harvester was accomplished quickly after 1965 (see Table V.2). Some canners bought machines and leased them to their growers (California Tomato Grower, 1965); some searched out new (large) growers willing to buy the machines.

The cost savings to growers who adopted the technology were significant. "According to the California studies, mechanical harvesting reduced costs by $5.41 to $7.47 per ton, including amortization and interest charges on the new machine at 6 percent" (Schmitz and Seckler, 1970). These savings arose largely because the harvester was a once-through-the-field operations, whereas hand harvesting required 3 to 6 passes through the field, and because the machine sorters, who replaced the field pickers, were paid 15 to 25 cents per hour less (see Lorenzen, 1964, p. 18; California Agrarian Action Project, 1977).

However, the adoption of the harvester was an uneven process. First, larger farmers tended to benefit. As can be seen in Table V.3,

TABLE V.3: DISTRIBUTION OF CALIFORNIA TOMATO GROWERS, BY ACRES; 1964

Acres	Number of growers	Percent of growers
1 - 99	697	65.1
100 - 199	249	23.2
200 - 299	66	6.2
300 - 399	31	2.9
400 - 499	15	1.4
500 plus	14	1.4

SOURCE: E.Thor and J.Mamer, "California Canning Tomatoes, 1965 Labor Situation," Department of Agricultural Economics, University of California, Berkeley.

over 65% of canning tomato growers in California farmed less than 100 acres of tomatoes in the year prior to the end of the Bracero Program. The harvester, when first introduced, was designed to cover about 100 acres in a season. This minimum scale has risen constantly in the past 15 years with the introduction of new, faster machines.

Second, California has been favored over the Midwestern and Eastern tomato industries. California's share of U.S.processing tomato production has risen from around 50% in the early 1960s to over 90% in 1980 (California Tomato Grower, October 1980). Thus the continued demand for hard labor in the tomato fields of Ohio or New Jersey has steadily declined as a result of California's adoption of the harvester.

Finally, the introduction of the mechanical tomato harvester and new varieties of tomatoes made possible production in the Southern Central Valley on large, newly irrigated farms. Almost all of the subsequent growth of the industry has favored this region over the historical production areas of northern California.

The example of the tomato harvester conforms superficially to the well-known induced-innovation model of technological change: labor "scarcity" during World War II induced work to begin on the labor-saving technology package; further labor "scarcity" at the end of the Bracero Program brought about an increase in wages, inducing the adoption of the machine. But this formulation masks the social relations which lie beneath these changes in prices and wages. Thus, the Bracero Program, its termination, higher wages, and the adoption of the harvester can only be understood as the outcomes of a social conflict between capital and labor. The notion of labor "scarcity" in California agriculture is

really not one of absolute scarcity, but rather refers to a scarcity of labor that is willing to work for very low wages and under poor working conditions. It is better representation of history to place the tomato harvester into this context of cheap labor, after the industry lost its ability to control directly the supply of this labor. This is a much different perspective than the usual one that sees such invention as induced by changing factor price ratios.

Mechanization as a Labor Process Strategy

A dialectical approach to society seeks to locate the contradictions inherent in social reality that give rise to conflict and thus to qualitative changes in that reality. For understanding much of capitalist development, the fundamental motor force is that of the conflict between capital and labor. In the present example, this conflict plays a central role.

As we discussed above, the invention and adoption of the tomato harvester was a response to the problems associated with reproducing a cheap and docile labor force, the attempts to organize agricultural labor, and the resulting strikes and related higher wages. In the following section, we analyze the effects of the mechanical tomato harvester on labor by examining the struggles between growers and workers both over the control of the labor process and over the returns to labor. While the adoption of the harvester was an attempt to resolve some conflicts, and while it has provided a basis for a new process of accumulation, the basic contradictions of capitalist agriculture have merely been reposited in a new form.

The mechanical harvester offered tomato growers a new form of

control over the labor process. Braceros had been tremendously efficient workers: young men, coming from a very low-wage environment, paid on a piece-rate basis, and subject to being sent home if they did not perform up to a standard, had considerable incentives to work long and hard. These workers were effectively controlled by their ethnic separation from the rest of the labor force and by their non-citizen status, which served as a powerful threat. As we noted in Part II, this ethnic separation had characterized the history of labor control in California. But with the end of the Bracero Program, growers faced a new situation in which they were, for the first time, without access to a source of foreign workers to replenish the domestic labor market when conditions became tight. As a result, wages jumped and widespread agricultural labor organization became a real possibility. As we noted, there were several responses to this situation, but for tomato growers the solution was mechanization of the harvest.

