Jobless After a Man-Made Drought

A Report to the

Fresno County Economic Opportunities Commission
&
Fresno County Workforce Investment Board

by

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Executive Summary

During the past three years, farm operators in the Westlands Water District have sharply increased the fallowing of cropland, thereby reducing their harvested acreage. This increased land fallowing has raised concern in communities on the west side of the San Joaquin Valley. These communities are home to the thousands of hired workers who earn their livelihoods on District farms. Adverse economic impacts resulting from loss of employment, payroll and local purchases of farm inputs have not been previously determined, but may be substantial.

The present report seeks to provide quantitative substantiation of the economic impact of the land fallowing that has actually already occurred. There has been considerable speculation about the extent of these adverse economic impacts, and the District has itself commissioned an Economic Impact Statement to estimate possible long-term effects of reduced harvested acreage. The present report examines actual changes in District cropping to date, including the effects of significant land fallowing that is a result of inadequate water supply and lack of needed irrigation drainage service, and, to a lesser extent, the relatively small amount of permanent land retirement that has already taken place.

Records of farming operations in the District were examined to determine how farms have fared up to December 31, 2003. In addition, employment reports are examined to determine the job and payroll impacts of these losses of irrigated land.

The principal findings are:

- The average amount of District farmland annually fallowed during 2001, 2002 and 2003 as compared with the prior three-year period (1998-2000) increased by 42,526 acres; this increase of fallowed land represents 7% of the entire District.
- Annual total farm income of District farms in the period 2001-2003 fell by an estimated $60.0 million as compared with 1998-2000.
- Eighteen District farm operations active during the 2000 crop year, and with land later earmarked for retirement, had totally closed down by 2003.
- Forty-five District farm operations active during the 2003 crop year and with land later slated for retirement may be at risk for permanent closure.
- Between 15,000 and 18,000 hired farm workers are employed on District farms in the course of a typical year.
- Annual payroll for District farms is in excess of $150 million.
- Loss of employment associated with increased land fallowing has already impacted approximately 750 hired farm workers with job loss during the period 2001-2003.
- Loss of employment associated with increased land fallowing has resulted in an annual loss of about $6 million of hired farm worker wages during the period 2001-2003 as compared with 1998-2000.
- Additional land to be fallowed in the near term will probably increase both the amount of lost annual hired farm worker wages and the loss of hired farm workers' jobs to about $10 million and 1,100 persons, respectively.

- The ripple effect of reduced purchases of seed, fertilizer and other necessary farm inputs of land fallowed by the end of the 2003 crop year will result in an estimated annual loss of $23.2 million to agricultural service businesses.
- There were 283 active agricultural service businesses in west side communities during 2003. The number of such businesses active during the three-year period 1998-2000 was not determined.

Previously published papers addressing the impacts of reductions of irrigation water supplies are reviewed and discussed, but most such reports seek to predict likely future effects. Only three papers refer to actual employment effects.

The recently approved voluntary water transfer between the Imperial Irrigation District and the San Diego County Water Authority allocated at least $20 million, with provisions for more, if necessary, to ameliorate adverse community effects associated with the loss of irrigation supplies to the Imperial Valley. It is important to note that the Imperial water users will also receive very substantial sums for this water sale. At present, there are no funds committed to address adverse community impacts on the west side of the San Joaquin Valley that result from land fallowing associated with reduced irrigation water supplies or the failure of the federal government to provide adequate drainage facilities.

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The Westlands Water District is America's largest water district, comprised of approximately 950 square miles of land on the west side of the San Joaquin Valley. Over $1 billion in cash receipts are returned to the District's farms each year from the sale of agricultural commodities. Entire communities in the region depend on wages earned by hired farm workers who are employed by farm operations in the District.

Westlands has had a controversial history in seeking to obtain adequate supplies for its farms. The initial federal water supply contract with the District provided for 1.15 million acre-feet to be delivered annually. But the District comprises nearly 570,000 acres of irrigable land. At an average usage of 3 acre-feet per acre, the federally contracted amount is not sufficient for all of the District's water demand. Moreover, in drought years, only a portion of the contracted amount has been delivered, forcing farmers to fallow tens of thousands of acres of land and to pump from an already depleted underground water table.

In 1993, the Central Valley Project Improvement Act (CVPIA) mandated a cutback in irrigation supplies to agriculture amounting to 800,000 acre-feet, a reduction to be shared by all Central Valley Project contractors, not just Westlands. The water thus 'saved' is to be used for environmental restoration. This latest reduction amounts to an annual cut of about 20% of each district's average supply (average of the most recent ten-year history of actual water deliveries). However, owing to its large size, most of the cutbacks will be borne by Westlands. Under terms of CVPIA, water is also to be allocated to wildlife refuges. For Westlands, the combined effect will be to reduce irrigation supplies by up to 480,000 acre-feet per year, equivalent to about 160,000 acres of cropland.

Since its inception a half-century ago, part of the District has also been plagued with a perched water table, i.e., the buildup of a portion of applied irrigation water in the topsoil and accumulation of salts brought in as dissolved solutes in the surface water supplied from the Sacramento-San Joaquin Delta, or leached from local soils. The Federal Bureau of Reclamation, supplier of water to the district from its San Luis Canal (aka California Aqueduct), and District officials, have long sought to alleviate this problem through the costly construction of underground 'tile' drains and a surface drainage canal, the San Luis Drain. By collecting salt-laden drainage water and transporting it to final disposal elsewhere, it was the intent of irrigation engineers to prevent the buildup of a shallow salt-laden water table. Instead, blocked by environmental concerns, and the poisoning of wildlife in drainage water evaporation ponds in 1983, the entire drainage program has stalled and it is uncertain as to if and when drainage service will be provided. As a result, thousands of acres of formerly productive agricultural land are now useless.

In response to these dual crises - insufficient water supplies and the perched water table – thousands of acres of the most vulnerable lands are now fallowed. The District has purchased nearly 50,000 acres (49,209.05 acres) from private landowners as of December 15, 2003. Some of this land is to be permanently retired and not returned to irrigated farming in the future.

According to the District, settlement of litigation over the failure of the federal government to supply adequate drainage facilities (Peck settlement) provides for the acquisition by Westlands of over 34,000 acres of drainage-impaired lands within the District. The District will retain CVP water rights that will eventually be transferred to other lands. Approximately 11,000 acres were acquired in September 2003, with 11,000 more to be acquired in September 2004, and the remainder will be acquired in September 2005. Additional lands were purchased in connection with another case (Sagouspe settlement) and could be returned to production, assuming the District has an adequate water supply and drainage service.

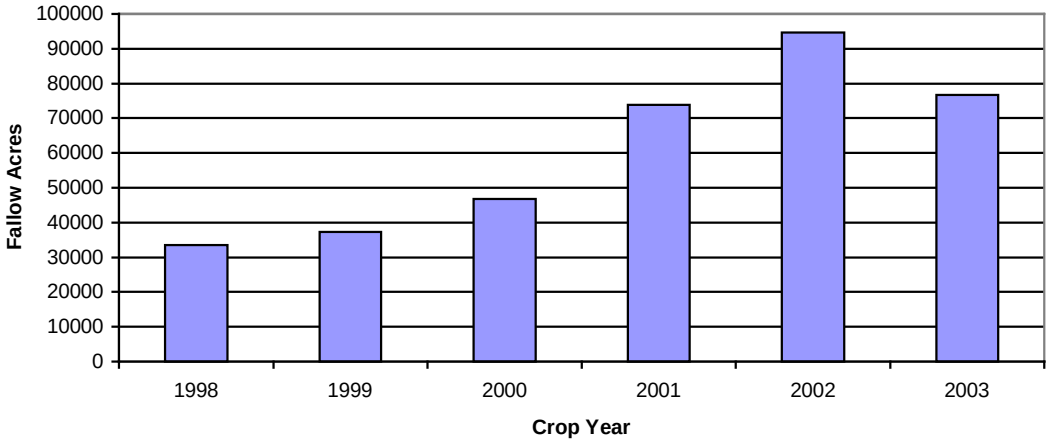
To assess the impact of increased fallowed acreage on the District's farm operators and its communities, it is important to first reflect on the type of farm businesses active in this region of California. A careful study of the District shortly after full deliveries of federal irrigation water were first realized found that the bulk of its agricultural production relied on hired labor for nearly all of the farm work.[1] In the early 1980s, it was found that farms then operating in the District had 5,305 full-time employees, including 278 full-time farm managers, 427 full-time foremen, and 4,600 full-time laborers.[2] Additional thousands of part-time laborers were also reportedly hired to assist with labor-intensive seasonal jobs, such as hoe and thin tasks (lettuce, tomatoes, cotton, sugar beets), pruning (orchards and vineyards), and harvesting (vegetables, melons, tree fruit, and grapes). Off-farm employment dependent upon District agriculture includes processing, packing and shipping crops, as well as agricultural services, such as equipment sales and repair.

