

**THE ECONOMIC  
IMPACTS OF REDUCING CORN  
AND DRY BEAN YIELDS  
IN A PORTION OF  
SAN JOAQUIN COUNTY, CALIFORNIA**

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# **THE ECONOMIC IMPACTS OF REDUCING CORN AND DRY BEAN YIELDS IN A PORTION OF SAN JOAQUIN COUNTY, CALIFORNIA**

## **I. INTRODUCTION**

Agriculture is an important component of California's economy. In 2002, California agriculture generated about \$28 billion value at the farm level (ERS-USDA) for the state's growers and ranchers. This was about 13 percent of the United States farm income that year. Thus, California is an important part of the nation's food and fiber supply.

California is the sole supplier of many specialty crops but it is also an important food purveyor to many nations of the world.

Of California's \$28 Billion output in 2002, about \$20 Billion of this income was produced by the crops sector. Of concern in this study is the potential impact increased salinity of the available irrigation water might have on yields of select California field crops. Specific emphasis is on the economic impacts of reduced yields on grain corn, corn silage and dry edible beans in San Joaquin County's Delta region.

The specific study area includes corn and beans grown in the Banta Carbona Irrigation District and dry edible beans grown in the Banta Carbona Irrigation District (BCID) and the southern San Joaquin Delta region of San Joaquin County. More specifically, we looked at corn and beans grown in Banta Carbona Irrigation District. These acreages were irrigated with surface water. In 2003, 403 acres of corn were grown in the Banta Carbona Irrigation District. This acreage was irrigated with surface water. During that year BCID had 2,301 acres of dry edible beans irrigated with surface water. It was assumed that there were 4,346 acres of dry beans grown in the southern San Joaquin Delta region during 2003 which were irrigated with surface water.\*

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\*Actual 2003 dry bean acreages grown in the southern San Joaquin Delta area were not available. However, there were 10,540 acres of beans grown in the South Delta area in 1996. It was assumed that dry bean acreages declined in the South Delta at the same rate dry bean acreages declined in San Joaquin County. Dry bean acreages declined by 58.77 percent from 1996 to 2003 in San Joaquin County (See Appendix – Acres). Thus, the southern San Joaquin Delta had 4,346 acres of beans in 2003. ( $10540 \times 41.32\% = 4346$  acres)

It should be noted that in 1996 about 75 percent of the beans grown in the southern Delta were irrigated with surface water. (Six maps-Vernalis – Lathrop Quadrangles) Thus, our estimate of acreages of beans irrigated with water from San Joaquin River would be less than 4,346 acres.

## **II. PURPOSE OF STUDY**

This study is being conducted to evaluate the economic impact reduced yields might have as a result of increasing the salinity of irrigation water.

The grain corn, corn silage and dry edible bean crops grown in San Joaquin County, California were selected for the study. These crops were selected because they were included in earlier studies measuring salinity levels and crop yields in the San Joaquin Delta area. The area of study is the corn and bean acreage of the Vernalis and adjacent areas that use surface water irrigation from the San Joaquin River.

## **III. SAN JOAQUIN COUNTY**

San Joaquin County, California is located in the northern portion of the San Joaquin Valley. The area includes the very fertile San Joaquin Delta area. Of the 738,000 acres of land located in the San Joaquin Delta area, an estimated 24 percent or 177,120 acres are located in San Joaquin County. There are about 133,170 acres of this Delta land in agricultural use. (San Joaquin Council of Governments) The county has 808.8 thousand acres in farms and an area of 1400 square miles. In 2003, the county had an estimated population of 630,600 people.

San Joaquin County is a leader in agricultural production. In 2003, the county had a gross agricultural output valued at \$1.4 Billion. (Ag Commissioner) This ranked seventh of the 58 California counties. The county produces a wide array of agricultural products. In 2003, milk was the highest valued product produced. San Joaquin dairy farmers received \$257 million for milk that year. (Ag Commissioner) Of the \$1.4 Billion 2003 farm income, \$140 million of this was made up of field crops.

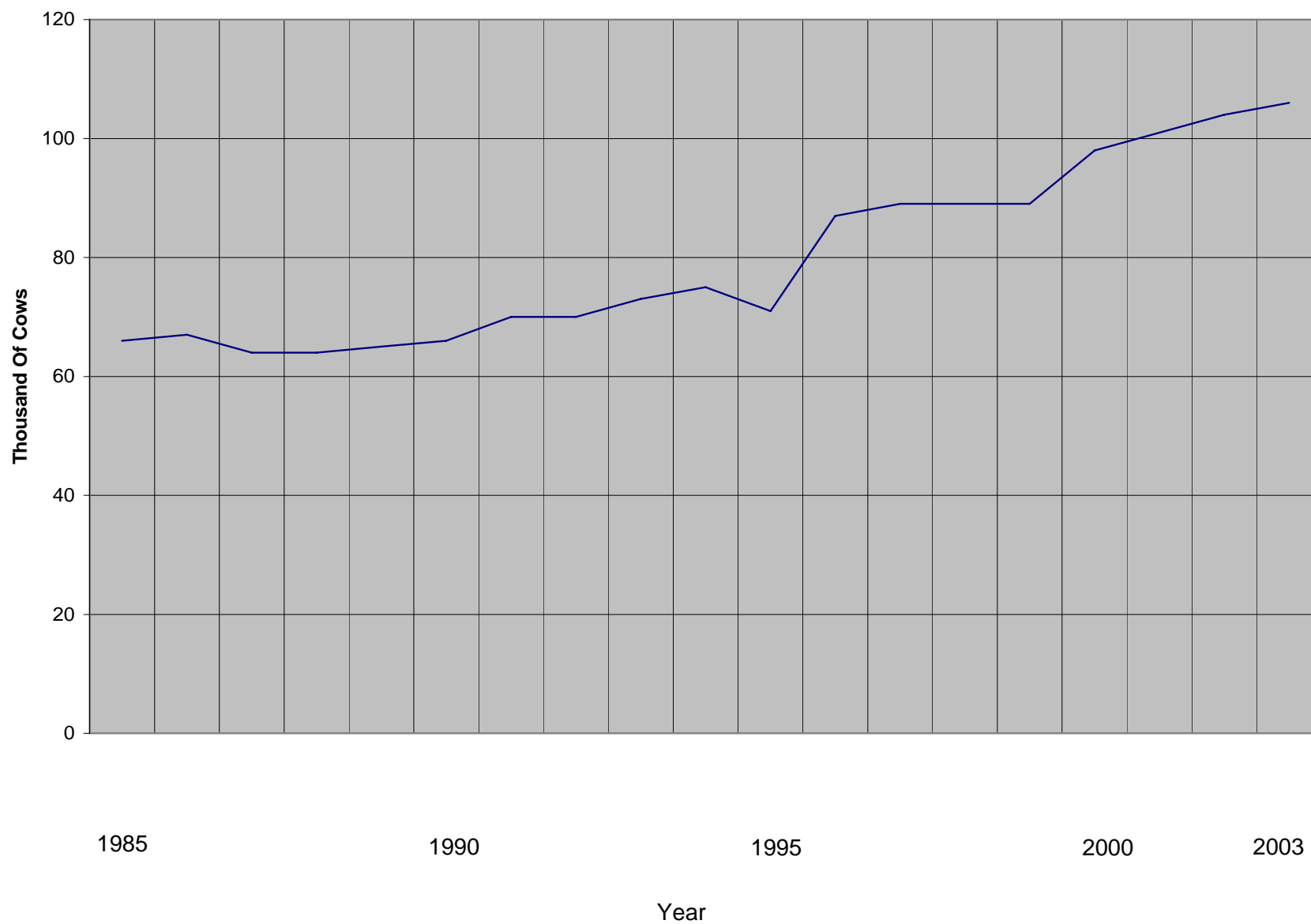
This study however is concerned with the acreage in the Banta Carbona Irrigation District and the South Delta area of corn and dry edible beans irrigated with San Joaquin River.

### **The San Joaquin County Dairy Industry:**

An important part of the analysis of this study is the relationship of the corn crop to the County's dairy industry. Dairy is in a growth mode in San Joaquin County.

In 1985, there were 66,000 dairy cows in the county but by 2003 this number had increased to 106,162. (CDFA – Dairy Statistics) (See the following graph)

**San Joaquin County Dairy Cow Numbers**



While cow numbers have been increasing, San Joaquin County dairy farm numbers have decreased to 151 farms in 2003 (CDFA).

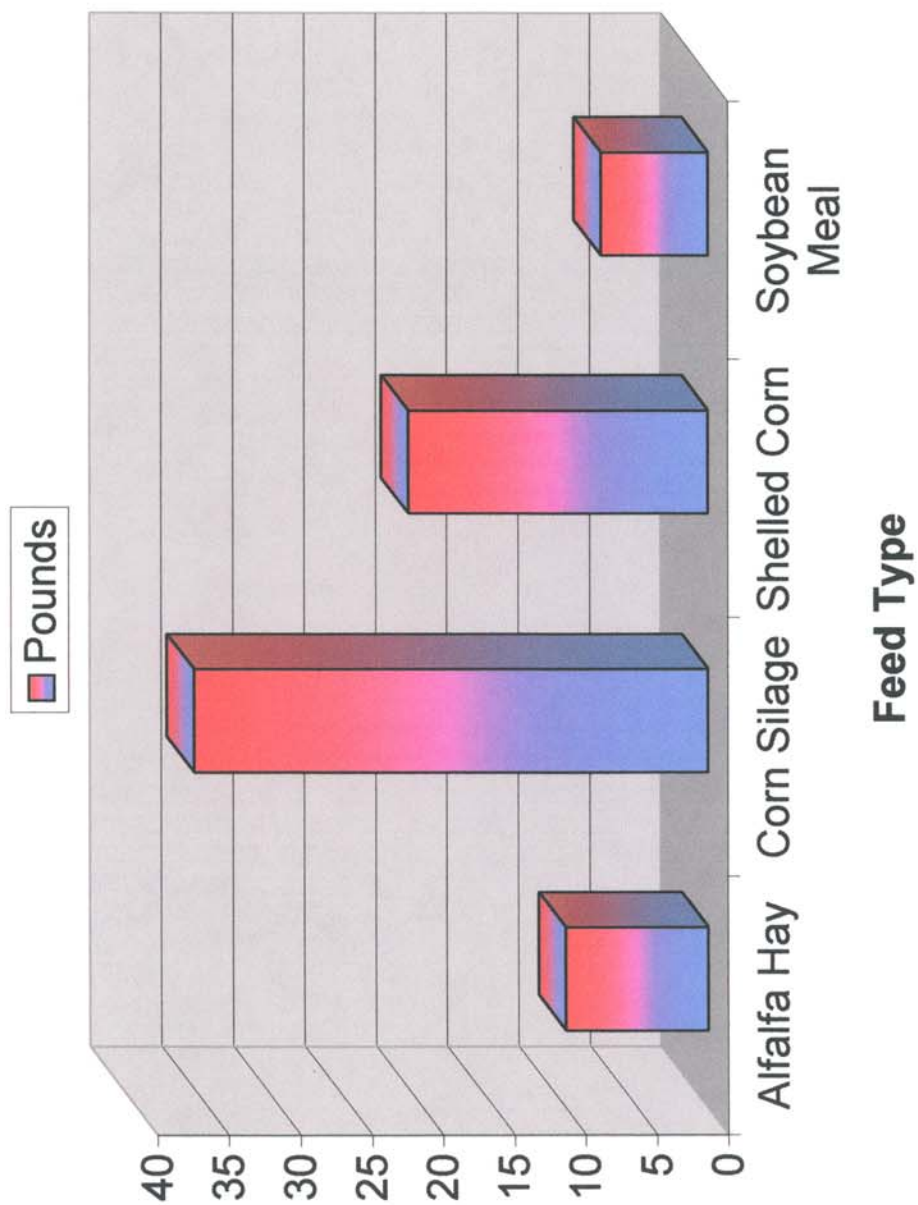
The average herd size in 2003 was 703 cows. That is up from the average herd size of 318 cows in 1987.