The harvester both reduced the number of workers needed and altered the method of control. The ethnic segmentation was retained (over 90 percent of the post-Bracero Program labor force consisted of workers of Mexican descent [Thompson and Scheuring, 1978, p. 37]), but growers were able to substitute women on the sorting belts for the formerly all-male hand-picking crews (Friedland and Barton, 1975). About 80 percent of the new labor force was female (Thompson and Scheuring, 1978). Interestingly, this strategy of substituting women for men was recommended by a 1965 University of California study (Becket, 1966). This substitution increased grower control over labor by opening up a new low-wage and unstructured labor market for exploitation.

Grower control over labor was also increased by the discipline of the machine. Under the previous hand-picking regime, pressure for worker productivity was maintained through the institution of the piece-rate wage. A worker had to perform at a standard acceptable to the grower, or his wages were very low. Under the machine technology, productivity of labor was set by the assembly line process of the sorter belt. Thus the speed of the belt, coupled with hourly wages, helped to increase control over worker productivity (Edwards, 1979).

This new machine process brought about a structural change in the nature of the labor force: it reduced the seasonality and magnitude of labor needs, but redefined the composition. There was a "deskilling" of the majority of the workers, as the women sorters replaced men pickers, and a "skilling" of a minority who worked in new jobs as drivers and mechanics (see Table V.4).

Thus, in general, there resulted an unequal payoff to labor due to several effects of the harvester. On the one hand, an unemployment effect displaced those (few) domestic workers and all of the Braceros who had picked tomatoes, and eliminated the domestic picking job slots which might have resulted from the end of the Bracero Program. An accompanying employment effect provided jobs for women and certain (skilled) men. It should be noted that a likely additional effect of the harvester was to reduce the potential demand for labor in rural Mexico, for had this technology not arisen, at least some of the tomato production would have followed the Braceros back to Mexico.

Because the tomato industry did expand in California, the net impact on employment must be seen as the difference between the new jobs

TABLE V.4: COMPARISON OF WORK ORGANIZATION: HAND VS. MACHINE HARVEST

	Hand harvest	Machine harvest
Number of workers	50,000 (1964)	18,000 (1972)
Machinery used	Trucks (hauling)	Harvester Tractors or semi-trucks Forklifts
Job or skill gradations	Supervisors Pickers Lug counters Swampers Drivers	Supervisor Harvester operator Truck/tractor drivers Lift conveyor operators Head sorter Forklift operator Sorters Repair and service workers
Rate of pay	Pickers/piece rate All others/hourly	Hourly
Length of working day	8-12 hours (Conditions permitting)	8-12 hours (Conditions permitting) Night shift optional
Working conditions; posture	Stoop	Standing Restricted movement
Pace control	Individual	Machine-controlled
Special clothing used	None	Rubber gloves Bandana Sunglasses

SOURCE: Friedland and Barton (1975), p. 41.

created by this expansion, based on the substitution of unskilled for more skilled workers, and the jobs lost as a consequence of the substitution of machines for human labor. It must be remembered that expansion of the industry created jobs in the related canning, manufacturing, and transportation sectors of the economy, many of which were held by more skilled, and higher-paid workers. One study estimates that the total number of jobs created approximately equalled the number of jobs lost (Brandt, et al., 1978). Of course, there is no guarantee that those workers displaced in the fields found employment in these jobs. Indeed, given the segmented nature of the labor market, it is very unlikely that agricultural workers found work in these nonagricultural occupations (see Appendix to Part II). Thus, while the harvester may not have caused an overall reduction in aggregate employment, it still may have had highly unequal impacts on labor in that it increased the demand for skilled, organized workers at the expense of the less organized and less-skilled workers. The effect of this inequality is to increase the welfare of those who already enjoy some measure of economic well-being and to reduce the employment and incomes of those who live at the margin of society. Thus the real losers would appear to have been those migrant Mexican laborers who would have had more employment opportunities had the harvester not been introduced.

In addition to its differential impact on employment of different groups of workers, the harvester technology, through its impact on the race/sex/skill levels of agricultural workers, also effectively increased income inequality among agricultural workers. The skilled, year-around male workers are paid considerably more than the female sorters. The

sorters are chosen from a more marginal labor market; women who are supplementing family incomes, who are not family heads, and who work for only a short period of the year are less demanding of higher wages and less likely to organize to get them. During the period when mechanical picking and hand-picking were both taking place, sorters were paid 20 percent less than the pickers, and 10 to 20 percent less than average California farm wage (California Agrarian Action Project, 1978, p. 1365). Though the women perform exactly the same job as cannery workers, they are paid only half as much due to the lack of unionization and the absence of white or male workers.

