

# University of Arizona

COLLEGE OF AGRICULTURE

AGRICULTURAL EXPERIMENT STATION

## HIRED LABOR REQUIREMENTS ON ARIZONA IRRIGATED FARMS

By

E. D. TETREAU

In co-operation with the Federal Works Progress Administration  
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\*On leave.

†In co-operation with United States Department of Agriculture, Bureau of Plant Industry.

‡In co-operation with United States Department of Agriculture, Bureau of Agricultural Engineering.

## SYNOPSIS

Arizona's five principal irrigated areas contain about 690,000 acres in irrigated farms. A sample of 670 farms, containing 67,000 acres, showed that a little less than one half of the farms were under 50 acres in size, 37 per cent ranged from 50 to 174 acres, and the remainder were from 175 to 1,000 acres or more in size. All farms averaged 100 acres, of which 90 acres were irrigated in 1935, 2 acres had previously been irrigated, and 8 acres had never been irrigated.

These five principal areas required 4,400,000 man-days of hired labor during 1935 which cost almost \$7,000,000. Less than one third of this amount of labor was hired by the month or by the year while the remainder was seasonal.

It was estimated that 1936 requirements were 5,250,000 man-days, hired at a cost of almost \$9,000,000. Increases over 1935 were about 5 per cent in the amount of regular labor and 25 per cent in the amount of seasonal labor; while rates of pay for regular labor went up about 9 per cent and for seasonal labor 10 per cent.

Hired labor during 1937 exceeded 1936 requirements by about 5 per cent for regular labor and 10 per cent for seasonal. Rates of pay were increased about 7½ per cent for regular and 10 per cent for seasonal labor. Total labor requirements amounted to 5,709,000 man-days, hired at a cost of \$10,600,000.

Regular labor, that is, labor hired by the month or by the year, was used in greater proportions in the Salt River Valley than in any other irrigated area. The smallest proportion of regular labor was used in the Casa Grande Valley. Of each 1,000 man-days of hired labor 356 were regular labor and 644 were seasonal labor in the Salt River Valley, while 147 were regular and 853 were seasonal labor in the Casa Grande Valley. Between these extremes fell the upper Gila, Yuma-Gila, and Santa Cruz valleys.

Regular labor requirements were fairly evenly distributed throughout the year, although February and March needs were low and June and July requirements high as compared with the remaining months of the year (Fig. 2).

Seasonal labor was required during every month of the year. November and March were the months of high and low requirements. While 558,000 man-days were used during November, 1935, only 89,000 were required during March. Roughly the proportion was as six is to one. The most extreme variations in seasonal labor needs were found in the upper Gila Valley, while the least extreme variations were in the Salt River Valley (Fig. 2).

Among the nine labor-use areas of the Salt River Valley the Glendale-Tolleson farming area showed the least difference between the months of high and low seasonal labor needs.

Among the four labor-use areas of the Yuma-Gila Valley, the Yuma Mesa farming area showed the least difference between

## SYNOPSIS—Continued

high and low months as to seasonal labor requirements.

Seasonal labor requirements were most evenly distributed in those areas that were largely devoted to truck crops or citrus fruits, while they were most unevenly distributed in those areas in which cotton was the chief commodity. Area diversification of crops tended to spread seasonal labor needs, while area specialization tended to concentrate requirements within the limits of a few months.

Rates of pay for hired labor on farms increased westward. They were lowest in the upper Gila Valley, higher in the Salt River Valley, and highest in the Yuma-Gila Valley, bordering California. Apparently proximity to California's highly developed irrigated areas tended to raise wage rates.

Hired labor costs on irrigated farms during 1936 were estimated to have been about \$2,000,000 higher than costs during 1935. This amount was more than one half of the increase in cash farm income during the same period. Increased labor costs were a result of increases in volume of labor used and increases in rates of pay.

Increases in the amount of hired labor used on Arizona irrigated farms indicate a return to a more normal labor situation on farms. Increases in the acreages of crops that require much hand labor and decreases in the amount of family labor used on the home farm have largely accounted for the increased amounts of hired labor employed. Increased rates of pay have been largely due to favorable commodity prices, to competing rates in non-agricultural employment, and to rates in government employment.

While wage rates in Arizona nonfarm industries, especially mines, made greater increases during the years from 1932 to 1936 than wage rates on Arizona irrigated farms, total annual pay rolls on farms were maintained on a more equal level from year to year. This was due to a more equitable distribution in the amounts of labor employed from year to year.

The greater part of the labor hired on Arizona irrigated farms falls under the heading of experienced common labor. With increased mechanization of farming operations, less unskilled and inexperienced labor will be needed. It is believed that there will be some increase in the demand for regular labor having both experience and skill in carrying on the many operations of a modern irrigated farm.

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# HIRED LABOR REQUIREMENTS ON ARIZONA IRRIGATED FARMS

BY E. D. TETREAU

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## WHY AND WHERE THE STUDY WAS MADE

### **Purpose of the study**

This study was designed to answer a number of questions about hired labor on Arizona irrigated farms. The most important of these were:

How much hired labor is required on Arizona irrigated farms?

How much is hired by the month or year? How much is seasonal?

How are hired labor requirements distributed throughout the year by months and by seasons?

How are hired labor requirements distributed throughout Arizona by irrigated areas and by special crops?

What factors are associated with farm-labor demand, and how do these affect the proportions of regular and seasonal labor required?

How much do Arizona farmers pay for hired labor?

It was intended that answers to these questions would be useful to Arizona agriculture.

The Agricultural Extension Service has very little organized information on farm labor, although labor constitutes one of the most important factors in the production of Arizona commodities.

Farm operators need a fairly complete picture of labor demand in irrigated areas in order to adjust their labor requirements in the interest of increased labor efficiency.

Farmers' employment bureaus are in need of additional information about the total amount of labor—regular and seasonal—used in irrigated farming areas, so as to co-ordinate anticipated seasonal labor needs for certain special crops such as cotton with needs for other crops and with regular labor requirements.

Public employment agencies that serve workers, in other industries as well as agriculture, need more complete data on agricultural labor requirements to compare with the requirements of mining, transportation, and trade.

It was also intended that the results of the study would be useful to public agencies that are directly concerned with the character and composition of Arizona's incoming population. It is a matter of common observation that many families that have entered Arizona in times of heavy seasonal labor demand remain in the state as permanent residents.

As a more generalized contribution of this study, it was believed that the analysis of factors associated with seasonal and regular

labor requirements would serve to clarify the relation of labor to other elements in the pattern of rural social organization.

#### Scope and method

Field surveys were made in eleven townships in the upper Gila, Salt River, Casa Grande, and Yuma-Gila valleys. These surveys were made during the summer of 1936 and covered labor requirements for 1935. Results were weighted so as to arrive at the labor requirements of the entire farm acreage contained in these four valleys and in addition were applied to the Santa Cruz Valley. The five valleys contained 690,640 acres in irrigated farms. Farms included in the field surveys contained 67,365 acres. Basic information was gathered from 670 farm operators, for each of which a farm schedule was filled. This schedule showed the tenure of the operator, total acres in the farm, acres irrigated during 1935, acres never irrigated, and the total number of man-days of hired labor used on the farm during 1935 with a statement of the total cost of the hired labor and its distribution in man-days month by month throughout the year. It also included a simple breakdown of the volume and cost of hired labor used in certain farming operations such as picking cotton and harvesting lettuce.<sup>1</sup>

#### REGULAR AND SEASONAL LABOR USED ON ARIZONA IRRIGATED FARMS

Results of the survey of hired labor used on 670 Arizona irrigated farms were applied to the total acreage in irrigated farms in Arizona's five major irrigated areas, the Salt River, upper Gila, Yuma-Gila, Santa Cruz, and Casa Grande valleys. It was found that in 1935 more than 4,400,000 man-days of hired labor were required to carry on farming in these five areas. By far the greater part of this hired labor was seasonal, 691 days per 1,000 being the proportion, while the remaining 309 days per 1,000 represented labor hired by the month or by the year (Table 1).