Without question, the fallowing of a substantial portion of District land will result in large-scale, permanent layoffs of hired farm workers and others whose livelihood is dependent on farming in the District. A report commissioned by the District sought to estimate the size of this labor displacement and projected a short- term negative impact on hired farm workers if as much as 200,000 acres were to be fallowed: –7.3% on employment and –5.1% on employee compensation.[3] The same report projected positive impacts on both employment and employee compensation in the long-term, assuming that farmers would be able to plant and market high-value, labor-intensive, crops on the reduced acreage.

The present report examines actual hired farm worker employment, labor demand, and the number of hired farm workers in the Westlands Water District. These measures of employment are examined through December 31, 2003.

That land fallowing has already become significant is shown in Figure 1, which indicates the total of fallowed acres in the District for the most recent six-year period. The total amount of District fallowed lands is now greater than during the first four years of the 1986-92 drought.

Figure 1. Fallow Acres, 1998-2003 Crop Years, Westlands Water District



Land Fallowing Impact on Westlands Water District Cropping Pattern

To determine the likely effect of land fallowing on employment, it is essential to have a clear and accurate understanding of the District's cropping pattern. Detailed comparison of crop production in the period immediately preceding the recent increase of land fallowing with that in subsequent years will inform determinations of employment impacts. In what follows, 'three-year' averages are computed wherever it is possible to do so. This is because year-to-year shifts in production are commonplace in agriculture and reliance on short-term fluctuations may obscure longer-term trends. Year-to-year variations in cropping are often attributed to highly variable factors such as weather, crop pests, markets, and, in the case of irrigated farming, water availability as well as its cost and quality. Usually, averages computed over three consecutive years are more reliable for use in longer-term comparisons because multi-year averages tend to smooth out short-term fluctuations.

Table 1 presents the findings of this report regarding the changes of the District's total harvested crop and fallow acres for the 3-year period 2001-2003 as compared with 1998-2000. The findings are unambiguous. First, there was a decrease of 41,052 harvested crop acres between the two periods, or a decline of about 8.1%. Second, the total of fallow acres more than doubled between the two periods, to about 81,700 acres. Critical to the analysis is the fact that the increase of fallowed acres corresponds very closely to the decline of harvested acres. In other words, non-bearing plantings (trees or vines) or abandoned crops do not account for the observed decline of harvested crop acres. It is also important to note that the average actual allocation of irrigation water to the District in the period 1998-2000 was close to 90% of the contracted amount, but that during the period 2001-2003 the allocation was closer to 60%, suggesting that the change in surface supply played a critical role in land fallowing decisions. Detailed crop acreage figures for each of the six years are presented in Appendix I.

Table 1
Comparison of Harvest Crop and Fallow Acres
Westland Water District, 3-year Averages, 1998-2003

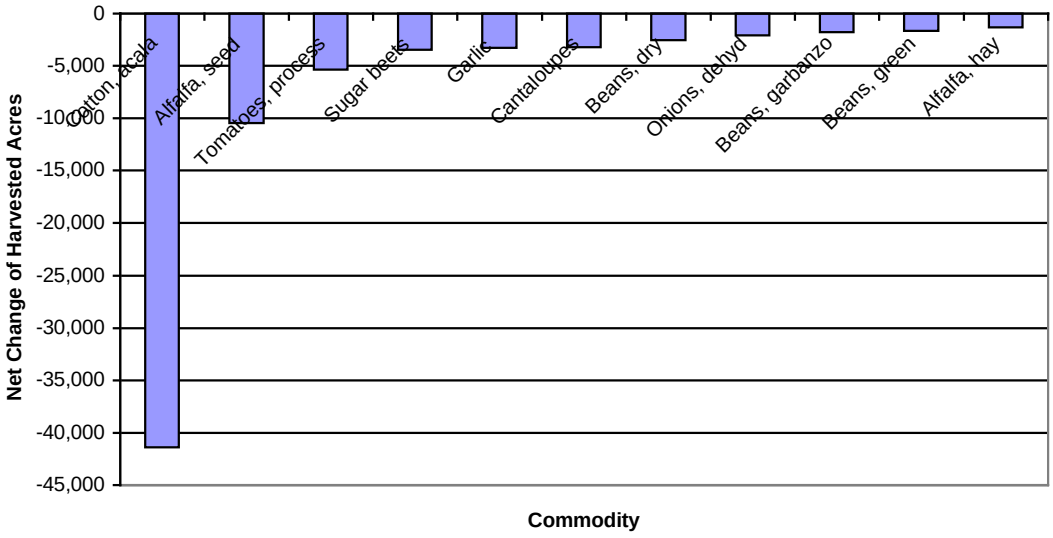
	Harvested Crop Acres	*Fallow Acres*
3-yr avg (1998/2000)	534,538	39,145
3-yr avg (2001/2003)	493,486	81,671
Change	**-41,052**	**+42,526**

Source: Westlands Water District, Annual Reports, 1998 – 1999 through 2002 – 2002; Westlands Water District, 2003 Annual Report to Bureau of Reclamation.

The data summarized in Table 1 indicated only net changes in harvested or fallowed acreage, not changes among individual crops. As indicated previously, harvested crop acreage figures are sensitive to market conditions and other factors, such as weather and crop pests. Thus, changes in District-wide production of specific crops in this period will likely reflect the influence of these other factors.

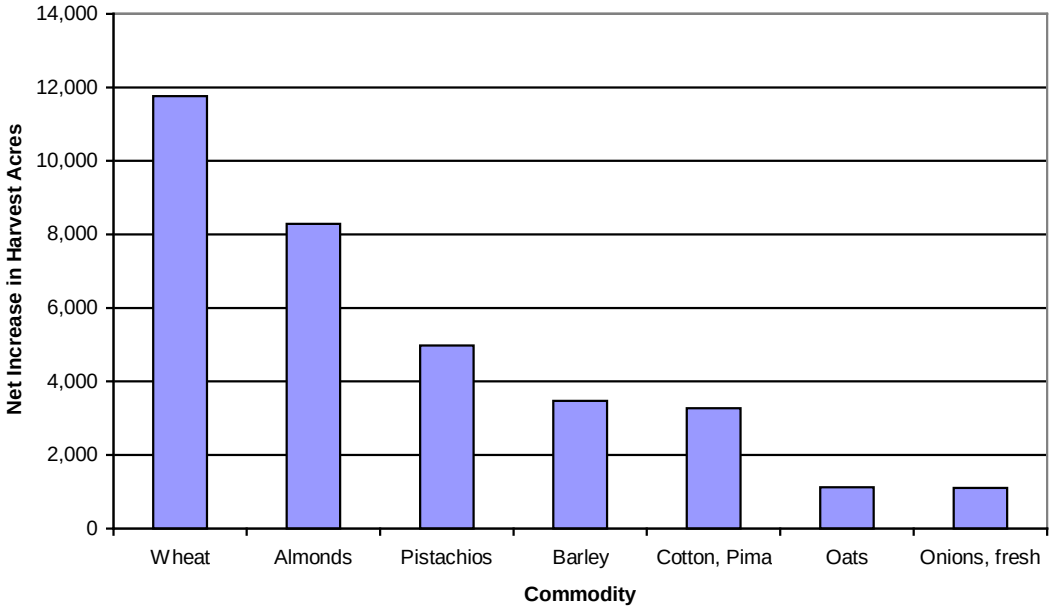
Figure 2 shows the leading crops according to the amount of net decreases of harvested acreage. The five crops with the largest net *decreases* of harvested acreage were Cotton (upland acala variety, -41,362 acres), Alfalfa seed (-10,470 acres), Tomatoes (processing varieties, -5,373 acres), Sugar beets (-3,443 acres) and Garlic (-3,245 acres). There were 33 crops that experienced decreases in harvested acreage during this period.