This restructuring of the labor force occurred in the context of a growing labor movement. A strike in Delano in 1965 set the stage for Cesar Chavez and the United Farm Workers Union to build an increasingly powerful organization of agricultural workers. The growing success of these efforts helped to provide impetus to all of the strategies we have discussed.

Labor won a number of such struggles at the level of the State: in 1965, a federal law regulated labor contractors; in 1974, the California minimum wage was extended to male agricultural workers; in 1975, the California legislature passed the Agricultural Labor Relations Act, giving farm workers the right to organize unions, and also passed a law including agriculture in the unemployment insurance program. All of these laws and regulations have tended to raise the cost of labor to growers, both in terms of wages and fringe benefits (Mamer and Fuller, 1978).

The United Farm Workers pursued an organizing drive in some tomato fields in 1974. Strikes at the height of the season led to a 50

cent per hour increase in wages (California Agrarian Action Project, 1978, p. 1365). This followed a very substantial jump in wages in 1972-73 (see Table V.2). The next year brought the California Agricultural Relations Act which provided labor with a stronger base from which to demand union recognition. The growers responded to this increasing threat of higher wages by adopting the second major harvester innovation, the electronic sorter, which uses an electric eye to do the work of the handsorters, thereby eliminating about half of the labor previously required by the harvester. In 1976, 19 percent of the canning tomatoes in California were electronically sorted; in 1977 about 35 percent were so sorted, and today virtually all are electrically sorted (Kumar, et al., 1978, p. 189). The electronic sorter does not have offsetting job creation, as did the original harvester, and it is estimated that its adoption eliminated roughly 12,000 to 14,000 jobs (Thompson and Scheuring, 1978).

Movements to organize workers in other regions of the nation have met with similar responses (Downs, et al, 1979). Ohio farmers had never adopted the mechanical harvester because of the scale of farms, weather problems, different tomato varieties, and a different processing orientation (tomato juice and soup rather than catsup and paste, etc.), and hence the process of concentration of farming was not as advanced as in California. When workers struck the farms supplying one large processor, they were not successful in their efforts, primarily because the farmers were themselves so dominated by the processor that they had no margin with which to bargain. When workers attempted to involve the processor, it responded by making technical changes necessary to process machine-harvested tomatoes, and proceeded to force the adoption of the

tomato picking machines through its contract arrangements with its farmers. Efforts by the workers to form an alliance with small farmers, whose existence was threatened by these developments, failed, as did their efforts to raise wages.

In these examples, capitalist agriculture provides the basis for the organization of workers into coherent and powerful groups. In response to the struggle, farmers substitute machines for labor, in an effort to reduce dependence on labor and to increase the productivity of the remaining workers sufficiently so as to permit higher wages without a loss of profit. In the course of these events, farms became larger and fewer in number, and workers were eliminated from agriculture. The tomato harvester is only the latest in a long history of such machines. The cotton harvester, adopted under similar conditions, led to the transformation of many rural areas and the migration of millions of poor blacks to the cities (Bertrand, 1948).

To summarize, the tomato harvester was the result of labor's opposition to the low wages/high exploitation that has characterized California agriculture from its inception. Labor's efforts to eliminate the Bracero Program caused the adoption of more machines and the rationalization schemes outlined earlier. These, in turn, provided a new basis for accumulation, with the California tomato industry, in particular, coming to dominate processing tomato production in the United States. But the basic contradiction of capitalist production has not disappeared, and the basis for organizing workers remains and hence, so does the continued possibility of new conflict. To this must be added new contradictions associated with the rapid rise in real energy costs and the

growing evidence that many labor-saving innovations imply ecological destruction that will reduce the long-run productivity of the land. These new contradictions may make the tomato harvester just one aspect of a unique, and passing, historical development.

PART VI:

CONCLUSION

We can now use the information derived from the case studies developed above to draw a few conclusions useful to advance the development of a theory of the political economy of technological change in agriculture, especially as it relates to the use of hired labor.

1) A theory of the political economy of technological change must rest on an analysis of conflict between the social groups and classes as the most important dynamic force in society. Technology arises out of efforts of some groups of classes to assert control over others. This approach is in direct contraposition to the postulate of social harmony which underlies the market theories of technological change: in those, technological adjustments to price signals are said to lead to fair returns to factors of production (in the sense that each factor is rewarded according to its marginal productivity) and competition is the process whereby inequalities of factor rewards are equalized through reallocation of resources.