Regular labor—that is, labor hired by the month or by the year—on Arizona farms was estimated to have been 5 per cent greater in volume during 1936 than 1935.<sup>2</sup> In man-days the estimated volume of regular labor employed was 1,436,900. Seasonal labor was estimated to have been at least 25 per cent greater in volume during 1936 than 1935.<sup>3</sup> For this class of labor 3,818,500 man-days were required. In all there were required during 1936 a total of 5,255,500 man-days.

It was estimated that during 1937 the amount of regular labor used exceeded the amount used during 1936 by 5 per cent, while seasonal labor exceeded the 1936 total by 10 per cent. Thus the amounts of regular and seasonal labor were 1,509,000 and 4,200,000

<sup>1</sup> A more complete account of research procedure is given on page 209.

<sup>2</sup> For the method of estimating changes in the amount of labor used from year to year see page 214.

<sup>3</sup> See note on estimates for 1936 and 1937, page 214.

TABLE 1.—REGULAR AND SEASONAL LABOR REQUIREMENTS BY AREAS, FIVE ARIZONA AREAS, 1935.

Area and county	Acres in irrigated farms	Commodities	All hired labor in man-days (in thousands)	Distribution per 1,000 man-days	
				Regular	Seasonal
Salt River Valley (Maricopa)	463,360	Cotton, alfalfa, beef cattle, dairy products, truck crops, grain, citrus fruits	2,890	356	644
Upper Gila Valley (Graham)	80,000	Cotton, alfalfa, grain, dairy products	245	314	686
Yuma-Gila Valley (Yuma)	46,240	Cotton, alfalfa, truck crops, citrus fruits	485	289	711
Santa Cruz Valley (Pima)	24,960	Cotton, some dairy products	198	164	836
Casa Grande Valley (Pinal)	76,080	Cotton, alfalfa, truck crops	605	147	853
Total	690,640		4,423	309	691



man-days, respectively. The year's requirements amounted to 5,709,000 man-days.

#### **Irrigated areas compared as to regular and seasonal labor**

It was found that the Salt River Valley farms used regular labor, as compared with seasonal, in higher proportions than any other major irrigated area in Arizona. Of each 1,000 man-days required (1935) on Salt River Valley farms, 356 were hired by the month or by the year. In contrast Casa Grande Valley farms used only 147 man-days, per 1,000 man-days, as labor hired by the month or by the year. Between these extremes fell the upper Gila, Yuma-Gila, and Santa Cruz valleys. In these areas the number of man-days of labor hired by the month or by the year were 314, 289, and 164, respectively per 1,000 man-days (Table 1).

Putting the comparison between the regular and seasonal labor requirements in its simplest terms, each man-day of regular labor used on Arizona irrigated farms was matched by 2.23 man-days of seasonal labor.

Salt River farms matched each man-day of regular labor with 1.81 man-days of seasonal labor; upper Gila farms used 2.15; Yuma-Gila farms required 2.46; Santa Cruz farms used 5.09; and Casa Grande Valley farms employed 5.12 man-days of seasonal labor for each man-day of regular labor required.

#### **Factors associated with regular and seasonal labor requirements**

Differences between irrigated areas with respect to the proportions of regular and seasonal labor used were associated with certain factors, the most important of which were: the extent of commodity diversification within a given area; the extent of diversification on individual farms; the extent to which family labor was used instead of hired labor to do regular or seasonal farm work; and the extent to which new land was being brought under irrigation in any given area.

Rather consistently with a decrease in the diversity of commodities produced within the areas went a decrease in the proportions of regular labor used. The Salt River Valley showed the greatest diversification of commodities, and the Santa Cruz and Casa Grande valleys showed the least,<sup>4</sup> the proportions of regular labor used varied accordingly (Table 1). Thus one factor which tended to increase the amount of regular labor needed on farms was partly neutralized by another. The extensive use of family labor decreased the amount of regular labor required in an area which would otherwise have required more regular labor. The operation of these factors placed the upper Gila below the Salt River Valley and above the Yuma-Gila, Santa Cruz, and Casa Grande valleys as to the proportions of regular labor required.<sup>5</sup>

<sup>4</sup> George W. Barr, Agricultural Economist, Arizona Agricultural Experiment Station, from unpublished records.

<sup>5</sup> *Census of Agriculture, Arizona, Second Series, 1935*, pp. 10 and 11.

Lack of diversification, either on individual farms or within the areas, had much to do with the small proportions of regular labor used in the Santa Cruz and Casa Grande valleys. Area diversification had much to do with the Yuma-Gila Valley's more extensive use of regular labor. It ranked third among the areas.

One of the most important factors associated with the small proportions of regular labor used in the Casa Grande Valley was the extensive acreage of new lands brought under cultivation and irrigation during recent years within that area. Clearing and leveling land has called for extra labor, the most of which was hired by the day. This extra labor was used to irrigate new lands and to do other work often done by regular labor. Moreover, cotton was widely used as a new-land crop, so that the seasonal requirements of this crop tended to increase the demand for day labor in this area. Many new families moved into the Casa Grande Valley at the time of the opening of the San Carlos project. Some were too poor to settle on good land. They became available as cheap labor. It is probable that the amount of labor locally available for employment by the day has had much to do with encouraging the practice of using large proportions of seasonal labor.

#### **Volume of hired labor from month to month**

The volume of hired labor used on Arizona irrigated farms changed a great deal from one month to another. As would be expected, the numbers of man-days of labor hired by the month or by the year varied much less from month to month than the numbers of man-days of seasonal labor. Regular labor, though quite evenly spread throughout the twelve months of the year, was employed in greater volume during June and July than during any other months. The smallest number of man-days of regular labor was found during the months of February and March. Seasonal labor employed was at its lowest ebb during the month of March and at its highest during November. November and March man-days of seasonal labor were as six to one. Looking upon the volume of labor for the year as a whole, considerably more than two days out of every three were hired seasonally (Table 2 and Fig. 1).

#### **Irrigated areas compared as to monthly distribution of regular labor**

Although the volume of labor hired by the month or by the year did not vary a great deal from month to month, a considerable difference between irrigated areas was found in this regard. Yuma-Gila Valley farms showed the least variation from month to month, while upper Gila Valley farms showed the greatest variation. These variations indicate that a great number of workers were hired for periods of one, two, or three months only, or at least that they worked only that long a period as regular laborers. They also suggest that in some areas, the Salt River Valley for example, the practice of hiring men by the month even

**HIRED LABOR DISTRIBUTION ON ARIZONA IRRIGATED FARMS,  
BY MONTHS, 1935**

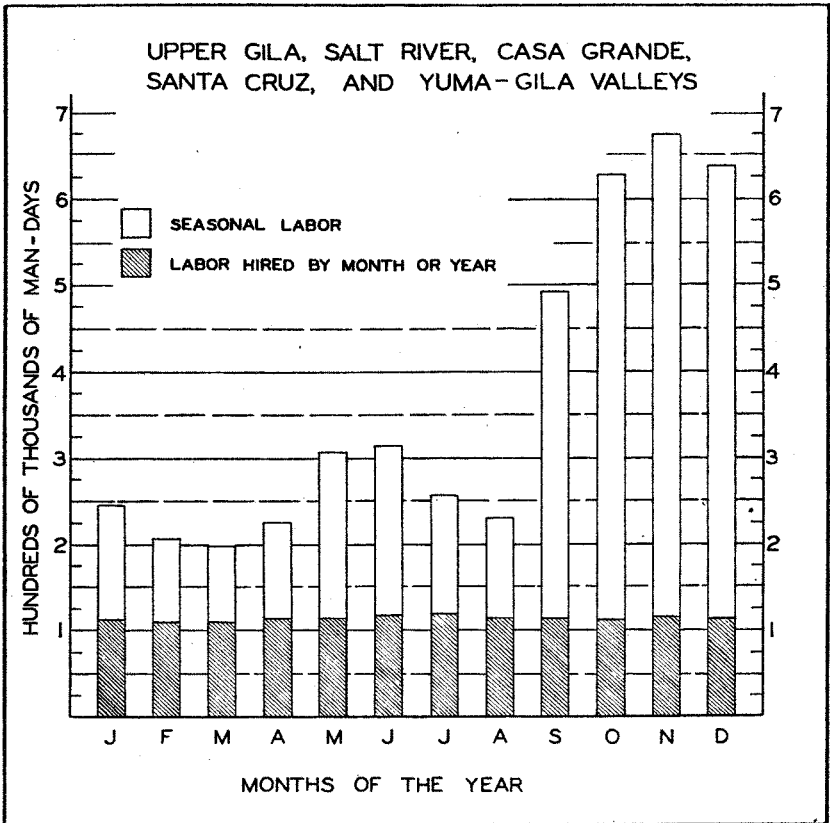


Figure 1.—Labor hired by the month or by the year in Arizona's five major irrigated areas was fairly evenly distributed month by month throughout the year. Seasonal labor in contrast varied in amount from month to month. Requirements in man-days for the high and low months, November and March, were as six to one.

for relatively short periods is more general than in other areas in which day labor is extensively employed (Table 3).