Figure 2. Net Reductions in Harvested Crop Acres 1998/2000 vs. 2001/2003, WWD Annual Reports



Some crops experienced increase harvested acreage during this period. Figure 3 shows the leading crops with the largest net *increases* of harvested acreage.

Figure 3. Net Increases of Harvested Crop Acres 1998/2000 vs. 2001/2003, WWD Annual Reports



The five crops with the largest net *increases* of harvested acreage were Wheat (+11,771 acres), Almonds (+8,294 acres), Pistachios (+4,976 acres), Barley (+3,469 acres) and Cotton (Pima variety, +3,277 acres). There were 28 crops that experienced increases of harvested acreage during this period.

Some of the decreases in harvested acreage of specific crops noted above can be understood in terms of market conditions. For example, world market prices for cotton have been depressed for a number of years. Growers of upland (acala) cotton have been eligible to qualify for Federal price or income support programs during this time framce because it has not been a profitable crop. A longer-term trend is the increasing shift away from acala to Pima cotton varieties by Central Valley growers; the latter having been forbidden by government regulation to produce in the region until fairly recently.

Processing tomato production in the Central Valley was substantially disrupted by the bankruptcy and dissolution in 2000 of Tri Valley Growers, formerly the world's largest cannery. Many growers lost tomato contracts and scrambled to find a home for their crop. It is not surprising that harvested acreage of processing tomatoes in the District fell in 2001, by about 13,000 acres (-14%), as compared with 2000. Production has yet to fully recover.

Finally, the garlic industry has been hard-hit by imports from China in the past half-dozen years. Both processors and growers have sought Federal protection from what they believe is 'dumping' of below-cost garlic in the U. S. market. It is likely that garlic grown for processing will be sharply reduced in the near future and farmers will focus their efforts on the fresh market.

In contrast, the almond industry has enjoyed an agricultural rarity: record high levels of production and relatively high prices for the past two years. Increases in

demand are keeping pace with increased production. Vast new plantings of almonds have followed and more are sure to come.

The increase of wheat acreage is likely due to a District program to plant dry land winter wheat on some of the land taken out of irrigated production. It is not known how much of the reported increase can be attributed to this program.

A crop that is especially important in Westlands is lettuce. For about five weeks each Spring, and an equal period in the Fall, Huron, located in the heart of the District, is the primary, and, often, the only substantial shipping point for commercially grown iceberg lettuce in the United States. This is because, at these particular times, the Huron area is both warm enough and mostly free of precipitation, whereas other important lettuce production areas (Salinas-Watsonville, Santa Maria, Imperial Valley, Central and Western Arizona) have less than ideal conditions for harvesting lettuce.

Over the three-year period 2001-2003, shipments of head lettuce from Huron averaged about 8.7 million 50-pound cartons per year, down about 7% from the 9.4 million average during the period 1998-2000.[4] However, comparing the earlier time frame with 2001-2002, shipments of leaf lettuce from Huron increased four-fold to more than 5 million 40-pound cartons per year.[5] As a result, the overall total of lettuce shipments actually increased somewhat during this six-year period.

While some of the fallowed acreage indicated in Table 1 is land that has been permanently retired, most has been fallowed owing to lack of sufficient irrigation water. The data provided by the Westlands Water District suggests that relatively little land has been permanently retired as of the present time.

In an effort to further examine this important factor, the map titled "Proposed Land Use in WWD," dated June 2003, and the printed table of land parcels titled "Summary of Acquired Land, Westlands Water District," dated December 15, 2003, were consulted.[6] A comprehensive database of land identified in either of these documents was constructed and served as a basis for examining farm activities.[7]

Annual pesticide permits obtained by farming businesses operating within the district were consulted to determine detailed information concerning crops and specific parcels where they were planted.[8] Land identified on the District map as 'acquired retired lands' or as 'Peck acquired lands' or on the printed table of land parcels were the focus of this analysis.

As of the 2003 crop year, the present analysis finds that the total of both 'retired' and 'Peck' land is approximately 76,800 gross acres. According to District sources, 34,000 acres were acquired or will be acquired under the Peck settlement, and additional land was acquired under a separate settlement (known as the Sagouspe settlement). Of that total, the pesticide permits indicate that about 28,200 net crop acres were very likely farmed during 2003 and about 48,600 acres were fallowed. However, about 4,300 acres of the former total was planted to wheat and may be in the dry land farming program described previously.

Thus, between 23,900 and 28,200 net crop acres, or as much as one-third of the total land now earmarked as 'retired' or 'Peck' has yet to go out of production.[9] The District indicates that lands acquired under the Sagouspe case settlement, which are a significant portion of this additional land to be fallowed, can be used for grain or livestock production. In part, the fact that some of the land regarded as planned for

retirement has yet to be acquired by the District depends upon the availability of funds for its purchase.

In any case, estimates of the short-run impact of land fallowing must consider that about 48,600 acres of 'retired' or 'Peck' land were out of irrigated production prior to the conclusion of the 2003 crop year, and as much as an additional 25,000 acres could be taken out of production in the period subsequent to January 1, 2004.

Estimates of Lost Crop Sales, Total Farm Revenue and Farm Operators

Prices received by farmers from the sale of crops harvested in Fresno County are summarized each year in the Fresno County Agricultural Crop and Livestock Report. This annual publication includes such detailed information as county-wide harvested acreage, physical measures of the quantity harvested, imputed average yields, annual average prices and total revenue.

This published crop valuation information was used to prepare an estimate of the change of Westlands farmer' annual crop revenue. A two-step process was undertaken. First, average revenue per harvested acre was computed for each crop from the Crop and Livestock Report on a countywide basis for the two years 2001 and 2002. Then, net, crop-by-crop increases or decreases in harvested acreage (see Appendix I), and the two-year average revenue per acre for each crop in the Westlands[10] were combined to determine the *net change of total revenue per crop*. **It was found that there has been an overall net decrease in annual crop revenue of approximately $58.7 million during the period 2001-03 as compared with the period 1998-2000.**

Examination of the roster of holders of pesticide permits who, during the 2000 crop year, had specific crop fields that were later designated for land retirement or as part of the Peck settlement, shows that a total of 63 farm operators had fallowed at least a portion of those designated lands of the 2003 crop year. Of that total, 18 farm operators had permanently closed down farming activities in the Westlands Water District before 2003. It is likely that inadequate water supply and/or inadequate drainage service played a significant role in those decisions. The remaining 45 had fallowed at least a portion of their farms.

Thus, 18 farm operators are now completely gone, and another 45 have had to significantly reduce their production. It is not known if any of these operations would have continued uninterrupted if the land on which they were farming had adequate irrigation water supplies and/or adequate drainage service.