To support this dairy herd requires a substantial feed supply. Dairy cow nutritional requirements vary by animal size and productive capacity. However, a rather conventional daily dairy cow ration consists of:

Alfalfa Hay	10 pounds
Corn Silage	36 pounds
Shelled Corn	21 pounds
Soybean Meal or (Almond hulls /cotton seed)	7.5 pounds
Select trace minerals and vitamins	

Corn is an important ingredient in the dairy cow ration (See the following graph).

## CONVENTIONAL DAILY COW RATION



## **IV. GRAIN CORN**

Grain corn is an important crop in San Joaquin County, California. In 2002, San Joaquin County grew more acres of grain corn than any other county in the state. (U.S. Census of Agriculture)

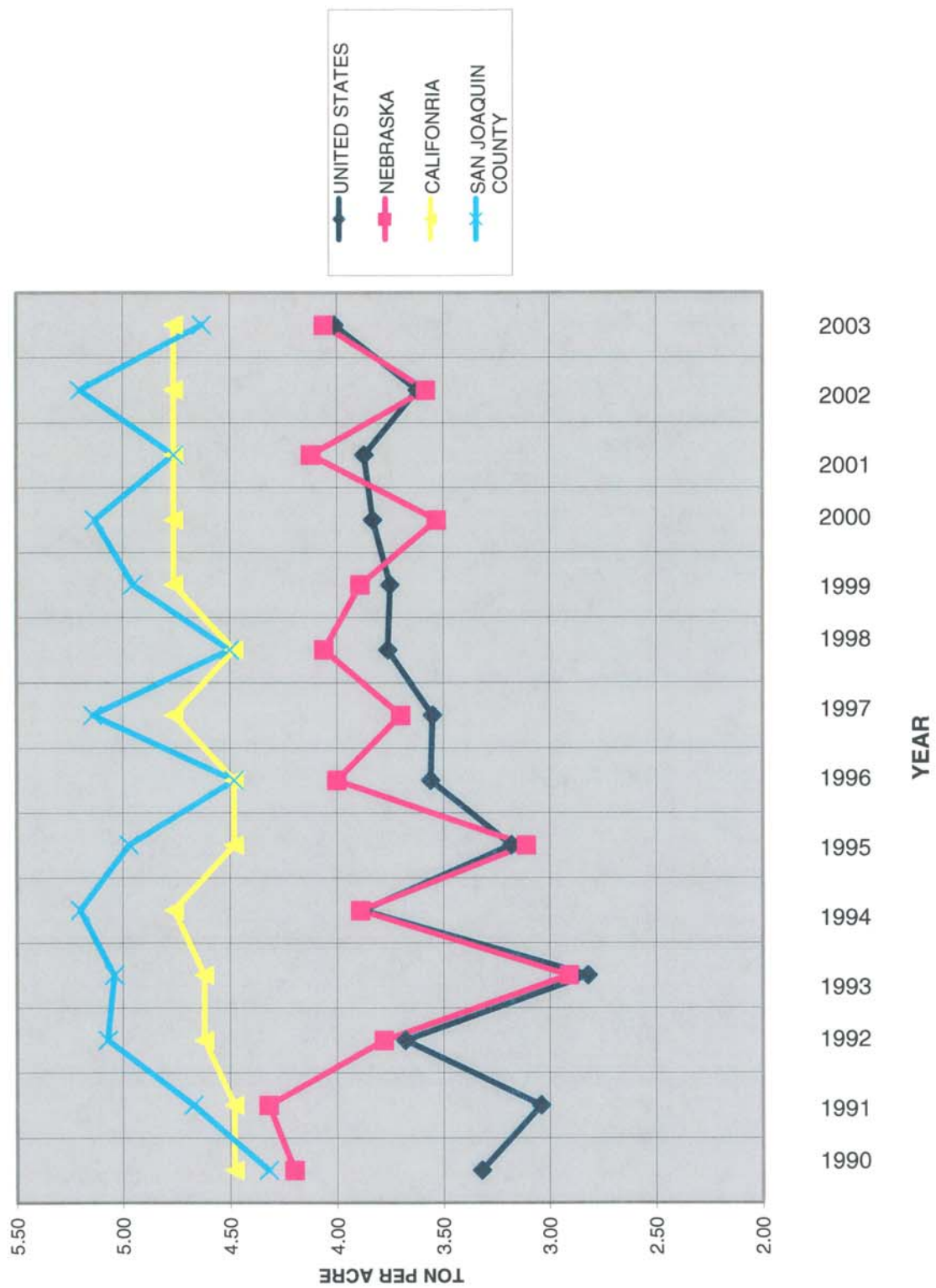
Corn is grown in this county by an estimated 106 farmers with an average acreage of 497 acres (2002 Census of Agriculture). San Joaquin County has historically produced a substantial part of California's corn crop. In 2003, this county produced 35 percent of the state's crop for which the growers received \$21 million.

Corn is usually planted in March with about 34,000 seeds per acre. Harvesting is done in August and September.

Corn is a vital part of California's agriculture because of its use for feed by the poultry and dairy industries. In addition to the state's production, about 3 million tons are imported annually from Nebraska.

Comparatively, San Joaquin County yields greatly exceed the grain corn yields obtained in both Nebraska and the United States. (See the following graph)

GRAIN CORN YIELDS (1990 - 2003)



#### **IV. GRAIN CORN (Continued)**

##### **COST OF PRODUCTION:**

UC Extension Farm Advisors estimated the following cost to produce grain corn in the San Joaquin Valley. These costs are based on 2003 prices and are considered to be typical grain corn production costs for the San Joaquin Valley:

<b><u>PRODUCTION</u></b>	<b>DOLLARS PER ACRE</b>
<b>Total Cultural Costs</b>	<b>488</b>
<b>Harvest Costs</b>	<b>89</b>
<b>Interest on Capital</b>	<b>16</b>
<b>Total Operating Costs</b>	<b>594</b>
<b>Overhead Costs</b>	<b>160</b>
<b>Total Cash Costs</b>	<b>754</b>
<b><u>Expected Yield per Acre: 5.00 Tons</u></b>	
<b>Cost Per Ton</b>	<b>\$150.80</b>

#### **IV. GRAIN CORN (Continued)**

##### **INDUSTRY STRUCTURE:**



##### **San Joaquin County**

**106 Growers  
46,700 Acres grown  
440 Acres – Ave acreage**

##### **To Dealers or Livestock Producers**

**75-85% - To Livestock  
Feed (Dairy – Poultry)**

**5% - To Food  
Manufactures**

**10% To Industrial Uses**

## **IV. GRAIN CORN**

### **(Continued)**

#### **GOVERNMENTAL PROGRAMS:**

Grain corn is covered under a United States Government program which is administered by the Farm Service Agency of the United States Department of Agriculture. The objective is to stabilize the price and incomes of corn growers.

Under the Farm Security and Rural Investment Act of 2002, eligible owners, operators, land lords, tenants, and sharecroppers can participate in the program. To be eligible a grower must be registered with the local Farm Service Agency and have a base production acreage. A normal base yield for each supported crop is also established for each grower.

The Support Program consists of a “direct payment” and a counter cyclical payment.

The direct payment for each crop year is calculated by using 85 percent of farms base acreage times the farms direct payment yield times the direct payment rate. The 2004 direct payment rate is \$.28 per bushel or \$10 per ton. As an example, a grower with a base acreage of 100 acres of grain corn would have 85 payment acres. If this grower had a base yield of 4.9 tons per acre, the direct payment would be:

$$85 \times 4.90 \times \$10. = \$4165.$$

The second part of this program is the counter cyclical payment. This payment is based on the difference between an established target price (annual) and the established “market year average” price. For 2004, the target price for grain corn is \$2.63 per bushel or \$93.92 per ton. The 2004, MYA price for corn grain is \$2.43 per bushel or \$86.70 per ton. Thus a grower would receive \$7.22 per ton for grain corn grown on 85 percent of the base acreage times the normal yield.

Both of these programs are designed to enhance income with out encouraging growers to expand acreages.

#### **IV. GRAIN CORN (Continued)**

##### **The 2004 Grain Corn Payments:**

Corn growers were eligible, in 2004, for the following payments:  
There are 35.71 bushels per ton.

<b>Target Price</b>	<b>\$2.63 per Bushel</b>	<b>\$93.92 per Ton</b>
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<b>Market Year Average Price (2004)</b>	<b>\$2.43 per Bushel</b>	<b>\$86.70 per Ton</b>
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<b>Counter Cyclical Payment</b>	<b>\$ .21 per Bushel</b>	<b>\$7.22 per Ton</b>
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<b>Direct Payment</b>	<b>\$ .28 per Bushel</b>	<b>\$10.00 per Ton</b>
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<b>Total</b>	<b>\$ .49 per Bushel</b>	<b>\$17.22 per Ton</b>
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<b>Per Ton Payment</b>	<b>\$17.22</b>
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## **IV. GRAIN CORN**

### **(Continued)**

#### **A HYPOTHETICAL CASE:**

As an example, a grain corn grower in 2004, with a historical yield of five tons per acre would be paid both a direct payment and a counter cyclical payment. This payment would be made on only 85 percent of the grower's base acreage.

Assuming a base acreage 100 acres the following payments would be received:

Direct Payment:	85 acres x 5.00 x \$10.00 = \$4,250.
Counter Cyclical Payment:	85 x 5.00 x \$7.22 = \$3,068.
Total Governmental Payment:	\$7,319
Per Acre Payment for 85 Acres:	\$86.11
Per Ton Payment of 85 Acres (5 ton/Acre Yield)	\$17.22

#### **PRICES:**

Corn prices vary daily depending on the economic conditions. It is also traded on the Chicago Board of Trade.

In December, 2004, California grain dealers in the Stockton area were paying between \$4.98 and \$5.10 per hundred weight delivered to the Stockton – Modesto area. This equates to \$99.60 to \$102 pr ton.

Surveyed California grain dealers indicated they usually buy a 100-110 carload lot (unit train) of corn from Nebraska. Transportation charges (In 2004) varied from \$20 to \$29 per ton from Nebraska. A rail car holds 100 tons.

The March, 2005 corn contracts for March, 2005 delivery, were selling on the Chicago Board of Trade on January 13, 2005 for \$2.005 per bushel. This translates into \$71.60 per ton. The 2004 United States crop was a record high 11.8 Billion bushels.

San Joaquin County corn growers received \$95 per ton for their 2003 crop. Adding the governmental payment of the \$17.22 per ton would have given these growers a price of \$112.22 per ton for their 2003 crop.

Nebraska corn prices have averaged about \$2.19 per bushel (\$78.20 per ton) since 1996. Yields have average about 3.74 tons per acre over eight years since 1996.

Reported cost of corn production for "Heartland-United States" growing areas is \$360 per acre. Thus, the Nebraska cost of production is about \$96 per ton.