**Irrigated areas compared as to monthly distribution of seasonal labor**

Considerable difference in monthly seasonal labor requirements was found in a comparison of irrigated areas. The most extreme variation appeared in the upper Gila Valley in which January and February requirements were practically nothing, and November requirements were 234 man-days per 1,000 man-days distributed throughout the year. Almost one fourth of the

TABLE 2.—REGULAR AND SEASONAL LABOR REQUIREMENTS ON ARIZONA IRRIGATED FARMS BY MONTHS, 1935.\*

Month	Monthly distribution of man-days, regular and seasonal labor, per 1,000 man-days					
	Labor hired by month or year		Seasonal labor		Total man-days	
	Number in thousands	Per 1,000	Number in thousands	Per 1,000	Number in thousands	Per 1,000
January	114	83	135	44	249	56
February	111	81	97	32	208	47
March	110	81	89	29	199	45
April	113	83	113	37	226	51
May	115	84	192	63	307	69
June	118	86	197	64	315	71
July	119	87	137	45	256	58
August	115	84	116	38	231	53
September	114	83	376	124	491	112
October	112	82	517	169	629	142
November	115	84	559	183	674	152
December	113	82	525	172	638	144
Total	1,369	1,000	3,054	1,000	4,423	1,000

\* This table shows man-days of hired labor used on irrigated farms in the Salt River, Upper Gila, Yuma-Gila, Santa Cruz, and Casa Grande valleys.

TABLE 3.—REGULAR LABOR IN MAN-DAYS, BY MONTHS, FIVE AREAS, 1935.\*

Month	Monthly distribution of man-days, regular labor, per 1,000 man-days				
	Upper Gila Valley	Salt River Valley	Santa Cruz Valley	Casa Grande Valley	Yuma-Gila Valley
January	78	83	80	80	83
February	78	81	80	80	82
March	78	81	81	81	82
April	78	82	83	83	83
May	83	84	84	84	84
June	87	86	84	84	85
July	87	87	84	84	85
August	83	86	84	84	84
September	85	83	85	85	83
October	87	82	85	85	82
November	89	83	85	85	84
December	87	82	85	85	83
Total	1,000	1,000	1,000	1,000	1,000

\* The total man-days of labor hired by the month or by the year during 1935 were: upper Gila, 77,000; Salt River, 1,030,000; Santa Cruz, 32,000; Casa Grande, 89,000; and Yuma-Gila, 140,000.

total volume of seasonal labor used in the area was concentrated in one month, November. The high and low points in seasonal labor requirements of Santa Cruz Valley farms were as thirteen to one; of Casa Grande Valley farms, eight to one; of Yuma-Gila Valley farms, seven to one; and of Salt River Valley irrigated farms they were as six to one (Table 4).

TABLE 4.—SEASONAL LABOR IN MAN-DAYS, BY MONTHS, FIVE AREAS, 1935.\*

Month	Monthly distribution of man-days, seasonal labor, per 1,000 man-days				
	Upper Gila Valley	Salt River Valley	Santa Cruz Valley	Casa Grande Valley	Yuma-Gila Valley
January	†	44	22	70	40
February	†	28	15	64	28
March	2	34	20	22	28
April	5	43	34	34	27
May	52	62	72	67	61
June	58	68	81	71	30
July	54	49	45	40	25
August	87	33	32	28	62
September	125	120	134	122	138
October	223	169	167	151	173
November	234	179	195	170	195
December	160	171	183	161	193
Total	1,000	1,000	1,000	1,000	1,000

\* Total man-days seasonally employed during 1935 were: upper Gila, 168,000; Salt River, 1,860,000; Santa Cruz, 166,000; Casa Grande, 516,000; and Yuma-Gila, 345,000.

† Less than one man-day per 1,000.

#### Labor-use areas compared

Within the Salt River Valley a study of labor-use areas showed a wide difference with respect to monthly requirements of seasonal labor. The Glendale-Tolleson area showed the least difference between the months of high and low labor requirements. December and February requirements in man-days were as four to one. At the other extreme stood the outlying area in which November and February requirements were as twenty-seven to one. The Buckeye and Chandler-Mesa areas required seasonal labor at high and low points in the proportions of seventeen to one and twelve to one. The remaining labor-use areas used seasonal labor volume that varied from high point to low point as nine to one, six to one, and five to one (Table 5 and Fig. 2).

Wide differences between labor-use areas were also found in the Yuma-Gila Valley. The most extreme fluctuations in monthly requirements of seasonal labor were found in the Mohawk area. In this area practically no seasonal labor was used during January while about one third of the total seasonal requirement was used

TABLE 5.—SEASONAL LABOR IN MAN-DAYS, BY MONTHS, SALT RIVER VALLEY LABOR-USE AREAS, 1935.\*

Month	Monthly distribution of man-days, seasonal labor, per 1,000 man-days									
	White Tanks foothill area	Buckeye area	Peoria- Marinette area	Phoenix Mts. foothill area	Glendale- Tolleson area	East Mesa and Salt River Mts. foothill area	Chandler- Mesa area	Phoenix suburban area	Outlying area	Total
January	44	12	31	45	99	44	31	44	15	1,000
February	28	16	19	41	54	34	17	28	8	1,000
March	43	14	25	38	67	24	26	43	20	1,000
April	47	33	34	42	47	49	46	47	47	1,000
May	71	45	61	73	59	66	65	71	69	1,000
June	83	60	66	65	54	99	68	83	76	1,000
July	62	44	48	61	40	78	43	62	47	1,000
August	39	35	33	65	21	45	23	39	26	1,000
September	119	160	143	117	74	130	118	119	130	1,000
October	158	203	189	146	137	158	178	158	185	1,000
November	155	200	184	164	143	148	209	155	214	1,000
December	151	178	167	143	205	125	176	151	163	1,000
Total	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

\* Total man-days seasonally employed during 1935 were: White Tanks foothills, 155,000; Buckeye, 279,000; Peoria-Marquette, 174,000; Phoenix Mountains foothills, 162,000; Glendale-Tolleson, 352,000; East Mesa and Salt River Mountains foothills, 122,000; Chandler-Mesa, 443,000; Phoenix suburban, 66,000; and outlying, 107,000.