Some farm operators also receive payments from the U.S. Department of Agriculture. This additional farm income must also be considered. A little understood consequence of the reduction of farming activity is that producers of 'program commodities,' which include cotton and grains, may be the loss of eligibility for all or a portion of USDA payments intended to support farm income. The 18 farm operators whose operations in Westlands had been permanently shut down by 2003 reportedly received an aggregate total of $6.7 million in such payments during the five-year period 1998-2002, an average of $1.3 million per year.[11] The 45 farm operators who had fallowed at least part of their lands had received a total of $28.3 million in USDA payments during the same five-year period, or an average of $5.6 million per year.[12]

Therefore, taking account of these USDA payments, Westlands farms have lost additional annual income of between $1.3 million and $6.9 million. This income should be added to the amount of lost crop sales as determined above.[13]

The annual lost gross revenue of Westlands farms that can be attributed to land fallowing as of the 2003 crop year is between $60.0 and $65.7 million. Additional land fallowing at the conclusion of the 2003 crop year or in future years will likely lead to a substantially larger annual losses of farm income.

Baseline Estimates of Employment, Labor Demand and Hired Farm Workers

An accurate summary of District employment is not available. Employment records for each of the District's farm entities and management companies are proprietary and, thus, confidential. These data could not be examined as part of the present report.

Previous findings on farm employment in the District have relied on quarterly ES-202 reports from employers to the Employment Development Department of the State of California (EDD).[14] These reports, aggregated at the community level, include summaries for employers headquartered in those communities or, in a few cases, local branch operations of businesses headquartered elsewhere.

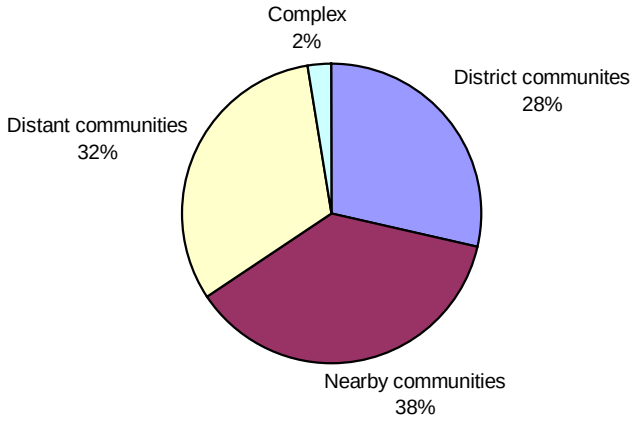
There are serious limitations to relying on the ES-202 reports from EDD. District farm operators headquartered in a distant community and not reporting through a local branch will be excluded from the tabulation. On the other hand, some farm operators headquartered in a community near or within the District do not have any operations there and their data should be excluded.

A similar problem in determining levels of employment of hired farm workers in the District is related to the widespread reliance of its farm operators on labor market intermediaries. There is compelling evidence that a majority of seasonal farm jobs in California are now filled through farm labor contractors.[15] Current registrations of farm labor contractors in both Fresno and Kings Counties were carefully reviewed.[16] It was determined that several dozen large farm labor contractors known to provide workers in the District are headquartered in distant communities and only report their statewide employment data through their home communities. At the same time, a very large farm labor contractor, headquartered in a nearby community, is known to provide labor throughout central California, but all of this employer's reports are attributed to the headquarters community.

To make an estimate of employment levels on District farms, aggregate administrative reports, grouped by reported city of *location* address, were consulted. This insures that local branches of businesses with a distant headquarters will be included, if they are separately reported.

The main findings are that only a little more than one-fourth of the District's farm operators have business addresses within or contiguous with the District boundaries. Another group, somewhat more than one third, are headquartered in nearby communities (typically within a dozen or so miles of the District's boundaries). A third group, comprising fully one-third of the farm operators, are headquartered a much larger distance away and report their employment as though it were located in their home community. These findings are summarized in Figure 4.

Figure 4. Headquarters Location of Westlands Water District farm operators, 2003



A total of 453 farm operators were identified, but many of these were found to be 'clusters' of legal entities operated by management companies. This phenomenon, and its role in formal compliance with acreage limitation provisions of Federal reclamation law, has been described in detail elsewhere.[17]

Business addresses were surprisingly varied. A total of 39 different places were found in these mail or physical addresses. The most distant place from the District is Yuba City with two farm operators.

There are only five communities (Census Designated Places) located within or contiguous with District boundaries: Cantua Creek (including nearby Three Rocks), Five Points, Huron, Mendota and Kettleman City. Of the District's 453 farm entities represented in pesticide permit files, just 129 (28%) had mail or physical addresses in these five communities.

Nearby communities, and the number of District farm operators in each, include: Avenal (1), Burrell (1), Coalinga (27), Firebaugh (48), Helm (2), Kerman (14), Lemoore (43), San Joaquin (10), Stratford (5) and Tranquillity (18). Altogether, 168 farm entities (37%) are based in these nearby west side communities. Many residents of these communities are employed as hired farm workers in the District.

Surprisingly, 145 farm entities (32%) are headquartered rather far from the District. In fact, Fresno is the location of the headquarters for 58 of the District's farm operators and no other community is home to a larger number of Westlands farms. These more distant communities include: Brentwood (3), Crows Landing (1), Dos Palos (10), Hanford (25), Hollister (2), King City (1), Kingsburg (2), Le Grand (2), Los Banos (2), Madera (9), Merced (1), Newman (1), Patterson (3), Pixley (1), Riverdale (13), Salinas (2), Sanger (4), Vernalis (1), Visalia (2) and Yuba City (2).

From these findings, it is clear that it will not be possible to determine precise farm employment levels from community-level administrative data. Since only a portion

of farm operators in each of the nearby and more distant communities actually operate in the District, reports of farm employment totals for those places would overstate District employment by a large and unknown amount.

However, community-level aggregations can provide some very useful data about employment and payrolls. Table 2 shows the findings for two levels of aggregation: communities within or contiguous with the District boundaries, and nearby communities.

Table 2
Peak Season Hired Farm Worker Employment and Annual Wages
West Side Communities, 2000

Category (SIC)	*Five WWD Communities, Annual Avg Employment*	*Five WWD Communities, Annual Wages (Million $)*	*Ten Nearby Communities, Annual Avg Employment*	*Ten Nearby Communities, Annual Wages (Million $)*
Farm Operators (01xx, 02xx)	1,429	$29.8	3,376	$68.6
Crop Services (072x)	1,710	$26.7	985	$23.2
Farm Labor Contractors and Management (076x)	2,374	$32.1	3,259	$32.9
Total	5,513	$88.7	7,620	$124.6

Monthly Employment refers to the number of persons on the payroll during the pay period that includes the 12th day of the month. Annual Average Employment refers to the 12-month average of Monthly Employment. Peak Monthly Employment refers to the highest of the 12 Monthly Employment figures. Annual Wages is the total of four quarterly reports of wages and salaries paid by the employers in question.

The most important findings shown in Table 2 are that Annual Average Employment of hired farm workers reported in just the five WWD communities is in excess of 5,500, and that 2000 Annual Payroll is $88.7 million. Recalling that only 129 (28%) of the 453 WWD farm operators report their employment and wages from these communities, it should be clear that WWD employment of hired farm workers is likely to be substantially greater than these figures suggest. For purposes of comparison with the Annual Average Employment figures, Peak Monthly Employment is 8,057 (July), and the lowest reported Monthly Employment is 2,728 (February).