We have seen that in the case of canning tomatoes the conflicts between capital and labor and between different fractions of capital, and the way in which these conflicts materialize at the level of the State, are essential determinants of the rate and bias of technological change. In the conflict between capital and labor, the mechanization of harvesting was introduced as a means of both controlling the labor process and counteracting the rise in wages resulting from a conjuncture of growing labor scarcity (end of the Bracero Program) and rising wages (unionization of farm workers). By pacing the rate of work of harvest

crews, mechanization allowed the elimination of piece-rate incentives and supervisory expenses; by substituting unskilled female labor as sorters on the machine for semi-skilled male pickers, it also permitted access to a cheap and docile labor pool. Under the continued pressure of unionization and higher wage demands, the introduction of electronic sorting created a substantial reduction in labor use without compensatory employment increases in other sectors of the economy. The conflicts among branches of capital -- growers, processors, banks, and merchants -- over the control and appropriation of the agricultural surplus and the surplus created by technology are also key determinants of the rate and bias of technological change

2) Because the State plays such an important role in the generation and diffusion of agricultural technology, a theory of the political economy of technological change must incorporate a theory of the State. Of particular importance is for the theory to explain the trade-offs and complementarities among economic and technological policies. In our case studies, public policies favorable to mechanization only came about once policies influencing the organization and control of the supply of labor became inapplicable.

As we have seen above, the primary concern of the State in specialty crop production was, until the early 1960s, the regulation of labor supply in order to ensure low wages and reliable delivery of harvest crews. This orientation of public policy owed to the fact that control over labor was politically feasible as it had a long history and a large support system in the local political economy of California. Furthermore, this set of policies was economically effective for agri-

cultural labor markets which could be successfully segmented from the rest of the economy and replenished through entry of foreign migrants. By contrast, the development of a mechanization alternative appeared as more complex and uncertain since it required high costs, a long gestation period, and coordination of numerous research efforts. For growers, mechanization implied high fixed costs and hence greater risks, as well as increasing subordination to industrial capital. For processors, it implied lower product quality and the need for investment in different methods of handling and processing. Mechanization thus displaced the arena of conflict from the relation of capital and labor to conflict within the capitalist class.

3) The theory of the State used as part of a general theory of the political economy of technological change must explain not only the trade-offs and complementarities between technological and economic policies, but also the degree of relative autonomy of the State in handling the technological question. That is, the theory must deal with the question of the degree to which State policy reflects the particular interests of certain groups or the more general interests of the society as a whole. What can be observed from the above case study is that the degree of autonomy of the State regarding mechanization is both different at different levels of government and has been increasing over time toward greater autonomy from grower interests.

At the level of the State of California, agricultural interests appear to have had historically a strong instrumental hold over the State apparatus. This resulted in the capacity to orient land, water, labor

and technological policies very much in the favor of these interests. But these policies are circumscribed by limits imposed by the federal system of government, and at that level, the State has either enjoyed greater autonomy or responded instrumentally to dominant interests beyond those of California agriculture. Thus, California agricultural interests have been involved in a constant struggle to maintain favorable national labor policies, without lasting success as evidenced by the anti-Chinese Exclusion Act, the New Deal policies, or the loss of the Bracero Program in 1964. The recent USDA prohibition of the use of federal funds to support research on labor-saving mechanization is another indication of the limits of instrumentalist politics at the level of the federal government.

The relatively greater domination of state and local government by agribusiness, however, appears to be diminished by events of the past decade. The "one-man-one-vote" ruling of the mid-1960s reduced the power of rural constituents and gave more power to urban interests at all levels of government. Urban liberals, allied with organized labor in industry, did much to erode the power of agribusiness over rural labor in the 1960s and, now, as a result, labor legislation has spread to agriculture. Similarly, environmentalist interests have become increasingly powerful and promote other demands with which agribusiness must deal, even at the level of California and local politics. The recent California Agrarian Action Project suit against the University of California's research on mechanization derives strong support from urban groups. Thus, even where agricultural interests had their most secure hold over the policy process, recent events indicate a breakdown

in the power of these special interest groups and, at least, a displacement of instrumental dominance away from merely local agribusiness interests.

4) A political economy of technological change needs also to incorporate the law of uneven development. While deprived of much predictive power, this law is useful in understanding how the dialectic of contradictions negates the linear evolution of society. In capitalist society, in particular, where both the generation and appropriation of surplus is based on exploitative relations, the contradictions implied by these relations and the reactions they engender lead to uneven development. In our case studies, we observed that technological change both occurred in the context of and reinforced uneven development among crops, stages of production, producers, and regions.