LABOR-USE AREAS IN FOUR ARIZONA COUNTIES

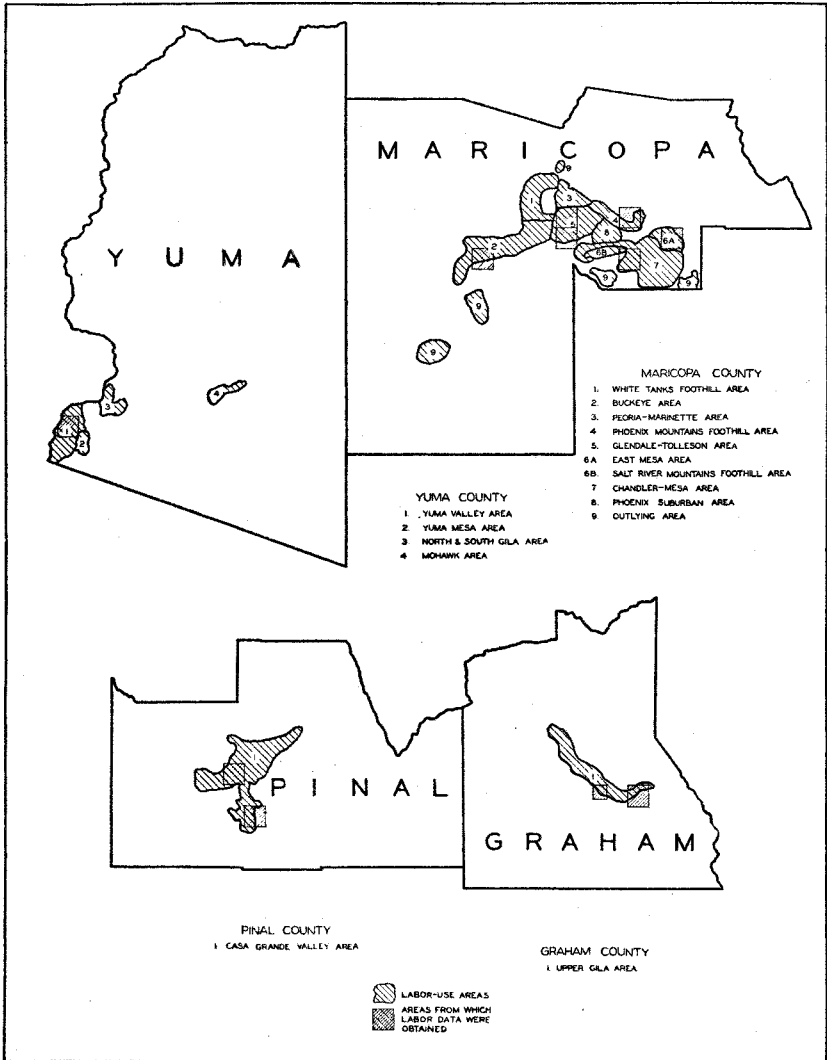


Figure 2.—Thirteen labor-use areas in the Salt River and Yuma-Gila valleys were defined with the assistance of George W. Barr, Agricultural Economist, and William Steenbergen, Assistant Agricultural Engineer, of the Arizona Agricultural Experiment Station; John H. O'Dell and Glenn E. Blackledge, county agricultural agents; W. W. Lane, President of the Arizona State Planning Board; and Harry A. Stewart, Farm Manager. The upper Gila and Casa Grande valleys were considered as single areas. Results obtained from the 670 farms located on the eleven sample townships were applied to all labor-use areas.

during the months of November and December. Requirements in the north and south Gila Valley area during high and low months were as twenty-seven to one; in the Yuma Valley area, as fourteen to one; and in the Yuma Mesa area, as four to one (Table 6 and Fig. 2).

TABLE 6.—SEASONAL LABOR IN MAN-DAYS, BY MONTHS, YUMA-GILA VALLEY LABOR-USE AREAS, 1935.\*

Month	Monthly distribution of man-days, seasonal labor, per 1,000 man-days			
	Yuma Valley area	Yuma Mesa area	North and south Gila Valley area	Mohawk area
January	44	47	15	2
February	29	41	8	33
March	28	38	20	33
April	21	42	47	61
May	58	73	69	35
June	16	65	76	89
July	15	61	47	70
August	66	65	26	51
September	142	116	130	141
October	177	145	185	158
November	198	164	214	164
December	206	143	163	163
Total	1,000	1,000	1,000	1,000

\* Total man-days seasonally employed during 1935 were: Yuma Valley, 263,000; Yuma Mesa, 29,000; north and south Gila, 34,000; Mohawk, 9,000.

Area comparisons of seasonal labor requirements were simplified by selecting for this purpose only those areas in which commodity production was not undergoing extensive changes. The twelve months' requirements of seasonal labor were also combined into three totals each representing a four-months' period. Six areas were selected. Seasonal labor needs were tabulated. The Glendale-Tolleson labor-use area, devoted to the production of truck crops, cotton, alfalfa, and grain, had the most even distribution of seasonal labor needs throughout the year. Seasonal labor per 1,000 man-days was required to the extent of 267, 174, and 559 man-days in the three periods, January through April, May through August, and September through December. Least evenly distributed were the requirements of the upper Gila Valley in which seasonal requirements per 1,000 man-days were seven, 251, and 742, respectively. Cotton was the chief commodity produced in this area. Between the Glendale-Tolleson and upper Gila, in the order named, came the Phoenix Mountains foothill area, producing citrus fruits and cotton; the Yuma Valley area devoted to cotton, truck crops, and livestock feeding; the Chand-



TABLE 7.—SEASONAL LABOR REQUIREMENTS, SIX AREAS, BY SEASONS, 1935.

Farming Area	Acres in irrigated farms	Commodities	Total requirements (in thousands of man-days)	Seasonal labor man-days			
				Seasonal distribution per 1,000 man-days			
				Jan.-Apr.	May-Aug.	Sept.-Dec.	
Glendale-Tolleson	67,840	Truck crops, cotton, alfalfa, grain	352	267	174	559	
Phoenix Mts. foothills	28,160	Citrus fruits, cotton	162	166	264	570	
Yuma Valley	53,760	Cotton, truck crops, livestock	263	122	155	723	
Chandler-Mesa	129,280	Cotton, livestock, truck crops	443	120	199	681	
Buckeye	83,200	Cotton, alfalfa, alfalfa seed	279	75	184	741	
Upper Gila	80,000	Cotton, alfalfa, dairy products	245	7	251	742	

ler-Mesa area in which cotton, livestock, and truck crops were the leading commodities; and the Buckeye area, given over to the production of cotton, alfalfa, and alfalfa seed (Table 7).

**Commodities compared as to the amount and monthly distribution of seasonal labor required**

Farm commodities registered wide differences with respect to the amounts of seasonal labor required for planting, cultivating, and harvesting. Alfalfa required between 300 and 350 man-days per 1,000 acres in the Salt River Valley, while lettuce requirements for thinning and harvesting were from 8,000 to 9,000 man-days. The most extreme differences were found in comparing the seasonal labor requirements of small grains and cantaloupes. Mechanization has reduced small-grain requirements to twenty-five or twenty-eight man-days per 1,000 acres, while cantaloupes required for thinning, hoeing, and harvesting between 17,000 and 18,000 man-days per 1,000 acres.

Commodities were also quite unlike with respect to the incidence of their labor needs from month to month. In 1,000 man-days used for thinning, hoeing, and harvesting lettuce 840 days were required during the months from October through February. Cotton seasonal demands were even more drastic. Of each 1,000 man-days required to chop, hoe, and pick the crop, 797 were required for picking during the period from September through December. Only 203 days remained to be spread through the weeks of chopping, hoeing, and late picking. Even in the harvesting of citrus fruits the seasonal incidence was marked. Of 1,000 man-days of seasonal labor required to care for citrus fruits, 877 man-days were used to harvest the crop during the months of November, December, January, February, and March, and more than one half of these were required during November and December when cotton and lettuce requirements were also heavy (Table 8).

**TABLE 8.—MONTHLY DISTRIBUTION OF MAN-DAY SEASONAL LABOR, PER 1,000 MAN-DAYS, SELECTED COMMODITIES, SALT RIVER VALLEY, ARIZONA, 1935.**

Month	Lettuce	Cotton	Citrus fruits
January	179	17	144
February	97	8	150
March	76	3	143
April	40	20	28
May	31	50	13
June	0	46	0
July	0	31	0
August	0	28	0
September	13	170	0
October	111	224	82
November	160	217	215
December	293	186	225
Total	1,000	1,000	1,000

**Seasonal requirements for the same operations compared by years**

Seasonal labor needs for the same farming operations differed from year to year. Cotton picking was an example. Looking upon the years from 1932 to 1936, the increases in total labor requirements were suggested by increases in the numbers of bales harvested. The 1936 crop was two and three quarters times as large as the crop of 1932. But probably as significant was the difference in monthly labor requirements. By October 1, 1933, only 9 per cent of the cotton had been picked, while the following year 22 per cent had been picked on that date. By November 1, 1933, only one third of the cotton crop had been harvested, while on the same date of the following year almost one half of the crop, that was 20 per cent larger, had been ginned (Table 9). These shifts in seasonal requirements, year by year, were most marked during the early months of the cotton-picking season. On December 1 of each of the five years, between 60 and 69 per cent of the cotton had been picked and ginned. Observation has shown that some years picking is dragged out into February and March, while other years it is finished earlier.