#### **IV. GRAIN CORN** **(Continued)**

##### **COMPARATIVE RETURNS:**

Comparing returns by San Joaquin County growers and Nebraska dealers indicates corn is a marginal crop in both growing areas:

<b><u>Nebraska</u></b>	<b><u>Per Ton</u></b>
Cost of Production	\$96.00
Returns per Ton	\$71.60
Add:	
Governmental Payment per ton	<u>\$17.22</u>
<b>Net</b>	<b>(-\$7.18)</b>

<b><u>San Joaquin County</u></b>	<b><u>Per Ton</u></b>
Cost of Production	\$150.80
Returns per Ton	\$95.00
Add:	
Governmental Payment per ton	<u>\$17.22</u>
<b>Net</b>	<b>(-\$38.58)</b>

It must be noted, however, that Nebraska corn may have a \$29.00 per ton shipping charge to California.

The \$150.80 estimated cost of producing grain corn in Central California was estimated by University of California Farm Advisors. This agency included in the cost a \$160 per acre overhead cost (depreciation, liability insurance, repairs, office expense). Not all growers use new equipment and, thus, have less depreciation and their office is their pick – up truck. If the \$160 per acre were removed from the cost of production the per ton cost of production would be \$118.80 per ton (a \$32.00 per ton reduction).

## **IV. GRAIN CORN (Continued)**

### **Why Do San Joaquin County Growers Grow Grain Corn?**

The estimated negative returns are probably the reason less corn is being grown in the county. But, for many growers they probably do not experience a negative \$38.58 per ton. While corn is a marginal crop the advantages of a local supply also have value. Some of these reasons are dependability of supply and better product control.

In some previous years when feed prices “spiked” upward the dairy farmers that made money were those who grew their own feed. Also, some of the low prices of imported corn are only available with a “unit train” purchase of a minimum of 100 carload lots. This is very large feed inventory especially for a dairy with 250 cows.

### **TRENDS:**

1. Grain corn acreages have declined in San Joaquin County over the past two decades but at a slower rate than in California.
2. San Joaquin County corn yields are generally higher than the state average and the Sacramento Valley yields.
3. Generally, California grain corn sells at a higher price than the United States average price.
4. The San Joaquin County share of the California grain corn crop has been increasing since 1980.
5. The value of the San Joaquin County corn crop has been decreasing just as has the value of California corn relative to the United States crop’s value.

## **V. CORN SILAGE**

Corn silage is also an important field crop for California growers. In 2002, there were 2,012 California corn silage growers (U.S. Census of Agriculture). The average grower had 196 acres.

There were 175 San Joaquin County corn silage growers in 2002; the average grower had 183 acres of corn silage. (U.S. Census of Agriculture)

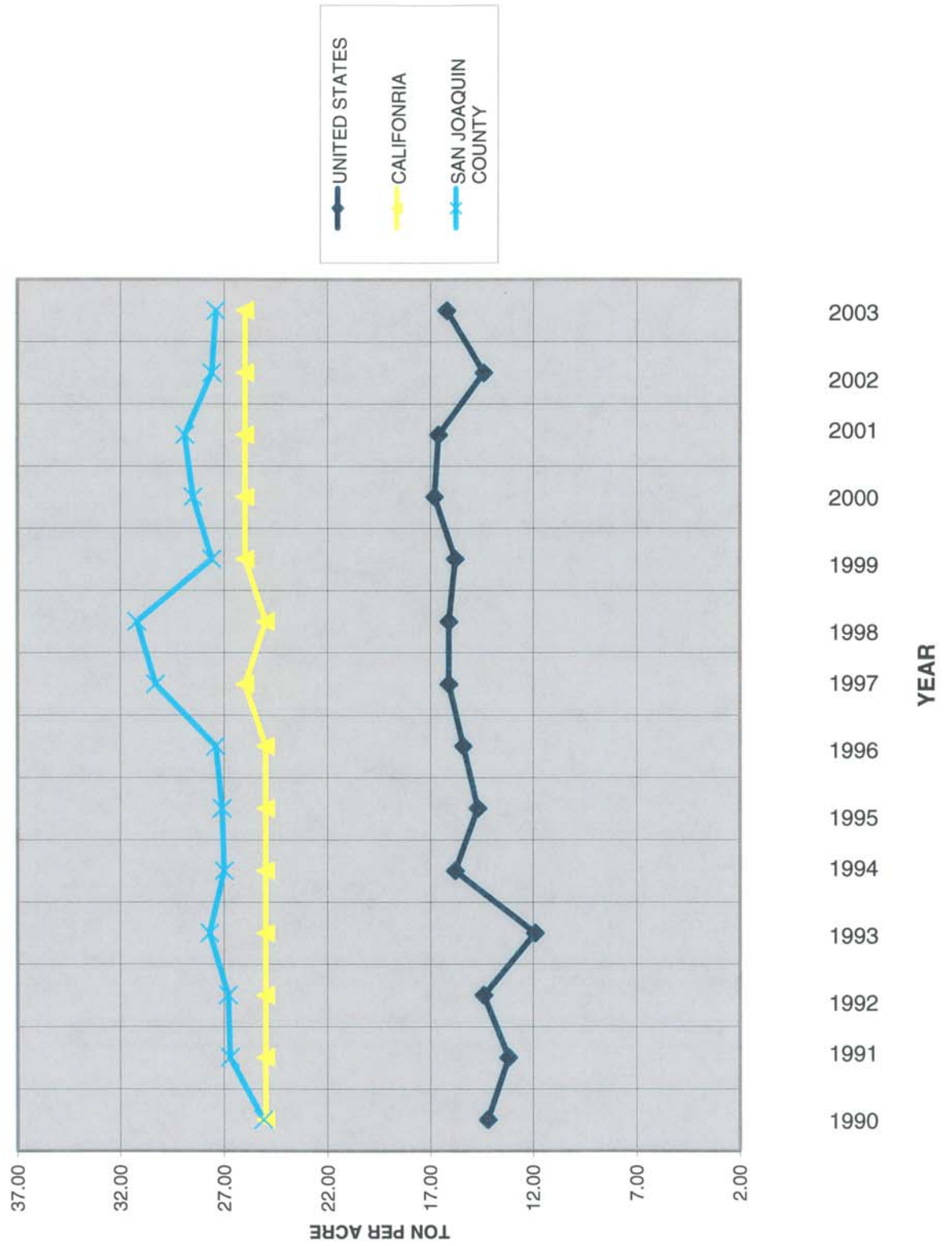
Corn silage acreages vary from year to year but there are about 350 thousand acres grown in California. In 2003 about 40 thousand acres were grown in San Joaquin County. This was about 12 percent of the state's output.

Corn silage is usually considered a bulky low value product. Thus, it is usually grown in the proximity of the dairy on which it is fed. It would also be difficult to replace any reduction of local supplies because of the relatively high cost of transporting corn silage.

This crop is usually planted in May with about 32,000 seeds per acre. Harvesting is done in September.

San Joaquin County is an important supplier of corn silage. It usually produces 10 to 14 percent of the State's supply. Probably one of the reasons corn silage is grown extensively in the county are the yields obtained. Since 1990, San Joaquin County corn silage yields have averaged 27.8 tons per acre. The United States yields during that period were 15.1 tons per acre (See the following graph).

CORN SILAGE YIELDS (1990 - 2003)



## V. CORN SILAGE (Continued)

### Industry Structure

The marketing channel for corn silage is short and direct. It is usually either grown on the dairy which feeds it or it is grown by a grower located adjacent to the dairy that buys it, in most cases where silage is bought, the grower will deliver under five miles, with a delivery charge for delivery at greater distances.

### Cost of Production

Cash costs for corn silage grown in San Joaquin County are estimated by the U.C. Cooperative Extension Services to be:

Cultural Costs (Includes seed and production costs)	\$467 per acre
Harvest Costs	\$210 per acre
Cash Overhead Costs	\$248 per acre

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Total Cash Cost Per Acre	\$925
Total cash cost per ton	\$33.00

## **V. CORN SILAGE (Continued)**

In 2003, San Joaquin County corn silage growers produced a product valued at \$20.00 per ton. Universities of California Farm Advisors, however, estimate it costs \$33.00 per ton to grow this crop. Why then would farmers continue to grow corn silage?

Corn silage is an important dairy feed. It is the lowest cost of all roughages and it was previously stated that a daily cow ration usually consists of 36 pounds. While it was priced at \$20.00 per ton in 2003, the value to a dairyman is greater than this or they would not grow it. Thus, the negative returns do not reflect the actual economic net to the dairy on which it is fed.

### **Trends:**

1. There has been an increasing acreage of corn silage grown in California and the San Joaquin County.
2. The average acres grown per farm have been increasing.
3. San Joaquin County yields usually exceed those of California and of the United States. A normal yield for San Joaquin County is about 28 tons per acre or 184 percent of the United States yield.
4. San Joaquin County usually produces slightly over one million tons of corn silage annually.

## **VI. DRY EDIBLE BEANS**

Dry edible beans are grown in both California and several other areas of the United States. California produces about eight percent of the nation's output.

There were 385 California farms that grew dry beans excluding dry lima beans in 2002. An estimated 58,420 acres were grown that year. (US Census of Agriculture) In addition 44,546 acres of lima beans were grown that year. An estimated 242 growers produced lima beans in 2002. (US Census of Agriculture)

San Joaquin County reported 52 growers of dry edible beans (excluding Lima varieties) and 30 growers of Lima beans in 2002. In 2003, California bean growers grew 75 thousand acres of dry edible beans. San Joaquin County accounted for 9.4 thousand acres, or 12.5 percent of the states total.

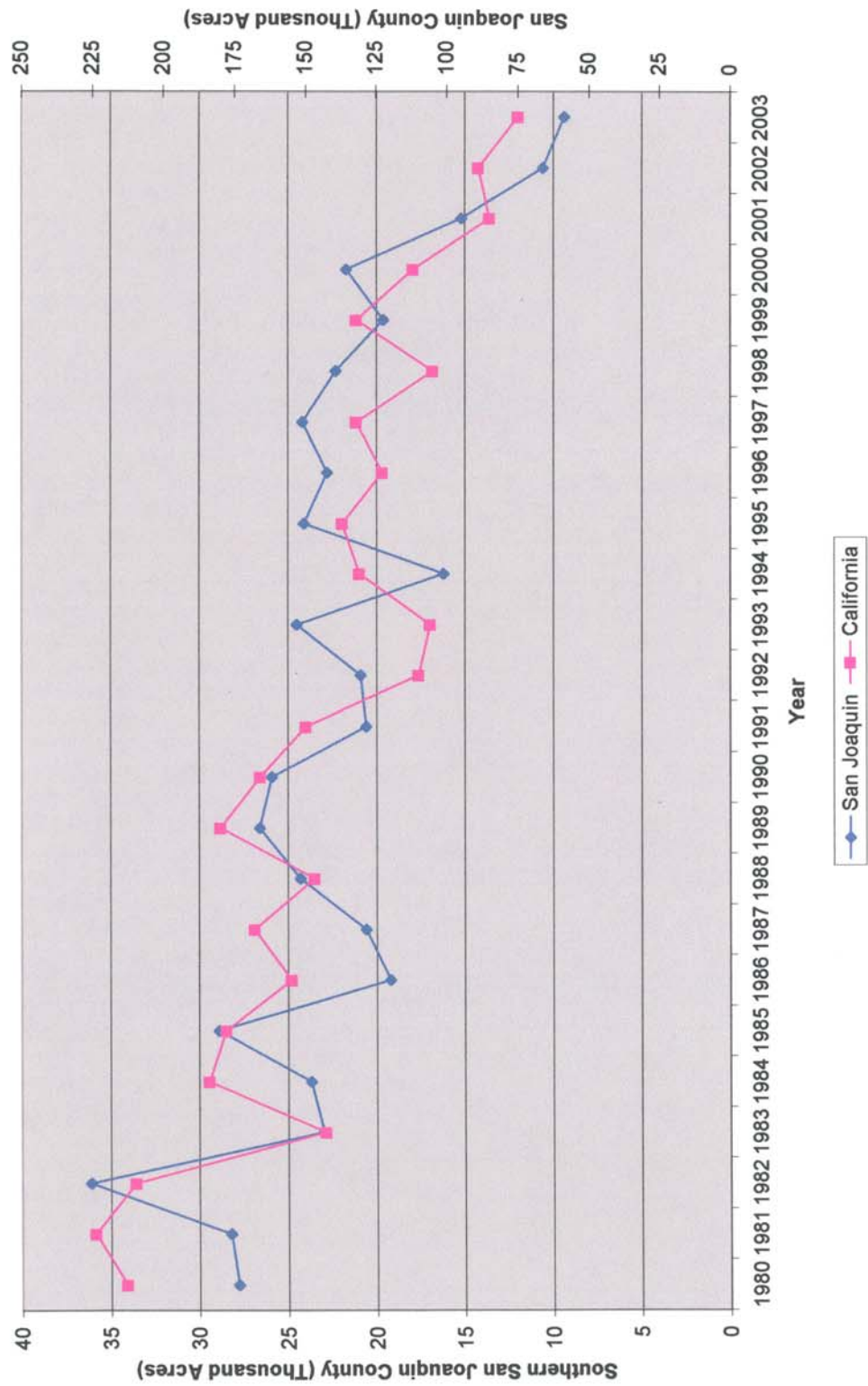
The California dry bean industry has slowly gone through a transition. California acreages grown in 1980 totaled 213 thousand acres but by 2003 these acres had declined to 75 thousand. (See the following graph).