Thus, we saw that in California the responses to the labor crisis of the early 1960s were quite varied among crops. Lettuce and citrus growers met the crisis by reorganizing the labor process to allow for higher wages. Labor rationalization schemes allowed them to stabilize the labor force, reduce needed employment, and raise productivity by at least as much as wages. Continuous employment was thus provided to a small number of highly paid workers. Strawberry growers, by contrast, adjusted to the labor crisis by converting farmworkers into sharecroppers. The institution of sharecropping, besides serving the usual purpose of capturing the totality of family labor, including that of women and children, also served as an intermediary access to the secondary labor market as the sharecroppers, in turn, recruited cheap Mexican illegals and relatives. For other crops, like asparagus, local adjustments to

higher wages were not possible and the activities were moved to Mexico where cheap labor was available.

The case of canning tomatoes, like the earlier example of sugar beets, provides an instance where higher labor costs were met through labor-saving mechanization. The effect on labor costs resulted from both sharply reduced labor needs and from the use of a different secondary labor force of women and youth whose work was being deskilled and paced by the machine.

Uneven development also occurred among stages of the production process and this had sharp implications for the structure of the labor market. Some stages of production of specialty crops were easier to mechanize than others: the preparation of the soil and cultural practices for tomatoes were mechanized early while harvesting had remained manual. The result was a concentration of labor requirements for very short periods of the production cycle and the consequent need to rely on a highly seasonal and abundant labor force. The labor structure of California agriculture thus became transformed into a combination of family and corporate enterprises with a minimum number of permanent employees to perform the mechanized and supervisory tasks and a seasonal labor force of semi-proletarian Mexican peasant to ensure the harvest. It is this sharp peak of seasonal demand that became compromised by the termination of the Bracero Program and for which a variety of alternative solutions had to be devised.

We have also seen evidence of the law of uneven development at work in the evolution of State policy toward immigrant labor. The mechanization of the cotton harvest in the 1950s freed producers in Texas

and other cotton-growing states from dependence on the Bracero Program and, consequently, political support for the program was gradually reduced to the non-mechanized specialty crops. Moreover, because specialty crop production was increasingly concentrated in California during the 1950s and 1960s (because of changes in transportation technology and the particular requirements of processors), most of the political support for the Bracero Program came from only California. Without a broader national constituency, the Bracero Program ceased to be politically viable.

Finally, we have seen that uneven development occurred among regions and growers. California's dominance in the canning tomato industry was reinforced by mechanization. Tomato producing regions in the midwest were eclipsed by this technological development. Within California, large growers in the southern part of the San Joaquin Valley, whose land had been recently irrigated with heavily subsidized water, were in a position to make use of the new machines and were the main beneficiaries of the technology among California growers.

5) An adequate theory of the political economy of technological change needs to incorporate a broad spectrum of social agents and specify the nature of their conflicts and common interests. In the case study of canning tomatoes, growers, processors, suppliers of agricultural inputs, and bankers all had actively influenced the generation and diffusion of the innovation through their political organizations, which took a great interest in the mechanization of tomatoes. These fractions of capital could influence mechanization policy because

they did not meet opposition from consumers or from industrial employers (since mechanization did not threaten real wages or industrial profits) and, because of the lack of effective union organization of agricultural workers, they did not meet opposition from labor. Thus, when faced with the serious political threats posed by industrial labor and urban groups to the continuation of the Bracero Program, these interests were able to turn to the mechanization strategy.

In handling the labor crisis via mechanization, the barriers these fractions of capital faced in the early 1960s were both overcome and re-created under new forms. It is also this dialectical transformation of barriers, and the consequent social and technological dynamic that it creates, that an adequate theory of technological change must incorporate. Here, new contradictions are emerging as a consequence of concentration of production and increasing organization of growers in relation to processors; relocation of domination over agriculture from industrial (processing) to merchant capital; increasing dependency on energy-intensive solutions in an era of energy crisis; increasing competition with industry for access to a minority of skilled workers; and weakening of labor segmentation and anti-union mechanisms of labor control. Created or reinforced by mechanization, these contradictions also set the background for new advances in agricultural technology.

BIBLIOGRAPHY

Arrington, L. "Science Government and Enterprise in Economic Development: The Western Sugar Beet Industry." Agricultural History. Vol. 41, No. 1 (January, 1967).

Bach, R. "Mexican Immigration and U.S. Immigration Reforms in the 1960s." Kapitalistate. No. 7 (1978).