**TABLE 9.—SEASONAL PROGRESS IN COTTON HARVESTING IN ARIZONA, 1932-36, AS INDICATED BY BALES GINNED.\***

Periods	Number of bales of cotton ginned (cumulative)				
	1932	1933	1934	1935	1936
To October 1	11,000	8,200	25,700	16,700	31,500
To November 1	28,400	31,300	56,200	50,300	78,000
To December 1	46,500	59,000	80,200	87,300	127,200
Total crop	69,000	96,000	116,000	135,000	191,000

Periods	Per cent of cotton ginned (cumulative)				
	1932	1933	1934	1935	1936
To October 1	16	9	22	12	16
To November 1	41	33	48	37	41
To December 1	67	61	69	65	67
Total crop	100	100	100	100	100

\* Releases of the United States Department of Agriculture, Bureau of Agricultural Economics, Washington, D.C., Cotton Reports.

**Factors associated with labor requirements by seasons**

What were the most important factors associated with the range of needs for seasonal labor as found in the different farming areas?

First, there were the specific requirements of individual commodities. Commodities registered wide differences in labor needs. Seasonal labor requirements were most unevenly distributed throughout the year in those areas in which cotton was the chief commodity, while in areas largely devoted to truck crops or citrus

fruits, requirements were more evenly spread from season to season.

Second was area diversification. Emphasis is here placed upon the *area* phase of diversification, not the individual farm. While there was some diversification on individual farms in all of Arizona's farming areas, it was more marked in some areas than in others. On the other hand *farm specification* and *area diversification* were especially to be noted in such areas as the Glendale-Tolleson and Yuma Valley areas. These farming areas produced lettuce, cantaloupes, and other truck crops, cotton, and alfalfa. This diversification of commodities produced on a commercial scale made for a more even spread of seasonal labor throughout the year than was found in areas where one or two commodities were produced. Conversely, area specialization tended to concentrate labor requirements. This was particularly true of the upper Gila and Buckeye areas.

#### HIRED LABOR COSTS ON ARIZONA IRRIGATED FARMS

How much do Arizona farmers pay for hired labor on irrigated farms? What proportion of the costs of hired labor are spent for regular labor and for seasonal labor? Are there differences in the rates of pay in the different irrigated areas? To what extent do farming operations differ in the costs per man-day of hired labor required? These questions were answered more or less fully in the survey of labor requirements for 1935.

##### **Hired labor costs during 1935**

Hired labor on Arizona irrigated farms during 1935 cost almost \$7,000,000. This represented the total cash amount spent for regular and seasonal labor on irrigated farms in the Salt River, upper Gila, Yuma-Gila, Santa Cruz, and Casa Grande valleys. Average costs per man-day were \$1.58 for all classes of hired labor in the five areas (Table 10).

##### **Regular and seasonal labor costs compared**

Labor hired by the month or by the year during 1935 cost a little more than \$2,500,000 while seasonal labor cost somewhat less than \$4,500,000. Using the more exact totals shown in Table 10, it was found that for each dollar paid for regular labor, \$1.77 was paid for seasonal labor. Regular labor averaged \$1.84 per man-day while seasonal labor cost \$1.46. This difference was probably due to the greater use of skilled workers as regular rather than as seasonal laborers.

##### **Costs in irrigated areas compared**

Costs per man-day increased as one moved westward across Arizona. Upper Gila, Salt River, and Yuma-Gila Valley costs were \$1.29, \$1.65, and \$1.87 per man-day, respectively. Santa Cruz and Casa Grande Valley costs fell below the upper Gila

TABLE 10.—AMOUNTS SPENT FOR HIRED LABOR ON IRRIGATED FARMS, FIVE AREAS, ARIZONA, 1935.

Area and county	Total amounts in thousands of dollars			Average per man-day* in dollars		
	All hired labor	Regular labor	Seasonal labor	All hired labor	Regular labor	Seasonal labor
Yuma-Gila Valley (Yuma)	908	294	614	1.87	2.10	1.78
Salt River Valley (Maricopa)	4,770	1,906	2,864	1.65	1.85	1.54
Upper Gila Valley (Graham)	315	122	193	1.29	1.59	1.15
Santa Cruz Valley (Pima)	243	54	189	1.23	1.69	1.14
Casa Grande Valley (Pinal)	738	150	588	1.22	1.69	1.14
Total	6,974	2,526	4,448	1.58	1.84	1.46

\* See Tables 3 and 4 for the numbers of man-days of regular and seasonal labor in the respective farming areas.

Valley, their average being \$1.22. Regular labor costs in the upper Gila, Salt River, and Yuma-Gila valleys were \$1.59, \$1.85, and \$2.10. Santa Cruz and Casa Grande Valley averages were higher than upper Gila Valley averages for regular labor, probably due to a more extensive use of skilled labor on large farms to handle tractors and farm machinery. When stated in the more customary terms regular labor costs per man per month were \$41.34, \$48.10, and \$54.60 in the upper Gila, Salt River, and Yuma-Gila valleys and \$43.94 in the Santa Cruz and Casa Grande valleys. This estimate was made on the basis of twenty-six working days per month. Seasonal labor costs increased westward also. Upper Gila, Salt River, and Yuma-Gila valley costs per man-day were \$1.15, \$1.54, and \$1.78. The Casa Grande and Santa Cruz valleys averaged \$1.14 (Table 10).

#### Costs for farming operations compared by areas

Certain farming operations varied in their average costs per man-day, increasing as one went westward. Chopping and hoeing cotton cost \$1.10, \$1.28, and \$1.53 in the upper Gila and Salt River and Yuma-Gila valleys. Man-day costs in the Casa Grande and Santa Cruz valleys fell between the upper Gila and Salt River Valley averages, being \$1.21. Picking cotton cost an average per man-day of \$1.09, \$1.28, and \$1.50, respectively. Making and baling hay and other forage crops averaged \$1.45, \$2.21, and \$2.47 per man-day, increasing westward.

#### Hired labor costs compared with farmers' cash farm income 1935, 1936, and 1937

It was estimated that regular labor requirements on Arizona irrigated farms were 5 per cent greater during 1936 than in 1935 and that seasonal labor requirements increased by 25 per cent during the same period. This meant that in all there were required during 1936 a total of 5,255,400 man-days of hired labor, 1,436,900 of which were hired by the month or by the year and 3,818,500 by the day. Apparently an increase of about 10 per cent was made in wages paid for seasonal labor and 9 per cent in wages paid for regular labor. These increases in volume of labor and in wage rates brought the total estimated cost of hired labor during 1936 to \$8,984,000, of which \$6,100,500 was paid for seasonal labor and \$2,883,500 for regular labor. If these estimates were approximately correct, the increase in the cost of farm labor during 1936 amounted to \$2,000,000 over the 1935 figure of about \$7,000,000. This was an advance of 29 per cent.

Since the 1936 cash income from Arizona irrigated farms was about \$35,000,000 as compared with a little less than \$31,000,000 the year before, an increase of about 13 per cent,<sup>6</sup> it is evident that hired-labor costs increased in a much greater proportion than cash farm income.

<sup>6</sup> George W. Barr and Lloyd B. Shinn, *Arizona Agricultural Situation, 1937*, page 2. Income from cattle, calves, sheep, lambs, and wool was subtracted from total cash income so as to get an estimate of income on irrigated farms.

These increases both in the amount of hired labor and in the wage rates secured indicate a return of a more normal labor situation on farms. Quite certainly wages were greatly depressed during the years 1932, 1933, and 1934. Moreover, the farm operator and his family did more farm work during the years of acute depression than was customary for them to do during better times. At the same time reductions were made in the acreages of crops that required much hand labor. Small grains were planted instead of truck crops and cotton. These and related factors unduly reduced the volume of hired labor employment on farms. Increases in the amount of labor hired and the rate of pay were to be expected with increased cash returns for farm commodities. Even though some crops did not pay, such as lettuce in 1936, other crops took up the slack. Cotton during 1935 and 1936 was a profitable crop. Acreages were increased, and labor requirements mounted high.