While San Joaquin County is an important dry edible bean grower, its averages have declined at about the same rate as have acreages in California (See the following graph). By 2003, San Joaquin County acreages had declined to 9.4 thousand acres.

Much of this acreage change has been attributed to increased dry bean production in the lower production cost regions such as North Dakota, Washington and Texas.

Several factors have had a possible negative effect on the San Joaquin County bean industry. First, in 1998, the Tri Valley Growers Cooperative officially filed for bankruptcy. This was a major bean canning facility. This was an important outlet for bean growers in the area. Secondly, the economic returns from dried beans have been marginal causing growers to grow more profitable crops.

Dry Beans Harvested in California and San Joaquin County (1980-2003)



## **VI. DRY EDIBLE BEANS**

### **(Continued)**

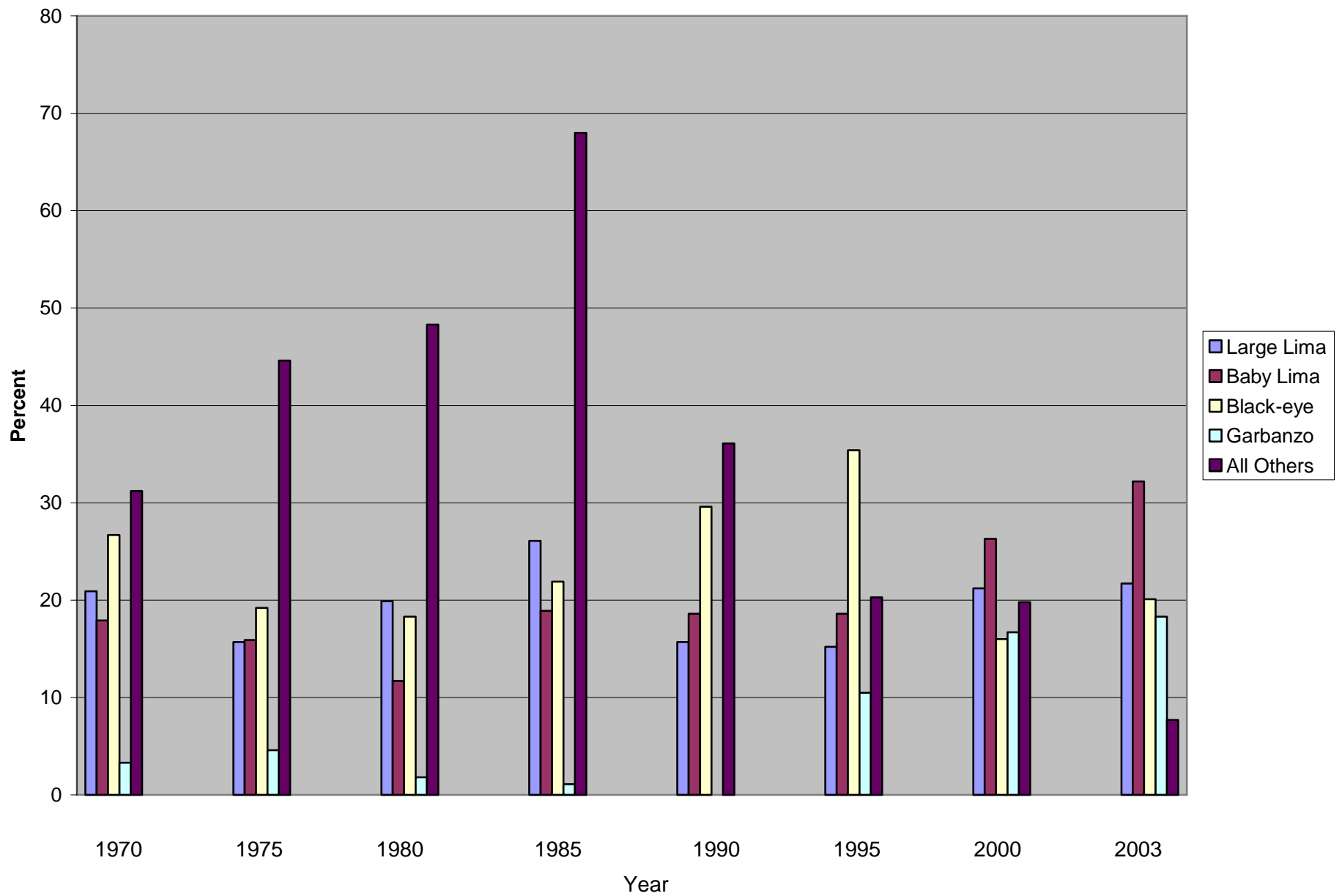
Just as the acreages have changed, so too, has the composition of the crop. There are many varieties of beans grown in California; However, the state has become a “Specialty Bean” producer. By 2003, over 80 percent of the dry bean crop was made up of four varieties; Black-eyed (27 percent), Baby Lima (22 percent), Large Lima (19 percent), and Garbanzo (12 percent). (See the following graph).

San Joaquin County has historically produced about 13 to 15 percent of California’s dry bean crop. The South Delta region is an important production area of the county. The 2,301 acres grown in 2003 in the Banta Carbona Irrigation District is about 24 percent of the county’s acreage. A substantial part of the state’s Baby Lima output is grown in the south Delta region.

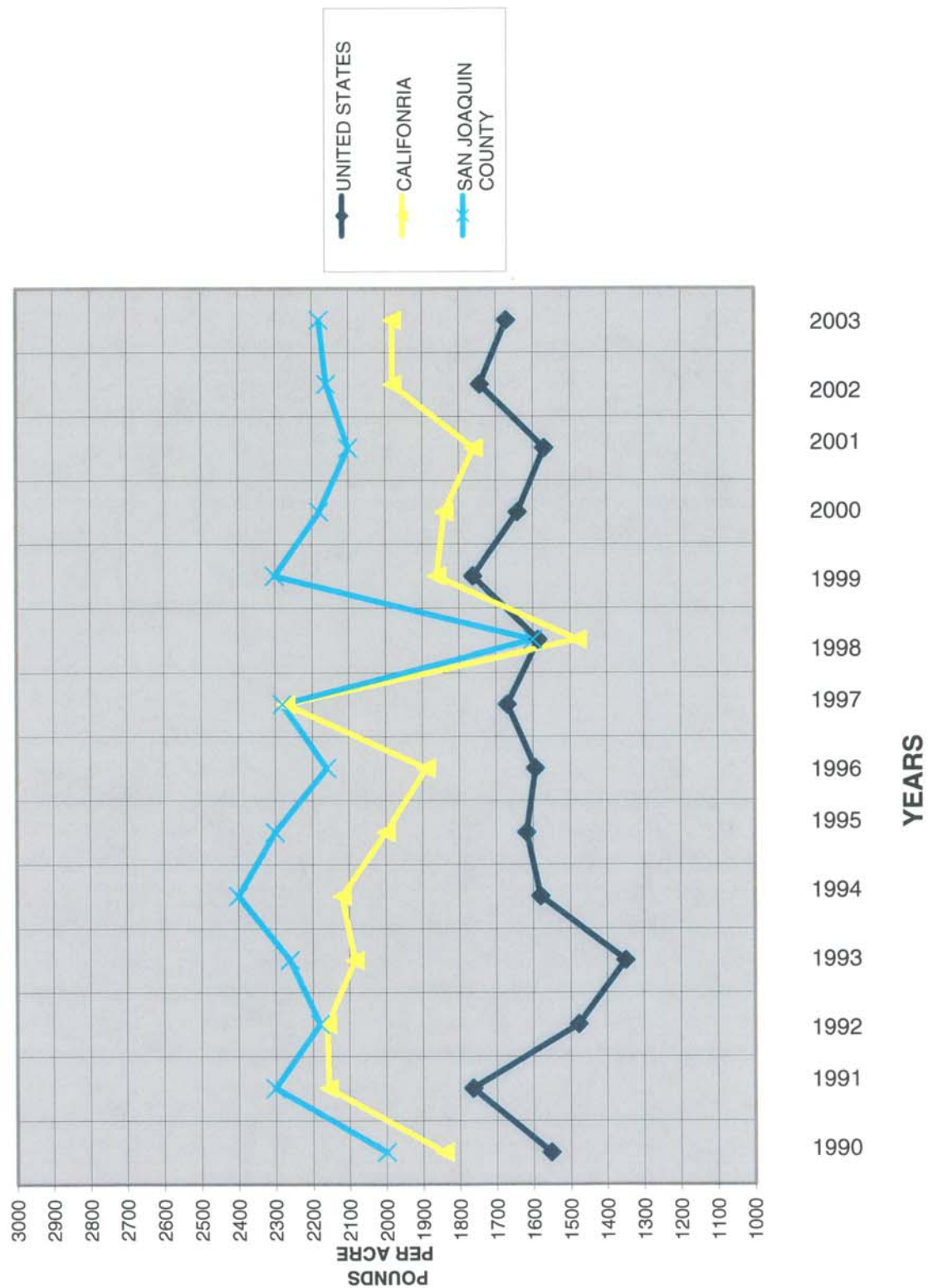
A large part of this Baby Lima crop is exported to Japan (Dry Bean Board).

A very important characteristic of the San Joaquin County dry bean industry has been the high yields these growers get. Generally, dry bean yields in San Joaquin County exceed those of California and the United States. (See the following graph). The severe downward spike of yields in 1998 can be attributed to the influence of adverse weather.