Bainer, R. "Mechanization in Agriculture." Hort Science. Vol. 4, No. 3 (Fall, 1969).

Becket, J. "The Domestic Farm Laborer: A Study of Yolo County Tomato Pickers." Department of Agricultural Education, Research Monograph No. 2, University of California, Davis, 1966.

Berger, S. Dollar Harvest: The Story of the Farm Bureau. Lexington, Mass.: D.C. Heath, 1971.

Bertrand, A. "The Social Processes and Mechanization of Southern Agricultural Systems." Rural Sociology. Vol. 13, No. 1 (March, 1948).

Blackwelder, E. Testimony to California Legislature, Assembly Interim Committee on Agriculture. "Symposium on Farm Mechanization -- Transcript of Proceedings." (October 14, 1964.)

Brandt, J., et al. Economic Performance of the Processing Tomato Industry. Giannini Foundation of Agricultural Economics, Bulletin 1888, University of California, Berkeley, 1978.

Burawoy, M. "The Functions and Reproduction of Migrant Labor: Comparative Material from Southern Africa and the United States." American Journal of Sociology. Vol. 81, No. 5 (March, 1976).

California Agrarian Action Project. No Hands Touch the Land. Davis, California (July, 1977). Reprinted in: U.S. Senate, Subcommittee on Administrative Practice and Procedure of the Committee on the Judiciary, Appendix to Hearings title Priorities in Agricultural Research of the U.S. Department of Agriculture -- Appendix, Part 2, 95th Congress, First Session, 1978.

California Farm Labor Panel. "Final Report of the California Farm Labor Panel to Secretary of Labor W. Willard Wirtz." Los Angeles, (December 1, 1965.)

California Strawberry Advisory Board. "Agricultural Labor Requirements in the California Strawberry Industry." (March, 1965.)

California Tomato Growers Association. California Tomato Grower. Vol. 3, No. 9 (October 1960); Vol. 8, No. 10 (November, 1965); Vol. 9, No. 4 (April, 1966); Vol. 9, No. 6 (June, 1966); Vol. 10, No. 7 (July-August, 1967); Vol. 11, No. 6 (June, 1968); Vol. 23, No. 5 (May, 1980).

Chambers, C. California Farm Organizations. Berkeley, California: University of California Press, 1952.

Craig, R. The Bracero Program. Austin, Texas: University of Texas Press, 1972.

Curley, R. and E. Thor. "Migrant Labor and Mechanization." Paper presented at the Annual Meetings of the American Society of Agricultural Engineers, Fort Collins, Colorado, June, 1964.

de la Tore, A. "Mechanization in the California Canning Tomato Industry." Unpublished Working Paper, Department of Agricultural and Resource Economics, University of California, Berkeley, 1980.

Del Monte Corporation. Del Monte Shield. Vol. 15, No. 9 (July, 1963); Vol. 16, No. 12 (October, 1964).

Doeringer, P. and M. Piore. Internal Labor Markets and Manpower Analysis. Lexington, Mass.: D.C. Heath, 1971.

Downs, P., et al. "Migrant Workers, Farmers, and the Mechanization of Agriculture: The Tomato Industry in Ohio." Science for the People. Vol. 11, No. 3 (May-June, 1979).

Feder, E. Strawberry Imperialism. The Hague: Institute of Social Studies, 1977 (Research Report Series, No. 1).

Fisher, L. The Harvest Labor Market in California. Cambridge, Mass.: Harvard University Press, 1953.

Friedland, W. H. "Technology in Agriculture: Labor and Rate of Accumulation." In F. H. Buttle and H. Newby, eds., The Rural Sociology of the Advanced Societies: Critical Perspectives. Montclair, New Jersey: Allanheld, Osmun, 1980.

Friedland, W. H., A. Barton and R. Thomas. Manufacturing Green Gold, the Conditions and Social Consequences of Lettuce Harvest Mechanization. Department of Applied Behavioral Sciences, California Agricultural Policy Seminar, University of California, Davis, July, 1978.

Friedland, W. H., M. Furnari and E. Pugliese. "The Labor Process and Agriculture." Paper presented to the Working Conference on the Labor Process, University of California, Santa Cruz, March 14-16, 1980.

Fujimoto, I. and W. Kopper. "Outside Influence on What Research Gets Done at a Land Grant School: Impact of Marketing Orders." In U.S. Congress, Senate, Subcommitte on Administrative Practice and Procedure of the Committee on the Judiciary. Priorities in Agricultural Research of the U.S. Department of Agriculture. Part 2, Appendix, 95th Congress, 1st Session, 1978.