Secondly, employers of hired farm workers that are headquartered in the ten nearby communities report Annual Average Employment of 15,120 and 2000 Annual Payroll of $124.6 million. Of course, only an unknown portion of this data can be attributed to the District. Again, recalling that 168 (37%) of WWD farm operators are headquartered in these communities, it is likely that quite a substantial fraction of the employment and wages figures for employers based in these ten communities corresponds to WWD agricultural activities. Review of individual employer reports for the ten communities suggests that at least one-fourth of the reported hired farm worker employment and payroll corresponds to activities by WWD farm operators. Using that

estimate, the present report attributes 3,780 of Annual Average Employment and $61 million of Annual Wages to WWD activities.

Finally, no estimate is possible for the 145 WWD farm operators headquartered in distant communities. Nevertheless, it is significant to note that a few of these are among the largest farm operators in the District, including several based in Fresno.

Using the above data, Annual Average Employment totaling 9,280 is the most reasonable minimum estimate of WWD hired farm worker employment for employers based in west side communities. Note carefully that this figure does not include employment reports from farm operators based in distant communities. Thus, it is most likely that the true figure is somewhat larger. Similar reasoning leads to the conclusion that hired farm worker wages totaled at least $150 million in 2000.

Estimates of the actual number of hired workers are considered next. Since most hired farm workers are employed in seasonal jobs, some lasting only a few days, an individual who works pruning vines or trees during December or January very likely only works part of the year performing farm tasks. Experienced farm labor researchers estimate that, on average, a California farm worker is able to find about 1,000 hours (or 26 weeks) of employment on farms in the course of a given year.[18] This means that a figure of Annual Average Employment = 1 (one full-time-equivalent) actually refers, on average, to two individuals. If so, that would mean about 18,560 individuals work on WWD farms in the course of a single year.

A more considered analysis to determine the number of hired farm workers, as distinct from reliance on monthly employment figures, can be carried out. EDD recently published a useful paper summarizing the annual earnings, on average, of persons hired by different types of farm employers.[19] That report finds, on average, an individual who works primarily for a farm labor contractor earned about $4,385 from that type of employment in 2001.[20] Similarly, on average, an individual primarily working for a cotton farm earned about $15,156 in 2001.[21]

Table 3
Number of Hired Farm Workers

Category (SIC)	*Five WWD Communities, Annual Avg Employment*	*Five WWD Communities, Number of Hired Farm Workers*	*Ten Nearby Communities, Annual Avg Employment*	*Ten Nearby Communities, Number of Hired Farm Workers*
Farm Operators (01xx, 02xx)	1,429	2,786	3,376	6,312
Crop Services (072x)	1,710	3,252	985	3,594
Farm Labor Contractors and Management (076x)	2,374	7,497	3,259	7,777
Total	5,513	13,535	7,620	17,683

From these data on average annual earnings of 'primary employees,' an estimate of the number of persons represented by payroll can be computed. Table 3 shows the findings for the five WWD communities and the ten nearby communities.

The main finding of this additional analysis is that an imputed total of 13,535 hired farm workers are employed by businesses based in the five WWD communities, and another 17,683 in the ten nearby communities. Many of these individuals reside year-round in the region, but many do not, migrating to find work when it is available. For example, Huron is noted for the large number of migrant workers who come into the community for the lettuce harvest season and then depart upon its conclusion.

Note that the 'multiplier' of Annual Average Employment differs greatly among the different categories of farm worker employers. For persons employed by farm operators, the factor is about 1.95, but for those employed by farm labor contractors, it is about 3.16, reflecting the shorter duration of employment the average worker obtains in that type of employment relationship.

Following the reasoning developed in the analysis of employment reports, an estimated one-fourth of the ten nearby community hired farm worker total is attributed to WWD. Hence, this method leads to an estimated total of about 17,960 individual hired farm workers employed in the District in the course of a single year. Note that this method provides an independent estimate of the number of individuals as compared with the method used previously that was based only on monthly employment reports.

A third independent measure of farm labor employment can be constructed based on the concept of *labor demand*. Consider an acre of a typical annual crop produced in WWD. During the course of a single crop cycle, the ground will be planted, cultivated, irrigated, treated for pest control purposes, and the crop harvested. The labor requirements for each of these tasks differs from crop to crop, typically least for grain crops and greatest for tree fruit, grapes and fresh market vegetables. Vegetables grown for processing usually require substantially less labor than do vegetables produced for the fresh market, and are often harvested entirely by machine.

The labor demand concept can be summarized as follows. For each crop, a Labor Coefficient (total hours required to produce one acre of the crop) and the harvested acres can be determined. Table 4 shows both the general method and a calculated example for head lettuce.

Table 4
Labor Demand Based on Crop Acres and Labor Coefficient

Labor Demand = (Hours per acre) x (Acres)

Example: Lettuce, head; Labor coefficient = 118.7 hours per acre
2003 Head Lettuce Acres (estimated): 20,800 acres

Labor Demand (Lettuce, head) = 20,800 acres x 118.7 hours per acre

Equals: 2,468,960 hours

Source for Labor Coefficient: Larson, Office of Migrant Health, 2000

Therefore, knowledge of the labor requirement for each crop and the number of acres of each crop produced leads to a determination of labor demand for each crop. By simply adding the findings across all crops, the total labor demand can be determined.

Using the published data on crop production provided by the WWD, we find that Annual Average Labor Demand in the period 1998-2000 was about 15.4 million hours per year. Note that this corresponds to about 15,000 individuals, assuming that an average of 1,000 hours is what the typical hired farm worker is able to obtain. Also, using the estimated 2003 average hired farm worker wage of $8.25, this labor demand figure corresponds to total District wages of about $127 million. Importantly, this latter figure does not include wages paid to foreman, farm managers, supervisors, bookkeepers, accountants, truck drivers, and other necessary support services.

Impact of Land Fallowing on West Side Hired Farm Worker Employment

Earlier in this report it was found that, as of the 2003 crop year, about 42,000 acres of land identified as part of the projected land retirement program had been fallowed. It is not known if those lands would have been farmed if adequate water supplies and/or drainage service were available. The only measure of the impact of land fallowing on hired farm worker employment as of December 31, 2003 that is presently available is the imputed change of Labor Demand caused by reduced crop production. This is because quarterly employment and wage reports from employers are not yet on file for the full year and will not become available until late in 2004. However, using the Labor Demand method described above, Annual Average Labor Demand in the period 2001-2003 was about 14.6 million hours per year. This is about 5% lower than the corresponding figure found for the 1998-2000 average.

Estimates of the reduction of employment are somewhat more difficult to construct. However, using the rough estimate of 1,000 hours per worker, this decline of 5% in labor demand corresponds to about 750 individuals losing their jobs.

The payroll impact can also be estimated. Using an estimated average wage of about $8.25 per hour, the lost labor demand is equivalent to about $6.1 million in wages paid to hired farm workers.

Recalling that the decline of harvested crop acreage was about 8%, and that much of the reduction was among the least labor-intensive commodities (cotton, alfalfa), it is not surprising that the decline of labor demand is found to be 5%.

During the period subsequent to January 1, 2004, it is anticipated that another 25,000 acres of land that was in production during 2003 may be fallowed. If so, the total short-term impact of presently committed land fallowing will be larger than the above figures suggest.

Assuming that crop patterns in the District follow the trends established during the period 2001-2003, but that the production of processing tomatoes continues to recover from the effects of the Tri Valley Growers collapse, the impact of this additional land fallowing will likely to lead to additional permanent job loss for another 375-450 or so individuals.

Thus, the total short-term impact of land fallowing will be the loss of about 1,100 – 1,200 hired farm worker jobs. The corresponding aggregate payroll loss will be about $10 million.

None of these figures include the loss of jobs by foreman, farm supervisors, farm managers, bookkeepers and other necessary personnel. Nor do they take account of loss of employment by providers of services not already taken into account in this analysis.

Impact of Land Fallowing on West Side Farm Agricultural Service Businesses

In addition to losses of farms and hired farm worker jobs, land fallowing has negatively impact local agricultural service businesses. Purchases of seed, fertilizer, pest control materials, and farm equipment will be affected, as will post-harvest processing activities.