California Dry Bean Varieties As A Percent Of Crop



DRY EDIBLE BEAN YIELDS (1990 - 2003)



## **VI. DRY EDIBLE BEANS (Continued)**

### **Industry Structure**

#### **Growers:**



**385 in California  
(Excluding Limas)**

**52 San Joaquin County  
(Excluding Limas)**

**242 Lima growers  
In California**

**30 Lima growers in  
In San Joaquin County**

#### **Dealers and Warehouses**

**Market and store beans**

## **VI. DRY EDIBLE BEANS (Continued)**

### **Industry Organizations**

Dry Bean Advisory Board-  
(Market Order)  
Dinuba, CA

### **Functions:**

Sponsors research, marketing, grading, inspection and promotional programs

### **Assessments**

Dealers	\$ 0.01 / Hundred Weight
Producers (For all types)	\$ 0.17 / Hundred Weight

Varietals Councils (additional)	Various Rates
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California Bean Shippers Association Sacramento, California	Consists of Dealers Warehouses And Exporters
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## **VI. DRY EDIBLE BEANS**

### **(Continued)**

#### **Cost of Production**

The UC Davis Farm Advisors estimated production cost for Black eyed and Baby Limas grown in the San Joaquin Valley.

#### **Per acre Costs**

<b><u>Cost Component</u></b>	<b><u>Baby Limas</u></b>	<b><u>Black eye</u></b>
<b>Cultural Costs</b>	<b>\$472</b>	<b>\$268</b>
<b>Harvesting Costs</b>	<b>\$190</b>	<b>\$273</b>
<b>Overhead Costs</b>	<b>\$185</b>	<b>\$ 65</b>
<b>Total Cash Costs</b>	<b>\$847</b>	<b>\$605</b>
<b>Expected Yield/acre (lbs)</b>	<b>2500</b>	<b>2800</b>
<b>Cost per Pound</b>	<b>\$ .34</b>	<b>\$ .22</b>

## **VI. DRY EDIBLE BEANS (Continued)**

These costs of production data suggest that bean grower would experience negative returns from growing beans. The cited cost data were developed by University of California Farm Advisors. This group estimated the overhead cost to be \$185 per acre to cover depreciation, taxes, insurance, office costs, etc. Not all growers have this much overhead. If the \$185 were deducted the cost of production for Baby Limas would be \$.26 per pound. This would result in a positive return of \$.06 per pound or \$150 per acre.

Also, in January, 2005, it was reported that bean prices had escalated to \$.40 per pound. This price increase was caused by a demand increase generated by the Iraq War. Beans are an aid – program food item. Industry observers indicated that bean prices usually increase during all recent wars.

## **VI. DRY EDIBLE BEANS (Continued)**

### **Consumption:**

Americans consume about 7.33 pounds annually of dry edible beans per capita. This is down from the 11 pounds consumed in 1950 but up from the 5.4 pounds eaten in 1984.

About 45 percent of the total United States consumption consists of the Pinto variety. This is the bean used in “Refried Beans” and Hispanic foods.

The export market is the primary outlet for the North Dakota crop. Leading foreign markets are Mexico, United Kingdom and Canada. In 2002, California growers exported dry beans valued at \$10.4 million. During that year most of the exports were Baby Limas that were exported to Japan for bean paste.

## **VI. DRY EDIBLE BEANS (Continued)**

### **Trends**

1. San Joaquin County is a primary producer of the Baby Lima variety. Japan is the major market for California exports (Dry Bean Advisory Board)
2. San Joaquin County is an important producer of California's dry edible bean supply.
3. Dry edible bean acres have declined in San Joaquin County at about the same rate as they have in California.
4. San Joaquin County dry bean yields are substantially above the California yields.
5. Dry edible bean prices received by San Joaquin County growers have changed little since 1980.
6. San Joaquin County dry bean production represents from 12 to 20 percent of the state's production.

## **VII DEMAND CHARACTERISTICS**

### **Grain Corn:**

Most grain corn grown in California is used to feed the livestock and poultry industries.

There are an estimated 1.7 million dairy cows in California living on 2,125 dairy farms. About one in five United State's dairy cows live in California.

Cheese is the most important product made from this milk. Historically, about three – fourths of the cheese consumed in California was imported from Wisconsin. California cheese production has more than doubled since 1992. A record 1.83 billion pounds were produced in 2003. This output is expected to continue in a growth mode.

In 2002 there were 178 dairy farms in San Joaquin County with 104,000 cows. In the adjacent county, Stanislaus, there were 359 dairy farms with 163,000 cows. Dairying has been in a growth mode in the San Joaquin County area.

In 2002 there were about 20 million egg producing chickens, 809 million broiler chickens raised, and 17 million turkeys produced in California. This is also an industry that is expanding production. (NASS – USDA)

In 2002, there were 83 San Joaquin County farms reporting producing poultry. (U.S. Census of Agriculture) These farms received \$33.8 million from poultry sales that year.

Clearly, dairy and poultry are important and growing industries in California and in San Joaquin County. Thus, the demand for corn will likely increase.

### **Dry Edible Beans:**

The United States capita consumption of dry edible beans has slowly increased in recent years. Bean consumption is greatest in the western and southern states of the nation.

Dry beans are an excellent low cost source of protein and historically were a staple of lower income households. Today, beans are an important component of fast food Hispanic food outlets.

Dry beans are on the healthful food list. Too, the increasing relative share of the United States population made up of Hispanics suggests that dry bean consumption will likely continue in a growth mode.

The demand for dry beans usually increases during times of war (Dry Bean Board).

## VIII. ECONOMIC IMPACTS

Grain corn, silage corn, and beans are important crops in San Joaquin County, and any changes in their production levels will affect the overall level of economic activity in the region. The first type of effect is labeled direct effects, which is a reduction in income and employment in the crop sectors where production is reduced. For example, a reduction in the yields of corn silage will directly affect the revenues received by those who grow corn silage, and employment in the corn silage industry may also decrease.

Indirect effects are those “spillover” economic effects that result from changes in the sectors anticipating changes in output (e.g. San Joaquin County agriculture). These indirect effects are the result of changes in income, spending and employment in those sectors that are linked to agriculture. Most often, researchers focus on the “backward” linkages that are affected by a change in the study industry. These backward linkages reflect the changes in purchases from supplier industries (e.g. fertilizer, fuel, farm implements) in the production process.<sup>1</sup>

Induced effects are the economic effects of changes in household and government spending that is the result of the direct and indirect changes in the original sector.

Most analyses focus on the dollar effects of changes in economic activity. It is also possible, however, to estimate the direct and indirect employment effects of changes in the original sectors. These analyses usually provide estimates of the increase or decrease in the number of jobs in relation to changes in final demand; e.g. the number of jobs gained or lost for every \$1 million changes in overall economic activity. An alternative approach is to estimate the number of indirect jobs lost or gained for every job that is created or lost in the study sectors.

There are a variety of regional economic (primarily input-output) models that provide the analytical capability to assess economic impacts of projected changes in specific sectors of a local economy. The two most frequently cited are RIMSIL, maintained by the U.S. Department of Commerce, and IMPLAN, originally developed by the U.S. Forest Service and the University of Minnesota. IMPLAN is currently maintained and marketed by the Minnesota IMPLAN Group, Inc., and is provided on a fee basis.

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<sup>1</sup> Some studies also try to capture the forward linkages, or value-added linkages, that represent the original industry’s output that passes downstream through the supply chain. This type of analysis requires a more thorough analysis of downstream industries such as food processing in the region than is feasible in this study. The result is that the estimates of direct and indirect economic impacts of changing agricultural production levels should be considered conservative.

## **VIII. ECONOMIC IMPACTS**

### **(Continued)**

For the purposes of this study, several studies were reviewed that employed the IMPLAN model ([www.implan.com](http://www.implan.com)). It seems to be widely used and accepted by a variety of public and private organizations. In order to provide precise estimates of the overall economic impacts of reductions in yields to the study crops, a detailed calibration of the model to San Joaquin County would have been required. This type of analysis is beyond the scope and time frame of this study. We have therefore opted to use the multipliers – or ratios between direct, indirect and total effects – of studies previously published.

The study which provided IMPLAN multipliers most directly related to the study crops was conducted by Mississippi State University “Economic Impacts from Agricultural Production in Mississippi” Although the economic structure of that state is obviously different than that of San Joaquin County, the use of the multipliers can provide a general – rather than precise – estimate of the overall economic effects of reductions in agricultural production. Moreover, a review of the various studies conducted during different time periods and in widely disparate geographic regions indicates that the multipliers for these agricultural sectors and crops tend to be very similar.

Based on these multipliers the economic loss was based on the following multipliers:

<b>Grain Corn</b>	<b>2.109</b>
<b>Corn Silage</b>	<b>2.124</b>
<b>Dry Beans</b>	<b>2.256</b>

## VIII. ECONOMIC IMPACTS

### (Continued)

Of concern in this study is the economic impact that would occur if yields were reduced by 10 percent on the corn and dry bean acreages in the Banta Carbona Irrigation District (BCID) located in the South Delta of San Joaquin County. In addition, the losses likely for a 10 percent yield reduction in the South Delta for dry beans were also made.

Data available made no distinction between grain corn and corn silage. Therefore, the assumption was made that the South Delta corn acreage would be divided between grain corn and corn silage at the same ratio that existed for these crops in San Joaquin County in 2003.

The following acreages were assumed for this analysis:

86,800	Acres of corn grown in San Joaquin County in 2003
46,700	Acres of grain corn grown in San Joaquin County in 2003 (53.8 percent of corn acres)
40,100	Acres of corn silage in San Joaquin County in 2003 (46.2 percent of corn grown)
403	Acres of corn grown in BCID in 2003
217	Acres of grain corn grown in BCID in 2003 (53.8 percent)
183	Acres of corn silage grown in BCID in 2003 (46.2 percent)

The following corn acreages are used to calculate the expected losses for the BCID acreages:

Grain Corn Acres	217
Corn Silage Acres	186

For dry beans, losses were also calculated for a 10 percent reduction of yields in the South San Joaquin Delta area.

The dry bean acreage assumed irrigated with surface water in 2003 was (See page2):

Dry beans	4,346 acres
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## **IX. LOSSES ASSOCIATED WITH A 10 PERCENT YIELD REDUCTION**

Based on the estimated acreage of grain corn, corn silage, and dry edible beans grown in the Banta Carbona Irrigation District in 2003, the following losses might be incurred with a 10 percent reduction in the yields of these crops.

Data in Table 1 reflects the per acre losses associated with a 10 percent yield reduction. These losses are based on San Joaquin County prices received for these three crops.