#### **Labor requirements and costs increased during 1937**

Seasonal labor requirements during 1937 exceeded the requirements of the previous year by about 10 per cent, while regular labor requirements increased 5 per cent over those of the previous year. Rates of pay were increased about 7½ per cent for regular labor and 10 per cent for seasonal labor. Thus, regular labor requirements were estimated to have totaled 1,508,700 man-days, which were hired at a cost of \$3,251,900; while seasonal labor requirements amounted to 4,200,311 man-days which cost the sum of \$7,350,100. Hired labor costs on Arizona irrigated farms during 1937 slightly exceeded \$10,600,000. This was an increase of \$1,600,000 over the 1936 total.

With a cash income of \$39,000,000 during 1937,<sup>7</sup> which was an increase of 10 per cent over the cash income of 1936, Arizona irrigated farms paid for hired labor during the same year a total sum which was 18 per cent greater than was paid the year before.

#### **Noncash items**

No information was obtained in this survey about the value of noncash items furnished by farm operators to their laborers, such as board and room, shelter, garden space, dairy and poultry products, vegetables, and garage space. In some parts of the United States these items constitute as much as 45 per cent of the total remuneration received by married farm workers employed by the month or the year. In every part of the United States these non-cash items constitute a smaller share of the remuneration of casual laborers than of regular laborers.<sup>8</sup>

It is a matter of general observation that a great number of regular laborers on Arizona farms receive the free use of a house.

<sup>7</sup> George W. Barr and Lloyd B. Shinn, *Arizona Agricultural Situation, 1938*, page 2. Income from cattle, calves, sheep, lambs, and wool was subtracted from total cash income.

<sup>8</sup> Josiah C. Folsom, *Perquisites and Wages of Hired Farm Laborers* (U.S. D.A., Tech. Bull. No. 213), 1931, pp. 25, 49, and 53.

In some areas dairy-poultry products are also furnished to regular hired labor. On the other hand, board and room with the operator's family is very uncommon. Casual labor is sometimes furnished shelter. In one instance this includes tent houses, running water, electric lights, shower baths, laundry sinks, clothes lines, and sanitary toilets.<sup>9</sup> Quite often casual labor receives only a cash wage and must find its own shelter.

#### Factors influencing hired labor costs

Hired labor costs represent the product of the rate of wages paid for hired labor and the amount of hired labor required. These gross quantities, in turn, depend upon a number of contributing factors. The amount of labor required in a given area depends upon: commodity requirements; degree of intensification with respect to specific commodities; alternative choice of factors, such as more intensive use of machinery instead of labor, or an expansion of land acreage and the practice of a less intensive cultivation per acre; government programs of crop control; and the efficiency of workers available.

Wage rates in a given area depend upon: wage rates for the same or a comparable class of labor in industrial centers or in rural nonfarm occupations; wage rates in neighboring agricultural regions or farming areas; rates in government employment; numbers of workers available for a given class of labor in a given area; the quality or efficiency of workers available; the price level of specific farm commodities; and custom.

Commodities differ widely in their total annual labor requirements. Grain sorghums require twenty times as many man-days of seasonal labor per 1,000 acres as small grains in addition to the regular labor needed to plant and irrigate the crops. Citrus fruits require almost fourteen times as many man-days of seasonal labor as are needed to produce grain sorghums, while cantaloupes demand more than three times as much seasonal labor as citrus fruits. These figures are in addition to the amount of regular labor needed to produce these commodities.<sup>10</sup>

Mechanization of special crop operations and the degree of experience and skill required in certain laborers bear a close relationship to one another. Men who operate farm machinery, generally tractors and tilling or harvesting machinery, must work without detailed direction and under circumstances that require the exercise of judgment (Pl. I).

In this class of experienced workers are tractor drivers, herds-men, orchardists, irrigators, and others capable of doing similar types of work. Most of the labor that is hired by the month or by the year must be classed as experienced skilled labor.

Experienced common labor constitutes the greatest part of the labor hired on Arizona irrigated farms. This includes chopping,

<sup>9</sup> Cortaro Farms; from an unpublished survey of Marana Community, Arizona.

<sup>10</sup> R. L. Adams, *Proceedings of the Western Farm Economics Association*, 1937, pp. 72 and 73.



EXPERIENCED SKILLED WORKER HANDLING TRACTOR AND  
BINDER CUTTING ENSILAGE

—Photo by Maricopa County Agr. Ext. Service.

Plate I.—This experienced skilled worker, with tractor and binder, does the work of from ten to twelve experienced common laborers. This so-called displacement of laborers really means that the number of persons engaged in agriculture is reduced but the number required to make and service tractors and binders is increased with the more extensive use of these implements.

hoeing, and picking cotton; thinning, hoeing, and harvesting lettuce; covering, thinning, hoeing, and harvesting cantaloupes; and making hay (Pl. II).

Much work, however, is done by unskilled inexperienced workers. They fork manure, grub stumps, and pick up fallen fruit and nuts.

Mechanization of special-crop operations is likely to play an important part in the determination of future labor costs on Arizona irrigated farms.<sup>11</sup> Mechanical pickers may soon displace thousands of cotton pickers. Some mechanization of lettuce harvesting is under way, and labor needs for thinning and hoeing lettuce may be reduced by changes in methods of planting.

Labor costs will not likely be reduced during the immediate future by a substitution of land acreage for labor. Good land with an adequate supply of water for irrigation being very limited in quantity, it seems improbable that farmers will use less intensive methods for many years to come. Programs of crop control should be taken into account, however. These may in effect lessen the intensification of cultivation. While there is some likelihood that existing irrigated acres may be more strictly governed with respect to the amount of water allowed to be used

<sup>11</sup> Paul S. Taylor, *Monthly Labor Review*, March, 1937, pp. 134, 625-34, 637.

## COTTON PICKERS COMING IN AT NOON



—Photo by American S. S. Union.

Plate II.—Experienced common labor constitutes the greatest part of the labor hired on Arizona irrigated farms. Foremost in this requirement is the need for cotton pickers. It is believed that mechanical pickers will displace hand pickers, especially in the case of short-staple cotton, more rapidly in Arizona than in some parts of the Old South in which a cheap resident labor supply is available in sufficient quantities to pick the crop without undue delay. Arizona must necessarily import many cotton pickers in order to harvest the cotton crop by hand.

Some adjustments in the cost and efficiency of mechanical pickers will be needed, however, before their use will become widespread. R. L. Howe and E. G. McKibben have made a brief survey of the possibilities in the *Mechanical Cotton Picker*, published by the Works Progress Administration National Research Project, Philadelphia, Pennsylvania, August, 1937. Assuming 300 pounds of lint cotton per acre, 320 working hours for the machine per year, a cost of \$1,000 for a one-row picker, a life of five years for the machine, 5 per-cent waste in the field, and 12 per-cent loss in lowered cotton grades, the cost of picking would be \$1.65 per 100 pounds of seed cotton.

during any one season, such measures would not necessarily result in widespread change in the commodities produced and consequent reductions in the amount of hired labor required. They would more likely necessitate economy in the transmission and utilization of water. Meanwhile the scarcity of good, irrigable land compels economy in its use and prevents its substitution for labor.

Taking into consideration only the labor requirements of areas now under irrigation and making no allowance for requirements that will rise with the development of new land in Arizona, it seems improbable that the volume of seasonal labor requirements will be greatly increased during the next few years. It rather seems that they may remain somewhat near the 1937 level or may even be reduced by the employment of regular instead of seasonal labor, and by a more extensive use of machinery in special crop operations. On the other hand, with the bringing of new lands under irrigation, it is believed that seasonal labor requirements will increase at a more rapid pace than regular labor. Amounts of labor required, the proportions of regular and seasonal labor, and the distribution of seasonal labor throughout the year will

depend upon conditions that go to determine the amounts of regular and seasonal labor as discussed above.