Fuller, V. "Comments on the Labor Situation." In Commonwealth Club of California, "California's Agricultural Objectives." Transactions of the Commonwealth Club of California. Vol. 38, No. 5 (July, 1944): pp. 173ff.

------. "Hired Farm Labor in the West." In President's National Advisory Commission on Rural Poverty. Rural Poverty in the United States. Washington, D.C.: U.S. Government Printing Office, 1968.

------. "The Struggle for Public Policy on Farm-Labor Management Relations." Unpublished Paper, Department of Agricultural Economics, University of California, Davis, 1973.

------. "The Supply of Agricultural Labor as a Factor in the Evolution of Farm Organization in California." Ph.D. dissertation, University of California, Berkeley; printed in U.S. Congress, Senate, Hearings of the Committee on Violations of Free Speech and Rights of Labor, Part 54. Washington, D.C.: U.S. Government Printing Office, 1940.

Gates, P. "Public Land Disposal in California." Agricultural History. Vol. XLIX, No. 1 (January, 1975).

Glass, J. "Conditions Which Facilitate Unionization of Agricultural Workers: A Case Study of the Salinas Valley Lettuce Industry." Unpublished Ph.D. dissertation, University of California, Los Angeles, 1966.

Hatch, E. "Stratification in a Rural California Community." Agricultural History. Vol. XLIX, No. 1 (January, 1975).

Hawley, E. "The Politics of the Mexican Labor Issue, 1950-1965." Agricultural History. Vol. XL, No. 3 (July, 1966).

Hayes, S. "Farm and Nonfarm Wages and Farm Benefits, 1948-1977." In Technological Change, Farm Mechanization and Agricultural Employment. Division of Agricultural Sciences, Publication No. 4085, University of California, Berkeley, 1978.

Hightower, J. Hard Tomatoes, Hard Times: The Failures of the Land-Grant College Complex. Cambridge, Mass.: Schenkman, 1978.

Hoffman, A. Unwanted Mexican-Americans in the Great Depression: Repatriation Pressures 1929-1939. Tucson, Ariz.: University of Arizona Press, 1974.

Ichihashi, Y. Japanese in the United States. Stanford, California: Stanford University Press, 1932.

International Trade Centre, UNCTAD/GATT. Major Markets for Canned Asparagus. Geneva, 1979.

Jamieson, S. Labor Unionism in American Agriculture. U.S. Department of Labor, Bureau of Labor Statistics Bulletin, No. 836.

Jones, L. "Labor and Management in California Agriculture, 1864-1964." Labor History (Winter, 1970).

Kelly, C. F. Testimony to the California Legislature, Assembly Interim Committee on Agriculture, "Symposium on Farm Mechanization -- Transcript of Proceedings." October 14, 1964.

Kepner, R. A. "Mechanical Harvester Feasible for White Asparagus." California Agriculture. Vol. 19, No. 1 (January, 1965).

Kepner, R. A., M. O'Brien and A. Carlton. "Mechanical Harvesting of White Asparagus." California Agriculture. Vol. 20, No. 5 (May, 1966).

Knickerbocker, B. "Trouble for Tomato-Picking Machines: U.S. to Farm Farmhands Instead." The Christian Science Monitor. December 24, 1979, p. 1.

Kumar, R., W. Chancellor, and R. Garrett. "Estimates of the Impact of Agricultural Mechanization Development on In-Field Labor Requirements for California Crops." In Technological Change, Farm Mechanization and Agricultural Employment. Division of Agricultural Sciences, Publication No. 4085, University of California, Berkeley, 1978.

LeVeen, P. "Economic Advantages of Large Crop Farms in California." Working Paper, Department of Agricultural and Resource Economics, University of California, Berkeley, 1978.

------. "Natural Resource Development and State Policy: Origins and Significance of the Crisis in Reclamation." Antipode. Spring, 1979.

Light, I. Ethnic Enterprise in America. Berkeley, California: University of California Press, 1972.

Lorenzen, C. Testimony to the California Legislature, Assembly Interim Committee Agriculture, "Symposium on Farm Mechanization -- Transcript of Proceedings." October 14, 1964.

Mamer, J. "The Generation and Proliferation of Agricultural Hand-Labor-Saving Technology: A Case Study of Sugar Beets." Unpublished Ph.D. dissertation, University of California, Berkeley, 1958.

Mamer, J. and V. Fuller. "Employment on California Farms." In Technological Change, Farm Mechanization, and Agricultural Employment. Division of Agricultural Sciences, Publication No. 4085, University of California, Berkeley, 1978.