Using the assumed economic multipliers, a ten percent yield reduction would result in an economic loss of \$407,404.00 for the Banta Carbona Irrigation District corn and dry bean 2003 crops. (Table 2 and 3)

When a 10 percent yield reduction is assumed for the dry bean acreage grown in South Delta of San Joaquin County the loss is \$512,975.00 for the 2003 crop. (Table 4)

**Table 1:**

<b>Ten Percent Hypothetical Reduction of Yields</b>				
<b>CROPS</b>	<b>San Joaquin Co Yields per Acre</b>	<b>10 Percent Reduced Yield</b>	<b>Unit Value</b>	<b>Per Acre Value</b>
<b>Grain Corn</b>	<b>4.63 Tons</b>	<b>.46 Tons</b>	<b>\$112.22</b>	<b>\$51.62</b>
<b>Silage Corn</b>	<b>27.4 Tons</b>	<b>2.74 Tons</b>	<b>\$ 20.00</b>	<b>\$54.80</b>
<b>Dry Beans</b>	<b>2180 Pds.</b>	<b>218 Pds.</b>	<b>\$ .32</b>	<b>\$69.76</b>

**IX. LOSSES ASSOCIATED WITH A 10 PERCENT YIELD  
REDUCTION  
(Continued)**

**Table 2:**

**Losses Associated With A Ten Percent  
Yields Reduction – Banta Carbona Irrigation District**

<b>CROPS</b>	<b>Loss per Acre</b>	<b>Acres Grown</b>	<b>Value of Loss</b>
<b>Grain Corn</b>	<b>\$51.62</b>	<b>217</b>	<b>\$11,202</b>
<b>Silage Corn</b>	<b>\$54.80</b>	<b>186</b>	<b>\$10,193</b>
<b>Dry Beans</b>	<b>\$69.76</b>	<b>2301</b>	<b>\$160,518</b>

**Table 3:**

**Economic Impact Of A Ten Percent Yield Loss,  
Banta Carbona Irrigation District, San Joaquin County**

<b>Crops</b>	<b>Value of Loss</b>	<b>Multiplier</b>	<b>Economic Loss</b>
<b>Grain Corn</b>	<b>\$11,202</b>	<b>2.109</b>	<b>\$23,625</b>
<b>Silage Corn</b>	<b>\$10,193</b>	<b>2.124</b>	<b>\$21,650</b>
<b>Dry Beans</b>	<b>\$160,518</b>	<b>2.256</b>	<b><u>\$362,129</u></b>
<b>Total</b>			<b>\$407,404</b>

**Table 4:**

**Economic Impact Of A Ten Percent Yield Loss For Dry Beans,  
South Delta, San Joaquin County  
2003 Estimated Acreages**

<b>Characteristic</b>	<b>Value</b>
<b>Acres Grown*(4346 x 75%)</b>	<b>3,259.50</b>
<b>Loss Per Acre (218 Pounds x \$.32)</b>	<b>\$69.76</b>
<b>Value of Loss (10 Percent Yield Loss)</b>	<b>\$227,382.72</b>
<b>Loss Multiplier</b>	<b>2.256</b>
<b>Value of Economic Loss in South Delta San Joaquin County Dry Bean Crop, 2003</b>	<b>\$512,975.</b>

\*There were an estimated 4,346 acres of dry beans grown in the South Delta. But, it was assumed only 75 percent of this acreage was irrigated with surface water.

# **APPENDIX**

## **GRAIN**

### **CORN**

**CORN - GRAIN**  
**NUMBER OF FARMS GROWING**  
**CALIFORNIA AND SAN JOAQUIN COUNTY 1982-2002**

<b>YEAR</b>	<b>NUMBER OF CORN FARMS IN CALIF.</b>	<b>ACRES GROWN IN CALIFORNIA</b>	<b>AVERAGE SIZE OF FARM</b>	<b>NUMBER OF CORN FARMS SAN JOAQUIN CO</b>	<b>ACRES GROWN SAN JOAQUIN CO.</b>	<b>AVERAGE SIZE OF FARM SAN JOAQUIN CO.</b>
1982	1396	302,084	216	203	63,979	315
1987	1076	158,323	147	147	37,645	256
1992	731	148,616	203	115	47,265	411
1997	958	256,292	267	110	57,909	526
2002	592	168,354	284	106	52,748	497

SOURCE:  
US CENSUS OF AGRICULTURE

**CORN - GRAIN  
ACRES HARVESTED  
SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY <sup>1</sup></b>	<b>CALIFORNIA <sup>2</sup></b>	<b>UNITED STATES <sup>3</sup> (MILLION ACRES)</b>
1980	66,816	270,000	72.9
1981	70,000	275,000	74.5
1982	71,500	330,000	72.7
1983	40,100	260,000	51.5
1984	78,000	375,000	71.9
1985	72,300	320,000	75.2
1986	61,000	250,000	68.9
1987	51,700	221,000	59.5
1988	44,600	187,000	58.3
1989	54,800	185,000	64.8
1990	42,800	160,000	66.9
1991	35,100	115,000	68.8
1992	43,200	150,000	72.1
1993	56,200	170,000	62.9
1994	67,680	180,000	72.5
1995	40,430	150,000	65.2
1996	57,270	220,000	72.6
1997	68,000	265,000	72.7
1998	59,000	245,000	72.6
1999	56,000	185,000	70.5
2000	56,500	205,000	72.4
2001	57,800	160,000	68.8
2002	47,600	150,000	69.3
2003	46,700	130,000	71.1

**SOURCE:**

1. COUNTY AG COMM ANNUAL REPORTS

2.CDFA

3.NASS-USDA

**CORN - GRAIN  
YIELDS PER ACRE  
SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

YEAR	SAN JOAQUIN COUNTY 1	CALIFORNIA 2	UNITED STATES 3		SAN JOAQUIN CO PERCENT OF CALIF.	CALIFORNIA AS PERCENT OF U.S.
	TONS PER ACRE	TONS PER ACRE	BUSHEL PER ACRE	TONS PER ACRE		
1980	4.4	3.78	91.0	2.55	116.40%	148.20%
1981	3.89	3.64	108.9	3.05	106.9	119.3
1982	4.5	3.64	113.2	3.17	123.6	114.8
1983	9.92	3.58	81.1	2.27	277.1	157.7
1984	4.47	3.81	106.7	2.99	117.3	127.4
1985	4.7	4.06	118.0	3.30	115.8	123
1986	4.62	4.26	119.4	3.34	108.5	127.5
1987	4.7	4.48	119.8	3.35	104.9	133.7
1988	4.46	4.06	84.6	2.37	109.9	171.3
1989	4.64	4.48	116.3	3.26	103.6	137.4
1990	4.32	4.48	118.5	3.32	96.4	134.9
1991	4.67	4.48	108.6	3.04	104.2	147.4
1992	5.07	4.62	131.5	3.68	109.7	125.5
1993	5.04	4.62	100.7	2.82	109.1	163.8
1994	5.2	4.76	138.6	3.88	109.2	122.7
1995	4.97	4.48	113.5	3.18	110.9	140.9
1996	4.48	4.48	127.1	3.56	100	125.8
1997	5.14	4.76	126.7	3.55	108	134.1
1998	4.5	4.48	134.4	3.76	100.4	119.1
1999	4.95	4.76	133.8	3.75	104	126.9
2000	5.13	4.76	136.9	3.83	107.8	124.3
2001	4.76	4.76	138.2	3.87	100	123
2002	5.2	4.76	129.3	3.62	109.2	131.5
2003	4.63	4.76	142.3	3.98	97.3	119.6

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS
2. CDFA
3. NASS - USDA

## CORN - GRAIN PRICES

### SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003

YEAR	SAN JOAQUIN COUNTY <sup>1</sup>	CALIFORNIA <sup>2</sup>	UNITED STATES <sup>3</sup>		SAN JOAQUIN CO PERCENT OF CALIF.	CALIFORNIA AS PERCENT OF U.S.
	\$ PER TON	\$ PER TON	\$ PER BUSHELS	\$ PER TON		
1980	128	144.64	3.11	111.06	88.50%	130.20%
1981	122	119.64	2.50	89.28	102.0	134.0
1982	103	122.14	2.55	91.06	84.3	134.1
1983	139	144.65	3.21	114.63	96.1	126.2
1984	117	119.64	2.63	93.92	97.8	127.4
1985	104	107.14	2.23	79.63	97.1	134.5
1986	80	76.79	1.50	53.57	104.2	143.3
1987	84	86.07	1.94	69.28	97.6	124.2
1988	116	112.86	2.54	90.70	102.8	124.4
1989	107	107.14	2.36	84.28	99.9	127.1
1990	108	108.21	2.28	81.42	99.8	132.9
1991	106	110.71	2.37	84.63	95.7	130.8
1992	103	101.79	2.07	73.92	101.2	137.7
1993	117	113.93	2.50	89.28	102.7	127.6
1994	105	106.43	2.26	80.70	98.7	131.9
1995	121	141.07	3.24	115.70	85.8	121.9
1996	119	120.36	2.71	96.77	98.9	124.4
1997	123	108.93	2.43	86.78	112.9	125.5
1998	100	95.00	1.94	69.28	105.3	137.1
1999	83	89.29	1.82	64.99	93.0	137.4
2000	88	87.14	1.85	66.06	101.0	131.9
2001	92	87.50	1.97	70.35	105.1	124.4
2002	102	100.00	2.32	82.85	102.0	120.7
2003	95	103.00	2.45	87.49	92.2	117.7

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS

2. CDFA

3. NASS - USDA

## CORN - GRAIN PRODUCTION

### SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003

YEAR	SAN JOAQUIN COUNTY 1 THOUSAND TONS	CALIFORNIA 2 THOUSAND TONS	UNITED STATES 3 BILLION BUSHELS	UNITED STATES 3 THOUSAND TONS	SAN JOAQUIN CO PERCENT OF CALIF.	CALIFONRIA AS PERCENT OF U.S.
1980	294	1,021	6.6	184,822	28.80%	0.55%
1981	272	1,001	8.1	232,002	27.2	0.43
1982	322	1,201	8.2	226,827	26.8	0.53
1983	157	932	4.2	117,614	16.8	0.79
1984	349	1,428	7.7	196,024	24.4	0.73
1985	340	1,299	8.9	249,229	26.2	0.52
1986	282	1,064	8.2	229,628	26.5	0.46
1987	243	990	7.1	198,823	24.5	0.5
1988	199	759	4.9	137,216	26.2	0.55
1989	254	829	7.5	210,025	30.6	0.39
1990	185	717	7.9	221,227	25.8	0.32
1991	164	515	7.5	210,025	31.8	0.25
1992	219	693	9.5	266,031	31.6	0.26
1993	283	785	6.3	176,421	36.1	0.44
1994	352	857	10.1	282,834	41.1	0.3
1995	200	672	7.4	207,224	29.8	0.32
1996	256	986	9.2	257,630	26	0.38
1997	349	1,261	9.2	257,630	27.7	0.49
1998	130	1,098	9.8	274,432	11.8	0.4
1999	269	881	9.4	263,232	30.5	0.33
2000	289	976	9.9	277,233	29.6	0.35
2001	275	762	9.5	266,032	36.1	0.29
2002	247	714	8.9	249,230	34.6	0.29
2003	216	619	10.1	282,834	34.9	0.22

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS
2. CDFA
3. NASS - USDA

**CORN - GRAIN**  
**VALUE OF PRODUCTION**  
**SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY <sup>1</sup></b>	<b>CALIFORNIA <sup>2</sup></b>	<b>UNITED STATES <sup>3</sup></b>	<b>SAN JOAQUIN CO PERCENT OF CALIF.</b>	<b>CALIFORNIA AS PERCENT OF U.S.</b>
	<b>MILLION DOLLARS</b>	<b>MILLION DOLLARS</b>	<b>MILLION DOLLARS</b>		
1980	37.7	147.6	20,554	25.50%	0.72%
1981	33.2	119.8	20,200	27.7	0.59
1982	33.2	146.7	21,641	22.6	0.68
1983	22.5	134.8	13,553	16.7	0.99
1984	40.8	170.9	20,143	23.9	0.85
1985	35.2	139.2	19,519	25.3	0.71
1986	22.5	81.7	12,507	27.5	0.65
1987	20.4	85.2	14,107	23.9	0.6
1988	23.2	85.6	12,661	27.1	0.68
1989	27.2	88.8	17,912	30.6	0.5
1990	19.9	77.6	18,192	25.6	0.43
1991	17.4	57.0	17,861	30.5	0.32
1992	22.6	64.6	19,723	35	0.33
1993	33.1	89.4	16,035	37	0.56
1994	36.9	91.2	22,874	40.5	0.4
1995	24.2	94.8	24,202	25.5	0.39
1996	30.6	118.6	25,149	25.8	0.47
1997	42.8	137.4	22,351	31.1	0.61
1998	13.0	104.3	18,922	12.5	0.55
1999	22.4	78.6	17,103	28.5	0.46
2000	25.3	85.0	18,499	29.8	0.46
2001	25.4	66.6	18,888	38.1	0.35
2002	25.3	71.4	20,974	35.4	0.34
2003	20.6	63.8	24,803	32.3	0.26