It seems apparent that the most important factor in determining 1936 farm wage rates, as compared with 1935, was the price level of farm commodities. However, wage rates did not increase as much as they might have, since the numbers of workers available were sufficient to meet practically all seasonal farm requirements on schedule. The situation during the year 1937 was considerably different. Although the same factors appeared to be most important in determining the wage levels, price levels instead of pulling wages upward tended to hold wage rates down. This was particularly true in the cotton industry. Opposed to this tendency was the fact that workers were not plentiful so that wage-rate increases over and above the levels of the previous year were necessary in order to secure sufficient help to harvest 1937 crops.

Industrial and other nonagricultural wage rates have, during the past four years, moved upward throughout the United States more rapidly than farm wages.<sup>12</sup>

In Arizona, wage rates in the copper mines and among the various crafts of organized labor have doubtless advanced in greater proportion than farm-labor wage rates. On the other hand, farm workers had considerable employment through the years of depression while employment in copper mines was drastically cut. Regular employment on farms during 1933 has been estimated to have been equal to about 70 per cent of the 1936 volume in man-days. Pay rolls for labor during 1933 were somewhat smaller in proportion, since wage rates were lower during 1933 than during the years 1935 and 1936. Seasonal labor employment on farms during 1933 represented about 65 per cent of the 1936 amount. On the other hand regular employment in mines during 1933 represented only about 36 per cent of the 1936 amount of labor in mines. Pay rolls in 1933 were only 28 per cent of 1936 pay rolls.<sup>13</sup> In brief, the lag in farm wage rates as compared with industrial wage rates is only a part of the picture. Comparisons are made more complete when the total volume of labor and total pay rolls for different industries are compared for a period of time.

Custom does much to determine wage rates. This is true of farming areas and regions, and it is also true of laborer groups. Laborers of different nationality, color, or race are often paid different wages for doing equal amounts of work equally well on the same levels of experience and skill.

Wage rates in California irrigated areas doubtless affect rates in Arizona areas. Rates in the Yuma-Gila Valley are generally

<sup>12</sup> L. H. Bean, *The Agricultural Situation* (U.S.D.A.), October 1, 1937, pp. 11-14.

<sup>13</sup> E. D. Tetreau, *Unemployment Relief in Arizona from October 1, 1932, through December 31, 1936, with a Special Analysis of Rural and Farm Relief Households* (Ariz. Agri. Exp. Sta. Bull. No. 156), p. 111.

higher than rates in the Salt River Valley, which in turn are higher than those of the upper Gila Valley.

## NOTES

**Survey method**

Schedules for this study were filled in farm-to-farm visitation in connection with a survey of Rural Population Mobility carried on in Graham, Maricopa, Pinal, and Yuma counties during the summer of 1936. In order to secure a sample of rural population in Arizona irrigated areas, townships (36 square miles) were selected at random from the total irrigated land area in these counties. While covering these sample areas in the population survey, farm labor schedules were filled for all farms in the sample (township) areas from which the information could be obtained. Eleven townships were covered: six in Maricopa County, two in Pinal County, two in Graham County, and one in Yuma County. These townships and the number of farm schedules obtained were as follows:

Graham County	43 schedules—Township 7 S., Range 27 E. Township 7 S., Range 25 E.
Maricopa County	93 schedules—Township 1 N., Range 1 E. 180 schedules—Township 2 N., Range 1 E. 56 schedules—Township 1 S., Range 4 E. 105 schedules—Township 2 N., Range 4 E. 65 schedules—Township 1 N., Range 6 E. 23 schedules—Township 1 S., Range 4 W.
Pinal County	35 schedules—Township 6 S., Range 7 E. 8 schedules—Township 8 S., Range 8 E.
Yuma County	63 schedules—Township 9 S., Range 24 W.

Although population rather than farms afforded the basis for sampling, it was nevertheless considered that the sample of 670 farms obtained as described, quite well represented all farms in Arizona irrigated areas.

In order to apply the information obtained from 670 farms to all irrigated farms in Arizona the following steps were taken.

1. All irrigated lands in the upper Gila, Salt River, Casa Grande, Santa Cruz, and Yuma valleys were divided into labor-use areas, each area being marked off by natural features or distinguished by the production of one or more farm commodities. Each area was named according to important natural features or with reference to one or more towns within its borders. The upper Gila, Casa Grande, and Santa Cruz valleys were each designated as single areas; the Yuma-Gila Valley was divided into four labor-use areas; and the Salt River Valley was divided into nine labor-use areas.

2. The acreage in irrigated farms was estimated for each area.

3. The 670 farms surveyed composed several groups of farms whose acreages were totaled and weighted according to the total

TABLE 11.—ARIZONA FARMING AREAS SHOWING THE NUMBER OF ACRES IN IRRIGATED FARMS AND THE NUMBER OF ACRES IN THE SAMPLES.

County and farming area	Acres in irrigated farms	Acres in sample	Adjustments
Graham Upper Gila Valley	46,240	3,355	Multiplied by 13.78
Maricopa Salt River Valley White Tanks foothills	44,160	no sample	Applied results from 522 Salt River Valley farms surveyed
Buckeye	83,200	2,623*	Multiplied by 31.719 and adjusted for cotton farms totaling 27,000 acres
Peoria-Marinette	26,880	no sample	Applied results of Salt River Valley farms and adjusted for cotton farms throughout area
Phoenix Mountains foothills	28,160	4,841	Multiplied by 5.817
Glendale-Tolleson	67,840	24,592	Multiplied by 2.758 and adjusted for lettuce acreage
East Mesa-Salt River Mountains foothills	30,080	9,099	Multiplied by 3.305
Chandler-Mesa	129,280	7,815*	Multiplied by 16.542 and adjusted for cotton and lettuce
Phoenix suburban	19,200	no sample	Applied results from 522 Salt River Valley farms
Outlying	34,560	no sample	Applied results of Chandler-Mesa sample
Pima Santa Cruz	24,960		Applied results of Casa Grande Valley survey omitting truck-crop farms
Pinal Casa Grande Valley	76,080	9,612	Multiplied by 7.915

TABLE 11.—ARIZONA FARMING AREAS SHOWING THE NUMBER OF ACRES IN IRRIGATED FARMS AND THE NUMBER OF ACRES IN THE SAMPLES—Continued.

County and farming area	Acres in irrigated farms	Acres in sample	Adjustments
Yuma Yuma-Gila Valley	53,760	4,687	Multiplied by 11.470
Yuma Mesa	6,720	no sample	Applied results of Phoenix Mountains foothill area
North and south Gila	11,200	no sample	Applied results of Chandler-Mesa area survey Salt River Valley
Mohawk	8,320	no sample	Applied results of Buckeye sample

\* Samples taken in the Buckeye and Chandler-Mesa areas were small. This is due to the fact that Township 1 S., Range 4 E. and Township 1 S., Range 4 W. contained a great deal of desert land, and irrigated farms were larger than average. Due to limitation of funds, it was not thought advisable to increase these samples, especially since the Chandler-Mesa area was quite uniform as to commodities produced throughout the area and needed adjustment only for truck crops and since the Buckeye area seemed adequately represented after adjustments had been made for cotton acreage in the Roosevelt Irrigation District.

acreage of the areas in which the farms were located. For example, there were 9,612 acres in the farms surveyed in the Casa Grande Valley, and it was estimated that the entire Casa Grande Valley contained 76,080 acres in irrigated farms. Hence, data obtained from the farms surveyed were multiplied by 7.915.

Thus the original information on labor requirements was applied to each area surveyed.

4. Results thus obtained were also applied to unsurveyed areas. For example, the results obtained from the survey of Township 2 N., Range 4 E., the Phoenix Mountains foothill area, Salt River Valley, were applied to the Yuma Mesa area. Also, adjustments for special commodities were obtained by making a separate analysis of farms that produced certain commodities such as cotton or alfalfa seed and by applying the results to areas largely devoted to the production of these commodities. For example, the Buckeye area, Salt River Valley, containing 83,200 acres, included the Roosevelt Irrigation District which had a total area of 41,000 acres. It was estimated that of the 41,000 acres in the Roosevelt Irrigation District 30,000 acres were in farms and that over 90 per cent of these farms produced cotton. Since the sample farms surveyed in this farming area (Buckeye) were largely devoted to the production of alfalfa and alfalfa seed, cotton labor estimates were added for a total area of about 27,000 acres or 90 per cent of 30,000. It was assumed that all farms in this area produced cotton to the same extent as the sample farms that produced cotton.