Some of these activities have been taken into account in the previous analysis, such as the on-farm labor supplied by farm labor contractors and farm management companies. These firms are classified as 'agricultural service' businesses in the SIC and NAICS classification schemes but their employees perform agricultural production tasks directly on farms.

The Census Bureau long ago abandoned efforts to conduct a census of agricultural service businesses.[22] Absent reliable summary data, the present report approached this aspect of the impact of land fallowing in two ways: examining farm input expenditures, and compiling a preliminary listing of West Side agricultural service businesses.

There are two reliable sources of information concerning farm input costs. The Census of Agriculture, conducted every five years, reports countywide production costs in some detail. Second, the University of California Cooperative Extension Service regularly publishes costs and returns reports for a variety of crops that are especially important in the state.

Table 5
Selected Costs of Production, Combined Fresno and Kings Counties
Census of Agriculture, 2002

Type of Production Expense	*Expense (1997 dollars)*	*Expense per Harvested Acre*
Seeds, plants, etc	$66,822,000	$44.74
Commercial fertilizer	$125,222,000	$83.84
Agricultural chemicals	$210,303,000	$140.81
Petroleum products	$95,994,000	$64.27
Utilities	$143,362,000	$95.99
Repair and maintenance	$197,544,000	$132.27
Customwork and machine hire	$119,714,000	$80.16
Interest	$139,060,000	$93.11
Cash rent	$72,977,000	$48.86
Property taxes paid	$59,488,000	$39.83
Other expenses (excludes labor)	$266,661,000	$178.55

Census data are considered first. The most recent Census of Agriculture was conducted in 2002 and the results were released in June 2004.[23]

To apply the Census data on production costs, the present report combined data for Fresno and Kings counties because the Westlands Water District overlaps both. On a combined basis, the Census finds that 1,602,894 acres were harvested in the two counties.[24]

Table 5 shows the combined total of selected farm production expenses for the two counties as a whole, and also reports the average costs per acre harvested.[25] The above figure of 1,602,894 harvested acres was used for the latter calculation.

The present report finds an increase of fallowed land totaling about 42,526 acres during the past three years as compared with the previous three-year period. The data of Table 5 can then be utilized to estimate the annual revenue loss by agricultural service businesses. For example, seed sales lost are estimated to be (42,526) x ($44.74) = $1,890,533.

The total annual lost revenue for purchases of seeds, commercial fertilizer, agricultural chemicals, petroleum products, repair and maintenance, and customwork and machine hire amounts to an estimated $23.2 million. Much of this lost revenue would have accrued to agricultural service businesses within or adjacent to the District. Purchases of electricity and such production expenses as interest, cash rent, property taxes and other expenses are less likely to have accrued to local agricultural service businesses. For this reason, those expenses are not considered in this context.

University of California Cooperative Extension costs of production reports are considered next. The most recent report on acala cotton production is based on a hypothetical 1,200 acre farm in the San Joaquin Valley, of which 800 are planted to cotton.[26]

The Coop Extension report indicates that about $816 per acre is spent on inputs. Seed, fertilizer and agricultural chemicals account for about $225, hired and contract labor costs are $127, and custom work or machine hire costs are $78. The remaining costs are mainly for water and assumed cash rent.

WWD annual crop reports show that acala cotton production acreage has declined by 41,362 acres during the period in question. Therefore, the net loss of seed, fertilizer and agricultural chemical purchases attributed to reduced acala cotton acreage amounts to $9.3 million.

In the case of alfalfa production, the costs and returns data for San Joaquin Valley farms indicate that seed, fertilizer and agricultural chemical costs are a total of $171 per acre.[27] Based on the overall decline of alfalfa hay and seed acreage totaling 11,785 acres, the net loss of seed, fertilizer and agricultural chemical purchases is $2.0 million.

Similarly, costs and returns data are available for processing tomato production in the San Joaquin Valley.[28] For this crop, seed, fertilizer and agricultural chemical costs total an estimated $381 per acre. Thus, based on the decline of 5,373 acres of processing tomato production in the District, the net loss of these purchases amounts to $2.0 million.

Published, current cost and returns data are not available for San Joaquin Valley farm production for most crops produced in the District. Therefore, it is not possible to make estimates of the total decline of input purchases associated with land fallowing using these data alone.

However, the Coop Extension findings can be compared with the findings of the Census regarding production costs. Census data for 1997 and 2002 indicates that the average cost per harvested acre for seeds, fertilizer and agricultural chemicals in Fresno and Kings Counties combined is $246.60 (1997 dollars) and $269.39 (2002 dollars), respectively. The Coop Extension data for acala cotton, alfalfa, and processing tomatoes indicate costs for these three inputs are $225, $171 and $381, respectively. The average value for those inputs, weighted by the net decreased District acreage of each, is $228 per harvested acre. This result is sufficiently close to the average cost per harvested acre computed from countywide data to suggest that use of the Census data is probably reasonable for estimating lost agricultural service business revenue.

Absent a census of agricultural service businesses, the present report sought to make estimates of the numbers and types of these firms active in the five District communities or in the ten nearby communities. For simplicity of description, these firms will be collectively described as West Side Agricultural Service Businesses.

The main sources used to identify these businesses were the following:

California Department of Pesticide Regulation License Files
California Department of Food and Agriculture, Market Enforcement Branch Licenses
Coalinga City Business License Files
Firebaugh City Business License Files
Huron City Business License Files
InfoUSA PowerFinder Residential & Business Directory
Kerman City Business License Files
Lemoore City Business License Files
Mendota City Business License Files
Red Book Credit Services
San Joaquin City Business License Files
Western Growers Association

An important additional source concerning currently active farm labor contractors is the County Agricultural Commissioner registrations file, required of all of the county's contractors. Files for the year 2003 in both Fresno and Kings Counties were reviewed for this purpose.[29]

Each business was classified into one or more industry categories. For example, Pest Control Advisors, Pest Control Dealers, and Pest Control Operators are all represented. Of course, headquarters or branch business physical addresses, mailing addresses, and telephone numbers were recorded, as well as such other information as Contact Person and Annual Revenues, where available.

Summary findings concerning West Side Agricultural Service Businesses are presented in Table 6. Some 283 agricultural services firms were identified, of which 88 are located, or have operating branches, in the five District communities. A much larger number, 195 in all, are based in the ten nearby communities.

It is not known, nor is it possible to determine, the share of annual revenues of these agricultural service firms that is attributable exclusively to activities within the boundaries of the Westlands District. At the same time, it is possible that other agricultural service firms, located well outside of the District and nearby communities,

may operate within the District. For example, a large garlic processor that is located in King City (Monterey County) sources a considerable share of its garlic crop from farms within the District.

Table 6
West Side Agricultural Services Businesses, 2003

Category	*Number in Five District Communities*	*Number in Ten Nearby Communities*
Agricultural chemicals	5	3
Cotton gins	8	9
Equipment, machinery (sales, repair)	8	8
Farm labor contractors (registered)	11	23
Food processing	2	10
Irrigation systems	3	1
Packer, shipper (not farm operator)	22	5
Payroll services	6	3
Pest control advisors	2	64
Pest control operators	2	31
Precooling	5	0
Produce dealer licensees	3	27
Seed, fertilizer, farm supplies	3	6
Trucking (produce)	6	0
Unclassified	2	5

Importantly, agricultural service business operators who must have a somewhat higher than average level of formal education in order to become licensed, such as pest control advisors or operators, are far more likely to be based outside of the District (95 outside versus just 4 inside).

The present report did not seek to obtain information directly from these businesses concerning the impact of District land fallowing on their operations. Thus, no conclusion could be reached about this important aspect of community impacts.