Matsui, S. "Economic Aspects of the Japanese Situation in California." Unpublished Master's thesis, University of California, 1922.

McWilliams. C. California: The Great Exception. Santa Barbara, California: Peregrine Press, 1976.

------. Factories in the Field. Santa Barbara, California: Peregrine Press, 1971.

Mines, R. "Las Animas, California -- A Case Study of International Village Network Migration." Unpublished Ph.d. dissertation, University of California, Berkeley, 1980. Published as Monograph No. 3, Monographs in U.S.-Mexican Studies. La Jolla, California: Program in U.S.-Mexican Studies, University of California, San Diego, 1981.

------. "The AFL-CIO Drive in Agriculture, 1958-1961." Unpublished M.A. thesis, Columbia University, New York, 1974.

Murphy, Senator G. In California Tomato Grower. Vol. 9, No. 2 (February, 1966).

Peterson, M. L. "The University of California Research Program on Agricultural Mechanization." Speech given at the Meeting of the California State Chamber of Commerce, San Francisco, October 6, 1964.

Piore, M. "Notes for a Theory of Labor Market Stratification." In Edwards, et al. (eds.), Labor Market Segmentation. Lexington, Mass.: D.C. Heath, 1975.

Poli, A. Japanese Farm Holdings on the Pacific Coast. United States Department of Agriculture, Bureau of Agricultural Economics, 1944.

Rasmussen, W. D. "Technological Change in Western Sugar Beet Production." Agricultural History. Vol. 41, No. 1 (January, 1965).

Rosedale, D. and J. Mamer. "Labor Management for Seasonal Farm Workers: A Case Study." Information Series in Agricultural Economics. No. 74-1, University of California, Berkeley-Giannini Foundation, March 20, 1974.

Schmitz, A. and D. Seckler. "Mechanized Agriculture and Social Welfare: The Case of the Tomato Harvester." American Journal of Agricultural Economics. Vol. 52, No. 4 (November, 1970).

Shaw, T. Testimony in California Legislature, Assembly Interim Committee on Agriculture, "Symposium on Farm Mechanization -- Transcript of Proceedings." October 14, 1964.

Smith, R., D. Seamount and B. Mills. Lemon Picking and the Ventúra County Tree Production Incentive Wage System. California Agricultural Experiment Station Bulletin No. 809, University of California, January, 1965.

State of California, State Relief Administration, Special Surveys and Studies Division. Migratory Labor in California. San Francisco, California, 1936.

Taylor, Paul. "Hand Laborers in the Western Sugar Beet Industry." Agricultural History. Vol. 41, No. 1 (January, 1967).

Thompson, O. and A. Scheuring. "From Lug Boxes to Electronics: A Study of California Tomato Growers and Sorting Cres." California Agricultural Policy Seminar, Monograph No. 3, Department of Applied Behavioral Sciences, University of California, Davis, December, 1978.

Thor, E., A. A. M. Goueli and A. Hutchens. "Costs of Alternative Methods of Harvesting and Packing Lettuce." Information Series of Agricultural Economics. No. 65-1, Agricultural Experiment Station, University of California, Berkeley, October, 1965.

Turner, W. "No Dice for Braceros." Ramparts. September, 1965.

U.S. Congress, Senate, Committee on Education and Labor. Hearings before the Subcommittee on the Violations of Free Speech and the Rights of Labor, 76th Congress, 2nd Session, Washington, D.C.: Government Printing Office, 1940.

United States Department of Agriculture, Foreign Agricultural Service. Foreign Agriculture. May 23, 1966.

United States International Trade Commission. Asparagus: Report to the President on Investigation No. TA-201-4. USITC Publication 550, Washington, D.C., April, 1973.

United States Tariff Commission. Conditions of Competition Between U.S.-Produced and Foreign-Produced Asparagus. TC Publication 550, Washington, D.C., April, 1973.

University of California, Division of Agricultural Sciences. California Agricultural Labor Requirements and Adjustments. Berkeley, California, September, 1964.

------. Research on Agricultural Mechanization. 1966.

------. Research on Agricultural Mechanization. 1967.

------. Seasonal Labor in California Agriculture. 1963.

Wells, M. "Regional Forces and Industrial Constraints: Changing Labor Market Structure in the California Strawberry Industry." Unpublished Paper, Department of Applied Behavioral Sciences, University of California, Davis, 1980.

Wik, R. "Some Interpretations of the Mechanization of Agriculture in the Far West." Agricultural History. Vol. XLIX, No. 1 (January, 1975).

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