In this manner the results obtained from the survey of 670 farms were applied to all irrigated farms in the upper Gila, Salt River, Yuma-Gila, Casa Grande, and Santa Cruz valleys. Irrigated farms in other parts of the state were not taken into account in this survey since they are largely operated with family labor. Table 11 shows the number of acres in each area, the number of each sample, and the method of adjusting the sample.

#### **Farms surveyed and classified by size**

The average farm surveyed contained 100 acres of which 92 acres had at some time been under irrigation, 90 acres having been irrigated during the year 1935. Eight acres had never been irrigated. Yuma-Gila farms averaged a little less than 75 acres in size with 73 acres under irrigation; upper Gila Valley farms contained an average of about 80 acres of which 66 acres had been irrigated; Salt River Valley farms were 94 acres in size all but 6 acres having been under irrigation; and Casa Grande Valley farms contained an average of 240 acres of which all but 32 acres had been irrigated (Tables 12 and 13).

More than three fourths of the 670 farms studied were located in the Salt River Valley, Maricopa County; 6 per cent were in the upper Gila Valley, Graham County; 6 per cent in the Casa Grande Valley, Pinal County; and 9 per cent of the farms were located in the Yuma-Gila Valley, Yuma County (Table 12). This percentage

TABLE 12.—TOTAL ACRES AND ACRES IRRIGATED, 670 FARMS, FOUR ARIZONA AREAS.

Irrigated areas	Number of farms surveyed	Acres in farms surveyed			
		Total	Irrigated (1935)	Previously irrigated (not in 1935)	Never irrigated
Upper Gila Valley (Graham)	42	3,357	2,616	146	595
Salt River Valley (Maricopa)	522	48,984	45,470	370	3,144
Casa Grande Valley (Pinal)	43	10,337	7,822	1,148	1,367
Yuma-Gila Valley (Yuma)	63	4,687	4,578	0	109
Four irrigated areas	670	67,365	60,486	1,664	5,215

TABLE 13.—AVERAGE ACRES IN FARMS AND ACRES IRRIGATED, 670 FARMS, FOUR ARIZONA AREAS.

Irrigated areas	Number of farms	Average acres per farm*	Average acres irrig. 1935	Average acres prev. irrig. (not in 1935)	Average acres never irrigated
Upper Gila Valley	42	79.9	62.3	3.5	14.1
Salt River Valley	522	93.8	87.1	0.7	6.0
Casa Grande Valley	43	240.4	181.9	26.7	31.8
Yuma-Gila Valley	63	74.4	72.7	0.0	1.7
Four irrigated areas	670	100.5	90.3	2.5	7.7

\* Average acres per irrigated farm in the four counties in 1930 were: Graham, 235.6; Maricopa, 116.5; Pinal, 144.8; and Yuma, 115.8. Graham County figures indicate the presence of a number of large holdings only partly irrigated.

distribution is roughly similar to the distribution of all irrigated farms in these counties. Of the 6,181 irrigated farms enumerated in these counties in 1930, 9 per cent were in Graham County, 9 per cent in Pinal, 11 per cent in Yuma, and 71 per cent in Maricopa County (Tables 12 and 13). (See also the *Fifteenth Census of the United States, 1930. Irrigation, Arizona Statistics*, pp. 10 and 11.)



A little more than one half of the 670 farms studied were less than 50 acres in size, 37 per cent ranged from 50 to 174 acres, and the remainder (almost 12 per cent) ranged from 175 to 1,000 or more acres in size. There were eighty farms of 175 to 1,000 acres or more: six in Graham, six in Yuma, fifteen in Pinal, and fifty-three in Maricopa County. Sixteen of these large-sized farms contained from 500 to 1,000 or more acres each. Twelve of the sixteen were located in Maricopa County, three in Pinal, and one in Yuma (Table 14). No comparable data on the distribution of irrigated farms in Arizona by size have been published by the Bureau of the Census.

#### **Costs of labor**

No study of wages and wage rates was undertaken in this survey. Total costs of hired labor for 1935 were obtained from the farm operators interviewed. In the majority of cases these costs were broken down into several subtotals for such operations as picking cotton and thinning and hoeing lettuce. It was from this information together with the information showing the number of man-days used that costs per man-day were obtained. Costs per man-day do not correspond to wage rates.

#### **Amount and cost of hired labor (1936 and 1937)**

In estimating the amount of labor used on Arizona irrigated farms during 1936 and 1937, a number of assumptions were made:

1. It was assumed that changes in cash farm income would indicate the direction and roughly suggest the proportion of changes made in the amounts of regular hired labor used on irrigated farms. This was considered to be true because regular hired labor is to a considerable extent replaced by the labor of the operator and his family during periods of lowering income, while, correspondingly, regular hired labor is used in increased quantities and family labor reduced during periods of increasing income. Since it has been estimated that cash income from irrigated farms during 1935, 1936, and 1937 amounted to \$31,400,000, \$35,300,000, and \$39,000,000, it was apparent that cash farm income increased by 13 and 10 per cent during these years.

Employers of farm labor and employment agencies were consulted, and it seemed reasonably certain that the amount of labor hired by the month or by the year was increased by 5 per cent during 1936 and by an additional 5 per cent during 1937.

This informal inquiry also showed that rates of pay were increased 9 per cent during 1936 and 7½ per cent during 1937.

2. Arizona's major crops require varying amounts of seasonal labor. Alfalfa, cotton, citrus fruits, lettuce, and cantaloupes each call for volumes of seasonal labor. Among these, however, cotton is the principal cash crop and requires more seasonal labor in total than any other crop. It was therefore assumed that changes in cotton production would indicate roughly the direction and proportion of changes in amounts of seasonal labor used on irrigated farms. Since cotton production in bales was increased by

TABLE 14.—SIZE OF 670 IRRIGATED FARMS, FOUR IRRIGATED AREAS, 1935.\*

Size of farms (acres)	All farms surveyed		Number of farms			
	Number	Per cent	Upper Gila Valley (Graham)	Salt River Valley (Maricopa)	Casa Grande Valley (Pinal)	Yuma-Gila Valley (Yuma)
Under 3	4	0.6	0	4	0	0
3- 9	47	7.0	3	43	0	1
10- 19	58	8.7	3	51	0	4
20- 49	234	34.9	15	188	3	28
50- 99	144	21.5	9	111	9	15
100-174	103	15.4	6	72	16	9
175-259	33	4.9	4	24	1	4
260-499	31	4.6	2	17	11	1
500-999	10	1.5	0	7	2	1
1,000 and over	6	0.9	0	5	1	0
Total	670†	100.0	42†	522†	43†	63†

\* It was not possible to compare results in this survey as to size of farm with data published by the Bureau of the Census. Bureau of the Census publications on irrigation of agricultural land in Arizona do not show the distribution of irrigated farms by size.

† *The Fifteenth Census of the United States, Arizona, Irrigation, 1930*, showed that there were 6,181 farms in Graham, Maricopa, Pinal, and Yuma counties. By counties there were 579, 4,382, 523, and 697 farms respectively.



54 per cent in 1936 as compared with 1935 and by 24 per cent in 1937 as compared with 1936, it seemed evident that increases were made in seasonal labor employment during these years. It could not be assumed, however, that seasonal labor increases were directly proportional to increases in the amounts of cotton produced, since without doubt reductions were made in other crops, such as alfalfa, during these years. New lands planted to cotton did not increase seasonal labor requirements in proportion to acreage since their production was lower than average. The average of all major crops under irrigation was increased about 7 per cent during 1936 over 1935 and 13 per cent during 1937 as compared with 1936. Taking into account, therefore, the conservative increases in all major crops as well as the disproportionate increases in cotton production, it seemed apparent that seasonal labor requirements during 1936 were about 25 per cent greater in amount than during 1935 and 10 per cent greater during 1937 than during 1936.

Rates of pay for cotton picking, hoeing and thinning lettuce, and other seasonal work were increased about 10 per cent per year during 1936 and 1937.

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