Summary and Discussion

The principal findings of the present report concerning the land fallowing within the Westlands Water District are:

- The average amount of District farmland annually fallowed during 2001-2003 as compared with 1998-2000 increased by 42,526 acres.
- Annual gross farm income of District farms in the period 2001-2003 fell by at least $60.0 million as compared with 1998-2000.
- Eighteen District farm operations active during the 2000 crop year and with land later earmarked for retirement had totally closed down by 2003.
- Forty-five District farm operations active during the 2003 crop year and with land later slated for retirement may be at risk for permanent closure.

- Between 15,000 and 18,000 hired farm workers are employed on District farms in the course of a typical year.
- Annual payroll for District farms is in excess of $150 million.
- Loss of employment during the period of increased land fallowing has impacted approximately 750 hired farm workers during the period 2001-2003.
- Loss of District employment during the period of increased land fallowing has resulted in an annual loss of about $6 million of hired farm worker wages during the period 2001-2003 as compared with 1998-2000.
- Additional land that will probably be fallowed in the near term will likely increase the annual amount of lost wages and lost jobs to about $10 million and 1,100, respectively.
- Consideration of the ripple effect of reduced purchases of seed, fertilizer and other necessary farm inputs this report finds an estimated annual loss of $23.2 million to agricultural service businesses.
- There were 283 active agricultural service businesses in west side communities during 2003.

Though it is still early in the process of the fallowing of what might ultimately be as much as 100,000 acres in Westlands to reach definitive conclusions regarding community impacts, it is evident that the economic and employment impact has already been substantial. Much of this annual economic loss is concentrated among west side communities.

With a reduction of 42,000 acres out of the total irrigable area of about 560,000 acres, farm income has dropped by an estimated 5%, payroll has declined by an estimated 4%, hired farm worker Labor Demand has been reduced by an estimated 5%, and the number of hired farm workers employed has declined by an estimated 4%. The effects on local agricultural service and non-farm businesses have not been measured as yet.

The District indicates that most of the imputed losses should be attributed to fallowing caused by a lack of adequate water supply and/or drainage service. It is very important to note that the economic impact analysis of the present report refers not to *total* fallowed acres, but only to the *increase* of fallowed acres during the period 2001-2003.

There are only a very few published reports assessing the effect of land retirement or reductions of irrigation supplies on California communities. Villarejo studied the effects of the prolonged six year (1987-1992) drought on the Central Valley Project service area, and, separately, on the community of Mendota.[30] Among the findings were that pumped groundwater was used to partially compensate for the loss of surface supplies, but the poor quality of locally available groundwater effectively precluded substitution of high-value, labor-intensive crops, such as cantaloupes, for low-value crops. In all, an estimated loss of 4.7 million hours of annual hired farm Labor Demand was found in the CVP service area, and about 362,000 hours of that total was in the Mendota area. The ripple effect of reduced farm output and payroll was evident in Mendota: lower retail sales, reduced sales tax revenue and lowered property tax revenue.

Loh and Gomez examined the reduction of harvested acreage in the Palo Verde Valley that accompanied an intentional water transfer. The Palo Verde Valley is adjacent

to the Colorado River in southeastern Riverside County. Losses of employment were found to be relatively small.[31]

Lee et al show that a prospective 25% cutback in surface water supplies to Sacramento Valley farmers would likely result in a loss of about $32.8 million in farm income, assuming a normal water year and that no groundwater sources are used to replace the lost surface supplies. Additionally, about 300 farm jobs would be lost. The impacts would be greatest in Colusa County, which is highly dependent on agriculture as compared with other Valley Counties.[32]

Sunding et al developed an innovative model to examine the effects of anticipated water transfers. This model will be useful in helping to understand all of the effects, not just those on local communities.[33]

The papers by Martin and by Palerm and Du Bry discuss the community impacts of the transfer of water from the Imperial Irrigation District (IID) to the San Diego Municipal Water Authority (SDMWA).[34] The transfer contemplates that about 300,000 acre-feet per year of IID's present supply will be made available to SDMWA for a period of at least 75 years. Martin estimates that IID will lose about 10% of its annual irrigation supply, and finds that hired farm worker employment will decrease by about 200 jobs and that total employment in Imperial County will decrease by about 250 jobs. Palerm and Du Bry do not quantify the economic impact; instead they discuss the positive community-building effects of the migration of Mexican hired farm workers to the Coachella and Imperial Valleys.

Only the papers by Villarejo and by Loh and Gomez determine actual employment impacts of a water transfer that had, in fact, already occurred. None of the other four papers assess the effects of past water transfers, or of land retirement that had occurred. Rather, they are useful papers because they are intended to help understand and to anticipate such effects.

Importantly, and not discussed by either Martin, or Palerm and Du Bry, the IID water transfer is expected to result in a reduction of irrigation supplies that will be at least partially offset by improved conservation measures.[35] The loss of irrigation water due to seepage from IID canals, estimated to be as much as 700,000 acre-feet per year, will be substantially reduced by lining earthen canals with concrete. Through this and other measures, the amount of water available for irrigation purposes will be partially restored.

Community impacts are carefully considered in the IID-SDMWA agreement. About $20 million in community mitigation funds to be administered by a 'local entity,' especially created for this purpose. Additional funds may become available, if needed. Three economists have been or are to be hired to assist the members of this body of appointed local community representatives. It is important to note that the IID-SDMWA agreement is a voluntary sale of water rights, and the agencies agreed in advance to seek to mitigate any adverse community impacts. In contrast, CVPIA was Federal law, and not a voluntary undertaking by Westlands. And CVPIA made no provision whatsoever for mitigating possible adverse community impacts of water reallocation.

Appendix I

Crop Acreage, Westlands Water District, 1998-2003

	1998	*1999*	*2000*	*2001*	*2002*	*2003*
Crop	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Alfalfa, hay	10550	15250	13304	9701	13150	12307
Alfalfa, seed	12393	14111	8915	2214	1460	336
Almonds	21868	28103	29178	31683	34794	37554
Apples	1568	1102	1127	707	467	387
Apricots	638	644	604	598	525	535
Artichokes	15	15	32	26	27	
Asparagus	1246	822	866	655	671	620
Barley	7076	5609	6851	15110	7634	7199
Beans, dry	4585	4590	1106	589	1093	949
Beans, garbanzo	3524	7277	8082	8320	4065	1140
Beans, jojoba						11
Beans, green	2019	2924	1247	629	386	250
Broccoli	4618	7405	2412	3394	4849	5048
Cabbage	138	428	27	165	39	
Cantaloupes	18405	17944	18193	14025	14260	16713
Carrots	371	1168	328	283	40	300
Cauliflower	101	30	29	43	15	
Cherries	60	62	123	143	212	252
Corn, field	1509	584	694	395	1066	442
Corn, sweet	4595	5289	4240	3621	5254	5931
Corn nuts		21	179	145	160	
Cotton, alcala	138118	127340	180141	98354	101306	121853
Cotton, Pima	74729	75980	28024	90215	60727	37621
Cucumbers and Pickles	40	78	214	204	472	473
Eucalyptus	76	42	59	53	51	51
Garlic	23497	22820	14064	15146	17036	18465
Grains-Sorghum	282	279	1259	2680	960	99
Grapefruit	103	38	38	38	38	38
Grapes, raisin	155	0	0	0	145	185
Grapes, table	535	730	1014	1055	899	1235
Grapes, wine	7054	8559	8776	9111	8281	6789
Honeydews	2025	2284	1732	2513	3002	2949
Lettuce	23509	26414	24091	23136	25402	23849
Melons, mixed	806	746	642	658	599	573
Milo	152					
Mustard				47	198	179
Nectarines	30	30	32	30	190	90
Oats	1313	493	284	371	3400	1665
Olives	312	312	312	312	312	
Onions, dry	12052	11790	10471	8647	10301	9148
Onions, fresh market	2285	1916	2410	3232	2869	3824
Oranges	216	325	216	216	1039	216
Parsley		421	421	412	317	710