SOURCE:

1. COUNTY AG. COMM. ANNUAL REPORTS

2. CDFA

3. NASS - USDA

**GRAIN CORN YIELDS**  
**UNITED STATES**  
**NEBRASKA, CALIFORNIA AND SAN JOAQUIN COUNTY**  
**(1990 -2003) TONS PER ACRE**

<b>YEAR</b>	<b>UNITED STATES</b>	<b>NEBRASKA</b>	<b>CALIFORNIA</b>	<b>SAN JOAQUIN COUNTY</b>
	TONS PER ACRE	TONS PER ACRE	TONS PER ACRE	TONS PER ACRE
1990	3.32	4.20	4.48	4.32
1991	3.04	4.32	4.48	4.67
1992	3.68	3.78	4.62	5.07
1993	2.82	2.91	4.62	5.04
1994	3.88	3.89	4.76	5.20
1995	3.18	3.11	4.48	4.97
1996	3.56	4.00	4.48	4.48
1997	3.55	3.70	4.76	5.14
1998	3.76	4.06	4.48	4.50
1999	3.75	3.89	4.76	4.95
2000	3.83	3.53	4.76	5.13
2001	3.87	4.12	4.76	4.76
2002	3.62	3.58	4.76	5.20
2003	4.01	4.06	4.76	4.63

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS
2. CDFA
3. NASS - USDA

# **APPENDIX**

# **CORN**

# **SILAGE**

**CORN SILAGE  
NUMBER OF GROWERS  
CALIFORNIA AND SAN JOAQUIN COUNTY 1982-2002**

<b>YEAR</b>	<b>NUMBER OF GROWERS IN CALIF.</b>	<b>ACRES GROWN IN CALIFORNIA</b>	<b>AVERAGE SIZE OF FARM</b>	<b>NUMBER OF GROWERS SAN JOAQUIN CO</b>	<b>ACRES GROWN SAN JOAQUIN CO.</b>	<b>AVERAGE SIZE OF FARM SAN JOAQUIN CO.</b>
1982	1995	198,342	99	185	24,092	130
1987	1784	191,357	107	157	19,391	124
1992	1717	218,113	127	178	26,149	147
1997	1985	314,357	158	201	32,864	164
2002	2012	393,694	196	175	31,950	183

SOURCE:  
US CENSUS OF AGRICULTURE

**CORN SILAGE  
ACRES HARVESTED  
SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY <sup>1</sup></b>	<b>CALIFORNIA <sup>2</sup></b>	<b>UNITED STATES <sup>3</sup></b>	<b>SAN JOAQUIN CO PERCENT OF CALIF.</b>	<b>CALIFONRIA AS PERCENT OF U.S.</b>
	THOUSAND ACRES	THOUSAND ACRES	THOUSAND ACRES		
1980	28.7	178.0	9,299	16.1%	1.9%
1981	24.3	193.0	8,307	12.6%	2.3%
1982	24.1	213.0	8,252	11.3%	2.6%
1983	23.0	175.0	7,808	13.1%	2.2%
1984	21.5	190.0	7,535	11.3%	2.5%
1985	20.0	225.0	7,155	8.9%	3.1%
1986	24.2	243.0	6,418	10.0%	3.8%
1987	21.2	196.0	5,994	10.8%	3.3%
1988	22.2	182.0	8,301	12.2%	2.2%
1989	22.2	189.0	6,606	11.7%	2.9%
1990	20.0	210.0	6,123	9.5%	3.4%
1991	21.5	210.0	6,140	10.2%	3.4%
1992	24.2	220.0	6,069	11.0%	3.6%
1993	25.4	225.0	6,823	11.3%	3.3%
1994	27.0	235.0	5,717	11.5%	4.1%
1995	41.3	280.0	5,321	14.8%	5.3%
1996	23.1	275.0	5,607	8.4%	4.9%
1997	32.4	315.0	6,054	10.3%	5.2%
1998	31.3	350.0	5,913	8.9%	5.9%
1999	32.9	335.0	6,037	9.8%	5.5%
2000	33.6	330.0	6,082	10.2%	5.4%
2001	37.6	315.0	6,142	11.9%	5.1%
2002	39.7	390.0	7,122	10.2%	5.5%
2003	40.1	355.0	6,528	11.3%	5.4%

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS

2. CDFA

3. NASS - USDA

**CORN SILAGE  
YIELDS PER ACRE  
SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY <sup>1</sup></b>	<b>CALIFORNIA <sup>2</sup></b>	<b>UNITED STATES <sup>3</sup></b>	<b>SAN JOAQUIN CO PERCENT OF CALIF.</b>	<b>CALIFONRIA AS PERCENT OF U.S.</b>
	<b>TONS PER ACRE</b>	<b>TONS PER ACRE</b>	<b>TONS PER ACRE</b>		
1980	23.0	21.0	12.0	109.50%	175.00%
1981	23.0	20.5	14.2	112.2	144.4
1982	22.5	21.5	14.3	104.7	150.3
1983	23.0	21.0	12.3	109.5	170.7
1984	22.0	21.0	13.9	104.8	151.1
1985	22.8	22.0	14.3	103.6	153.8
1986	26.0	24.0	14.1	108.3	170.2
1987	29.3	26.0	14.4	112.7	180.6
1988	22.4	24.0	9.5	93.3	252.6
1989	26.3	24.0	13.0	109.6	184.6
1990	25.1	25.0	14.2	100.4	176.1
1991	26.7	25.0	13.2	106.8	189.4
1992	26.8	25.0	14.4	107.2	173.6
1993	27.7	25.0	11.9	110.8	210.1
1994	27.0	25.0	15.8	108.0	158.2
1995	27.1	25.0	14.7	108.4	170.1
1996	27.4	25.0	15.4	109.6	162.3
1997	30.3	26.0	16.1	116.5	161.5
1998	31.2	25.0	16.1	124.8	155.3
1999	27.6	26.0	15.8	106.2	164.6
2000	28.5	26.0	16.8	109.6	154.8
2001	28.9	26.0	16.6	111.2	156.6
2002	27.6	26.0	14.4	106.2	180.6
2003	27.4	26.0	16.2	105.4	160.5

SOURCE:

1. COUNTY AG. COMM. ANNUAL REPORTS

2. CDFA

3. NASS - USDA

**CORN SILAGE  
PRICE PER TON  
SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY <sup>1</sup></b>	<b>CALIFORNIA <sup>2</sup></b>	<b>UNITED STATES <sup>3</sup></b>
	DOLLARS PER TON	DOLLARS PER TON	DOLLARS PER TON
1980	18	NA	NA
1981	19	NA	NA
1982	16	NA	NA
1983	18	NA	NA
1984	16	NA	NA
1985	16	NA	NA
1986	17	NA	NA
1987	15	NA	NA
1988	20	NA	NA
1989	19	NA	NA
1990	22	NA	NA
1991	18	NA	NA
1992	16	NA	NA
1993	17	NA	NA
1994	18	NA	NA
1995	20	NA	NA
1996	21	NA	NA
1997	20	NA	NA
1998	20	NA	NA
1999	18	NA	NA
2000	18	NA	NA
2001	21	NA	NA
2002	22	NA	NA
2003	20	NA	NA

NA = NOT AVAILABLE

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS

2. CDFA

## CORN SILAGE PRODUCTION

### SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003

YEAR	SAN JOAQUIN COUNTY <sup>1</sup>	CALIFORNIA <sup>2</sup>	UNITED STATES <sup>3</sup>	SAN JOAQUIN CO PERCENT OF CALIF.	CALIFONRIA AS PERCENT OF U.S.
	THOUSAND TONS	THOUSAND TONS	THOUSAND TONS		
1980	694	3,738	111,990	18.6%	3.30%
1981	581	3,957	117,891	14.7	3.4
1982	584	4,580	117,782	12.8	3.9
1983	579	3,675	96,238	15.8	3.8
1984	527	3,990	104,491	13.2	3.8
1985	545	4,950	102,664	11	1.8
1986	637	5,832	90,227	10.9	6.5
1987	563	5,096	86,442	11	5.9
1988	509	4,186	78,911	12.2	5.3
1989	543	4,536	86,111	12	5.3
1990	474	5,250	86,820	9	6.0
1991	579	5,250	81,216	11	6.5
1992	608	5,500	87,663	11.1	6.3
1993	663	5,625	81,131	11.8	6.9
1994	783	5,875	90,170	13.3	6.5
1995	1,147	7,000	78,181	16.4	9.0
1996	637	6,875	86,581	9.3	7.9
1997	914	8,190	97,192	11.2	8.4
1998	880	8,750	95,479	10	9.2
1999	926	8,710	95,479	10.6	9.1
2000	971	8,580	102,156	11.3	8.4
2001	1,123	8,190	101,992	13.7	8.0
2002	1,192	10,140	102,293	11.8	9.9
2003	1,137	9,230	105,864	12.3	8.7

## SOURCE:

1. COUNTY AG. COMM. ANNUAL REPORTS

2. CDFA

3. NASS - USDA

**CORN SILAGE YIELDS  
UNITED STATES  
CALIFORNIA AND SAN JOAQUIN COUNTY  
(1990 -2003) TONS PER ACRE**

<b>YEAR</b>	<b>UNITED STATES</b>	<b>CALIFORNIA</b>	<b>SAN JOAQUIN COUNTY</b>
	TONS PER ACRE	TONS PER ACRE	TONS PER ACRE
1990	14.20	25.00	25.10
1991	13.20	25.00	26.70
1992	14.40	25.00	26.80
1993	11.90	25.00	27.70
1994	15.80	25.00	27.00
1995	14.70	25.00	27.10
1996	15.40	25.00	27.40
1997	16.10	26.00	30.30
1998	16.10	25.00	31.20
1999	15.80	26.00	27.60
2000	16.80	26.00	28.50
2001	16.60	26.00	28.90
2002	14.40	26.00	27.60
2003	16.20	26.00	27.40

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS
2. CDFA
3. NASS - USDA

# **APPENDIX**

## **DRY**

### **EDIBLE**

### **BEANS**

**DRY BEANS**  
**NUMBER OF FARMS GROWING**  
**CALIFORNIA AND SAN JOAQUIN COUNTY 1982-2002**  
**EXCLUDES DRY LIMA BEANS**

<b>YEAR</b>	<b>NUMBER OF DRY BEAN FARMS IN CALIF.</b>	<b>ACRES GROWN IN CALIFORNIA</b>	<b>AVERAGE SIZE OF FARM</b>	<b>NUMBER OF DRY BEAN FARMS SAN JOAQUIN CO</b>	<b>ACRES GROWN SAN JOAQUIN CO.</b>	<b>AVERAGE SIZE OF FARM SAN JOAQUIN CO.</b>
1982	1120	133,022	119	146	17,242	118
1987	978	110,959	113	168	23,370	139
1992	690	79,735	116	123	13,589	110
1997	413	60,153	146	56	6,191	111
2002	385	58,420	152	52	4,913	95