Pasture	2425	1396	1554	1739	1560	1681
Peaches	263	223	226	223	971	1133
Peppers, sweet	1310	1970	1747	1790	1214	1578
Pistachios	6784	5040	5131	9333	11393	11158
Plums and Prunes	149	149	149	229	441	293
Pomegranates	1025	841	1178	1234	1372	1481
Potatoes	0	0	29	0	0	
Pumpkins	0	0	62	0	7	
Radicchio	54		4	22		63
Safflower	3698	2567	2209	4409	3956	2236
Seed crops, misc	1409	1970	1630	2048	1680	1172
Spinach	51	53		75	75	305
Sugar Beets	9427	7432	8543	5007	5083	4984
Tangerines	50	50	50	50	50	50
Tomatoes, fresh	3766	3660	3235	3209	2815	4528
Tomatoes, processing	85881	95578	94982	81913	90360	88048
Vetch						145
Walnuts, English	427	435	459	356	357	411
Watermelons	1279	1528	1399	1454	1316	1710
Wheat	39536	23884	28436	35150	34174	57844
Non-bearing trees and vines	4041	4440	7077	4359	115	2018
Fallow	33481	37206	46748	73802	94557	76654
Nonharvested	747	645	850	1818	438	1722
Subtotal	578371	583042	577435	577096	579645	579200
Double crop	14737	18782	13255	12783	15491	15747
Total	563634	564260	564180	564313	564154	563453
Total harvested	540102	540751	522760	497117	484535	498806

Endnotes

[1] Charles V. Moore, David L. Wilson and Thomas C. Hatch, *Structure and Performance of Western Irrigated Agriculture With Special Reference to the Acreage Limitation Policy of the U. S. Department of Interior*, Giannini Foundation of Agricultural Economics, Bulletin 1905, Division of Agricultural Sciences, University of California, December 1982, p. 16.
[2] *Ibid.* p. 24.
[3] *Analysis of Economic Impacts of Proposed Land Retirement in Westlands Water District, Final Report to Westlands Water District, May 2003*, Table ES-1, Short-run Impacts Compared to No-action Scenario, p. ES-7.
[4] *Western Melon and Vegetable Report, Federal State Market News,* Agricultural Marketing Service, U.S. Department of Agriculture, Agriculture Market News Branch, 2202 Monterey Street, Suite 104-F, Fresno, CA 93721, (559)487-5178.
[5] *California Agricultural Commissioner Crop Reports*, California Agricultural Statistics Service, Annual. Data for Fresno County as a whole is reported. However, the vast majority of commercial leaf lettuce production in the county is centered in the Huron region of the Westlands Water District. Date for 2003 is not yet available.
[6] Both documents were provided through the kind courtesy of the Westlands Water District. The cooperation of the District, and the prompt response of their staff to the author's requests, is gratefully acknowledged.
[7] The two documents disagree slightly about which lands have been retired, owing in part to the fact that they refer to different dates: the map refers to June 2003 while the parcel list refers to December 15, 2003. However, two of the parcels on the latter list have incorrect legal descriptions; in fact, both parcels are located in different sections than the list indicates. For both of these parcels the map does correctly show their location and the fact that they have been retired. Also, five parcels on the list were not marked as retired on the map. It is likely that they were retired after the map was prepared. All seven of these corrections have been incorporated in the present report.
[8] Electronic files of permits were provided through the cooperation of the Agricultural Commissioners of Fresno and Kings Counties. The timely cooperation of the staffs of both agencies is gratefully acknowledged.
[9] It is important to note that the District's dry land wheat program contemplates use of some 'retired' land for growing wheat without irrigation. At least 1,700 acres of wheat was determined to be in production on land earmarked as 'retired.' No information is available on whether all, or any portion, of this wheat production is part of the dry land farming program, or whether it was produced using irrigation.
[10] *Fresno County Agricultural Crop and Livestock Report*, Department of Agriculture, County of Fresno, 2001 and 2002. Data for 2003 were not available at the time the present report was prepared.
[11] Data for each farm operator was determined from the web site of the Environmental Working Group, at the URL www.ewg.org. Data was not yet available for the 2003 crop year at the time the present report was prepared.
[12] *Ibid.*
[13] USDA program payments are not considered by the Fresno County Agricultural Department in its determination of crop revenues. Private communication, Fresno County Department of Agriculture, January 22, 2004.
[14] *Analysis of Economic Impacts…, op. cit.,* Table 5.8, 2001 Labor Force and Unemployment Rates for West Side Communities, p. 5-16.
[15] Don Villarejo, *California's Agricultural Employers: Twenty-five Years Later*, Invited paper, Symposium to Observe 25th Anniversary of the Agricultural Labor Relations Act, Davis, CA, October 4, 2000
[16] Electronic files of farm labor contractor registrations were provided through the cooperation of the Agricultural Commissioners of Fresno and Kings Counties. The timely cooperation of the staffs of both agencies is gratefully acknowledged.
[17] Don Villarejo and Judith Redmond, *Missed Opportunities – Squandered Resources: Why Prosperity Brought by Water Doesn't Trickle Down in the California Central Valley*, California Institute for Rural Studies, Davis, CA, 1988.
[18] Rick Mines, private communication, 2000.

[19] M. Akhtar Khan, Philip Martin and Phil Hardiman, *California's Farm Labor Markets: A Cross-Sectional Analysis of Employment and Earnings in 1991, 1996 and 2001,* Working Paper, Labor Market Information Division, Department of Employment Development, State of California, Sacramento, CA, August 2003.
[20] *Ibid,* Table 4: Earnings of Primary Employees ($), 2001, p. 11.
[21] *Ibid.*
[22] While the Census Bureau regularly examines important U.S. industries, no current Economic Census reviews the Agricultural Service sector of the economy. Only during 1969, 1974 and 1978 did the Census of Agriculture seek to conduct a special Census of Agricultural Services, which effort was fraught with difficulties. The Census Bureau relies primarily on mail-out solicitations for participation. Despite great efforts, it was determined that is was nearly impossible to develop a sufficiently reliable mail list. After 1978, this Special Report was abandoned.
[23] See http://www.nass.usda.gov/census/ for copies that can be downloaded.
[24] *Census of Agriculture 2002. California State and County Data. Volume 1. Geographic Areas Series, Part 5. Report No. AC02-A-5, June 2004*, Table 1. County Summary Highlights: 2002, pp. 212ff.
[25] *Ibid*, Table 3. Farm Production Expenses: 2002 and 1997, pp. 244ff.
[26] *Sample Costs to Produce Cotton*, U.C. Cooperative Extension, 1999. The report describes estimated costs for acala cotton, planted in 40-inch rows.
[27] *Sample Costs to Establish an Alfalfa Stand and Produce Alfalfa Hay*, U.C. Cooperative Extension, 1998.
[28] *Sample Costs to Produce Processing Tomatoes*, U.C. Cooperative Extension, 2002.
[29] Two currently active farm labor camps were not listed in either of the County Agricultural Commissioner files. One large, out-of-county farm labor contractor lists a local business address and telephone number in a District community. All three have been included in the present compilation.
[30] Don Villarejo, *Impact of Reduced Water Supplies on Central Valley Agriculture*, California Institute for Rural Studies, Davis, CA, February 1995; Don Villarejo, *93640 at Risk: Farmers, Workers and Townspeople in an Era of Water Uncertainty*, California Institute for Rural Studies, Davis, CA, March 1996.
[31] Penn Loh and Santos V. Gomez, *Water Transfers in California: A Framework for Sustainability and Justice*, Pacific Institute for Studies in Development Environment and Security, Oakland, CA, 1996.
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