SOURCE:  
US CENSUS OF AGRICULTURE

**DRY LIMA BEANS  
NUMBER OF GROWERS  
CALIFORNIA AND SAN JOAQUIN COUNTY 1982-2002**

<b>YEAR</b>	<b>NUMBER OF GROWERS IN CALIF.</b>	<b>ACRES GROWN IN CALIFORNIA</b>	<b>AVERAGE SIZE OF FARM</b>	<b>NUMBER OF GROWERS SAN JOAQUIN CO</b>	<b>ACRES GROWN SAN JOAQUIN CO.</b>	<b>AVERAGE SIZE OF FARM SAN JOAQUIN CO.</b>
1982	375	82,542	220	45	9,956	221
1987	264	42,989	163	31	6,879	222
1992	301	47,031	156	39	7,609	195
1997	386	70,201	182	52	12,565	242
2002	242	44,546	184	30	7,098	237

SOURCE:  
US CENSUS OF AGRICULTURE

# **DRY EDIBLE BEANS ACRES HARVESTED**

**SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY 1</b>	<b>CALIFORNIA 2</b>	<b>UNITED STATES 3</b>	<b>SAN JOAQUIN CO PERCENT OF CALIF.</b>	<b>CALIFORNIA AS PERCENT OF U.S.</b>
	THOUSAND ACRES	THOUSAND ACRES	THOUSAND ACRES		
1980	27.8	213.0	1,859	13.1%	11.5%
1981	28.2	224.0	2,270	12.6%	9.9%
1982	36.1	210.0	1,777	17.2%	11.8%
1983	23.0	143.0	1,139	16.1%	12.6%
1984	23.7	184.0	1,460	12.9%	12.6%
1985	28.9	178.0	1,481	16.2%	12.0%
1986	19.2	155.0	1,495	12.4%	10.4%
1987	20.6	168.0	1,665	12.3%	10.1%
1988	24.3	147.0	1,353	16.5%	10.9%
1989	26.6	180.0	1,651	14.8%	10.9%
1990	25.9	166.0	2,084	15.6%	8.0%
1991	20.6	150.0	1,914	13.7%	7.8%
1992	20.9	110.0	1,530	19.0%	7.2%
1993	24.5	106.0	1,618	23.1%	6.6%
1994	16.2	131.0	1,831	12.4%	7.2%
1995	24.1	137.0	1,896	17.6%	7.2%
1996	22.8	123.0	1,751	18.5%	7.0%
1997	24.2	132.0	1,759	18.3%	7.5%
1998	22.3	105.0	1,918	21.2%	5.5%
1999	19.6	132.0	1,881	14.8%	7.0%
2000	21.7	112.0	1,617	19.4%	6.9%
2001	15.2	85.0	1,250	17.9%	6.8%
2002	10.6	89.0	1,739	11.9%	5.1%
2003	9.4	75.0	1,347	12.5%	5.6%

SOURCE:

1. COUNTY AG. COMM. ANNUAL  
REPORTS

2. CDFA

3. NASS - USDA

**DRY EDIBLE BEANS  
YIELD PER ACRE  
SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY <sup>1</sup></b>	<b>CALIFORNIA <sup>2</sup></b>	<b>UNITED STATES <sup>3</sup></b>	<b>SAN JOAQUIN CO PERCENT OF CALIF.</b>	<b>CALIFORNIA AS PERCENT OF U.S.</b>
	<b>POUNDS PER ACRES</b>	<b>POUNDS PER ACRES</b>	<b>POUNDS PER ACRES</b>		
1980	2140	1790	1438	119.55%	124.48%
1981	2080	1833	1443	113.48%	127.03%
1982	1600	1707	1439	93.73%	118.62%
1983	1700	1687	1363	100.77%	123.77%
1984	1820	1684	1443	108.08%	116.70%
1985	2300	2002	1505	114.89%	133.02%
1986	2100	1846	1536	113.76%	120.18%
1987	2120	1868	1563	113.49%	119.51%
1988	2140	1963	1423	109.02%	137.95%
1989	2080	1865	1437	111.53%	129.78%
1990	3000	1842	1553	162.87%	118.61%
1991	2300	2157	1764	106.63%	122.28%
1992	2180	2160	1478	100.93%	146.14%
1993	2260	2085	1351	108.39%	154.33%
1994	2400	2120	1581	113.21%	134.09%
1995	2300	2000	1618	115.00%	123.61%
1996	2160	1890	1594	114.29%	118.57%
1997	2280	2270	1670	100.44%	135.93%
1998	1600	1480	1586	108.11%	93.32%
1999	2300	1860	1762	123.66%	105.56%
2000	2180	1840	1642	118.48%	112.06%
2001	2100	1760	1569	119.32%	112.17%
2002	2160	1980	1743	109.09%	113.60%
2003	2180	1980	1672	110.10%	118.42%

SOURCE:

1. COUNTY AG. COMM. ANNUAL REPORTS

2. CDFA

3. NASS - USDA

## DRY EDIBLE BEANS PRICES

### SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003

YEAR	SAN JOAQUIN COUNTY <sup>1</sup>	CALIFORNIA <sup>2</sup>	UNITED STATES <sup>3</sup>	SAN JOAQUIN CO PERCENT OF CALIF.	CALIFORNIA AS PERCENT OF U.S.
	DOLLARS PER CWT.	DOLLARS PER CWT.	DOLLARS PER CWT.	DOLLARS PER CWT.	DOLLARS PER CWT.
1980	30.65	32.70	27.60	93.7%	118.5%
1981	31.15	28.70	21.00	108.5%	136.7%
1982	20.25	23.30	14.20	86.9%	164.1%
1983	33.60	32.50	22.40	103.4%	145.1%
1984	31.95	29.20	18.70	109.4%	156.1%
1985	24.45	22.30	17.60	109.6%	126.7%
1986	31.30	28.50	19.10	109.8%	149.2%
1987	27.85	27.50	16.50	101.3%	166.7%
1988	36.45	36.20	29.90	100.7%	121.1%
1989	36.95	34.80	28.50	106.2%	122.1%
1990	27.35	30.90	18.50	88.5%	167.0%
1991	29.40	26.20	15.60	112.2%	167.9%
1992	28.25	24.40	19.90	115.8%	122.6%
1993	34.60	35.20	24.60	98.3%	143.1%
1994	33.15	34.80	22.50	95.3%	154.7%
1995	34.90	34.80	20.80	100.3%	167.3%
1996	41.00	38.50	23.50	106.5%	163.8%
1997	35.85	29.40	19.30	121.9%	152.3%
1998	33.60	36.10	19.00	93.1%	190.0%
1999	28.25	27.00	16.40	104.6%	164.6%
2000	26.35	26.80	15.50	98.3%	172.9%
2001	30.85	31.20	22.10	98.9%	141.2%
2002	34.65	32.00	17.10	108.3%	187.1%
2003	32.00	34.70P	17.80	92.2%	194.9%

P = Preliminary

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS
2. CDFA
3. NASS - USDA

# **DRY EDIBLE BEANS PRODUCTION**

## **SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY 1</b>	<b>CALIFORNIA 2</b>	<b>UNITED STATES 3</b>	<b>SAN JOAQUIN CO PERCENT OF CALIF.</b>	<b>CALIFORNIA AS PERCENT OF U.S.</b>
	THOUSAND CWT.	THOUSAND CWT.	THOUSAND CWT.		
1980	593	3,813	26,729	15.6%	14.3%
1981	589	4,105	32,751	14.3%	12.5%
1982	576	3,585	25,563	16.1%	14.0%
1983	389	2,412	15,520	16.1%	15.5%
1984	434	3,099	21,070	14.0%	14.7%
1985	666	3,563	22,298	18.7%	16.0%
1986	402	2,862	22,960	14.0%	12.5%
1987	436	3,138	26,031	13.9%	12.1%
1988	522	2,885	19,253	18.1%	15.0%
1989	554	3,357	23,729	16.5%	14.1%
1990	778	3,058	32,379	25.4%	9.4%
1991	472	3,235	33,765	14.6%	9.6%
1992	456	2,376	22,615	19.2%	10.5%
1993	552	2,210	21,862	25.0%	10.1%
1994	460	2,771	28,950	16.6%	9.6%
1995	552	2,740	30,689	20.1%	8.9%
1996	492	2,325	27,912	21.2%	8.3%
1997	554	3,000	29,370	18.5%	10.2%
1998	358	1,554	30,418	23.0%	5.1%
1999	452	2,455	33,146	18.4%	7.4%
2000	472	2,059	26,543	22.9%	7.8%
2001	320	1,496	19,610	21.4%	7.6%
2002	228	1,762	30,312	12.9%	5.8%
2003	207	1,762	22,515	11.7%	7.8%

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL  
REPORTS

2. CDFA

3. NASS - USDA

**DRY EDIBLE BEANS  
VALUE OF PRODUCTION  
SAN JOAQUIN COUNTY, CALIFORNIA AND UNITED STATES 1980-2003**

<b>YEAR</b>	<b>SAN JOAQUIN COUNTY <sup>1</sup></b>	<b>CALIFORNIA <sup>2</sup></b>	<b>UNITED STATES <sup>3</sup></b>	<b>SAN JOAQUIN CO PERCENT OF CALIF.</b>	<b>CALIFORNIA AS PERCENT OF U.S.</b>
	THOUSAND DOLLARS	THOUSAND DOLLARS	THOUSAND DOLLARS		
1980	18,149	124,685	737,447	14.6%	16.9%
1981	18,334	117,814	688,471	15.6%	17.1%
1982	11,638	83,531	363,809	13.9%	23.0%
1983	13,078	78,390	347,867	16.7%	22.5%
1984	13,838	90,491	394,969	15.3%	22.9%
1985	16,289	79,455	391,492	20.5%	20.3%
1986	12,590	81,567	437,379	15.4%	18.6%
1987	12,144	86,295	428,350	14.1%	20.1%
1988	19,013	104,437	575,148	18.2%	18.2%
1989	20,466	116,824	676,635	17.5%	17.3%
1990	21,290	94,492	594,167	22.5%	15.9%
1991	13,877	84,757	528,311	16.4%	16.0%
1992	12,885	57,974	457,269	22.2%	12.7%
1993	19,101	78,013	538,210	24.5%	14.5%
1994	15,254	96,431	631,080	15.8%	15.3%
1995	19,269	95,352	633,620	20.2%	15.0%
1996	20,181	89,513	652,240	22.5%	13.7%
1997	19,874	88,200	576,658	22.5%	15.3%
1998	12,032	56,099	567,243	21.4%	9.9%
1999	12,765	66,285	547,636	19.3%	12.1%
2000	12,431	55,181	413,986	22.5%	13.3%
2001	9,895	46,675	421,475	21.2%	11.1%
2002	7,895	56,384	513,793	14.0%	11.0%
2003	6,526	48684P	411,930	13.4%	11.8%

P = Preliminary

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS
2. CDFA
3. NASS - USDA

**DRY EDIBLE BEAN YIELDS**  
**UNITED STATES**  
**CALIFORNIA AND SAN JOAQUIN COUNTY**  
**(1990 -2003) IN POUNDS PER ACRE**

<b>YEAR</b>	<b>UNITED STATES</b>	<b>CALIFORNIA</b>	<b>SAN JOAQUIN COUNTY</b>
	<b>POUNDS PER ACRE</b>	<b>POUNDS PER ACRE</b>	<b>POUNDS PER ACRE</b>
1990	1553	1842	2000
1991	1764	2157	2300
1992	1478	2160	2180
1993	1351	2085	2260
1994	1581	2120	2400
1995	1618	2000	2300
1996	1594	1890	2160
1997	1670	2270	2280
1998	1586	1480	1600
1999	1762	1860	2300
2000	1642	1840	2180
2001	1569	1760	2100
2002	1743	1980	2160
2003	1672	1980	2180

**SOURCE:**

1. COUNTY AG. COMM. ANNUAL REPORTS
2. CDFA
3. NASS - USDA