

# **On Shaky Ground: Farm Operator Turnover in California Agriculture**

**By**

**Don Villarejo**

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The California Institute for Rural Studies

P.O. Box 2143

Davis, CA 95617

Phone: (916) 756-6555 • Fax: (916) 756-7429

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## Executive Summary

California's agriculture industry has experienced impressive growth in the last twenty years, growing faster than the nation's economy as a whole. This growth and the possible economic rewards have made farming an attractive venture. But at what risk, and what are the results for farmers both new and old? What are the factors that lead some farms to economic success and others to disaster? This report looks at these issues through examining farm operator turnover in two California counties, Fresno and Monterey.

Farm operator turnover as a concept can be accessed using two different measures, both of which are explored in this report. The first is attrition rates, which capture farm business closures during the five-year study period. The second measure is the turnover rate, which includes new farm ventures as well as farm closures during the study period. These two separate analyses were done by using the California Institute for Rural Studies (CIRS) Farm Operator data base as a source for longitudinal information on crop farm operators.

The study finds that yearly turnover is unexpectedly large and is quantitatively similar for the five-year interval in both counties. The attrition rate is somewhat smaller than the turnover rate, which includes farms not enumerated by the attrition rate. For Fresno County, the attrition rate is 5.4% per year and the turnover rate is equivalent to 7.7% per year, implying a nominal 100% turnover of farm operators in Fresno County in just 13 years. Monterey County has an attrition rate of 6.2% per year and a turnover rate of 10.8% per year, implying a nominal 100% farm operator turnover within 10 years.

Although these rates are quite high, a positive side can be seen from the turnover rate, which found 1,800 new farm start-ups during the five-year period in Fresno County, and 410 in Monterey County. These figures suggest that the economic growth of the agriculture industry is a great incentive to entering farming. However, as the attrition and turnover rates suggest, success is not always easily achieved.

Economic instability, although always present in farming, is more common in certain crops than in others. Annual crops, such as fresh market green beans, tomatoes and strawberries were found to have higher attrition rates than those for perennial crops. In addition, smaller farms were found to have much higher attrition rates than larger farms, suggesting a strong correlation between farm size and economic

stability. Thus those farms whose inputs are the lowest, i.e. farms with small amounts of land planted in annual crops, also run the highest risk of failure.

Economic instability is further analyzed in detail for Monterey's strawberry industry, where newcomers are likely to be of Latino/Hispanic origin and plant medium-sized farms. However, the attrition rates show that the likelihood of succeeding as a strawberry farmer is greatest among non-Hispanic, large acreage farms, and is least among small Hispanic-owned farms.

Thus the report's main finding is that high turnover rates exist alongside the substantial economic growth of the agricultural industries of these two counties. An explanation for this is that farming appears attractive to the entrepreneur despite being extremely risky for the newcomer who cannot afford high input costs. In Monterey County, nearly as many new farmers entered the business as left, and in Fresno four new farms started up for every five that quit the business. Clearly there exists a strong interest in farming as an economic venture. However outreach is needed to aid new farmers, and lending practices and resource policies should help encourage, not discourage these farmers in order to insure that California agriculture remains a healthy and growing industry while still being accessible to the small-scale entrepreneur.

## Introduction

Sustainable agriculture is understood among farmers today to be the practice of an explicit environmental consciousness on the farm. From mainstream conservationists to the strict organic practitioner, nurturing the environment through farming is respected in farm communities and gaining more attention from the general public. National Geographic, the most widely read English-language periodical addressing issues affecting people and their relation to the land, recently featured an article on the resurgence of interest in sustainable practices among farmers in the U.S.<sup>1</sup>

The primary focus of this renewed interest in the relationship of farming to the natural landscape has been production practices, especially the heavy reliance by most U.S. farmers on synthetic chemical fertilizers and pesticides. To many, both in the farm community as well as beyond, sustainable agriculture is understood solely in terms of a farmer's reliance on alternatives to synthetic chemicals, especially non-chemical methods of pest control.

Relatively less attention has been given to issues of economic sustainability in agriculture, by which we mean the ability of a farm family to earn a livelihood by producing and marketing agricultural commodities. In the context of discussions of sustainable agriculture this means examining both economic viability as well as production practices.

The devastating impact of the farm-debt crisis of the 1980s resulted in an estimated loss of 200,000 farms in the U.S., and the haunting return of the depression-era in-your-face farm foreclosures and auctions.<sup>2</sup> But unlike the 1930s, the 1980s brought to every American home the televised images of farmsteads with a family's sometimes well-worn but lovingly cared-for furniture and personal possessions neatly arrayed on the front lawn and side yards of their home while bankers, insurance company representatives and other financiers rummaged for items of significant commercial value.

As underscored in the National Geographic article, the most economically successful of the resurgent sustainable farmers have become expert practitioners of late 20th century global economics: niche marketing. Nowhere has this strategy been more successful than in California. Pockets of consumers have been identified and nurtured in increasing numbers throughout many California communities. Developed by a few well-organized groups and a number of talented entrepreneurs, innovative restaurants, grocery markets and Farmers' Markets now bring an increasing volume of

organic produce and other products to consumers who embrace the ideals of sustainable farm producers. They share a vision of an agriculture primarily understood in terms of non-chemical farming practices.

The successes of farmer direct marketing has stimulated additional variants of niche marketing, including community supported agriculture (a form of annual consumer subscription) and processed products, such as organic salad mixes. With the adoption of each new variant of the underlying niche marketing strategy, the overall economic strength of sustainable agriculture appears to increase.

Nevertheless, the economic viability of family farming remains an open question. Even "successful" organic farming businesses, such as California's Riverside Farms (Monterey, San Benito and Santa Cruz Counties), and T K O Farms, Inc. (San Benito and Monterey Counties), have recently closed or been sold outright. Overall, the decreasing number of farms in the U.S. suggests that there is a continuing decline in family farming despite the apparent recovery of the sector as a whole in the late 1980s and early 1990s.

This report presents a case study of the economic viability of agricultural enterprises using a fundamentally new measure: the sustainability of farm businesses over a multi-year period as reflected by the continuity of operation of these businesses. Two major agricultural counties in California were studied in detail: Fresno and Monterey. In both counties, farm operator turnover, by which we mean both the discontinuance of farming businesses as well as the establishment of new ones, is measured and analyzed. Evidence of the impact of sustainable agriculture practices are also measured. The results are both surprising and unexpected.

Marty Strange, in his book Family Farming, points out that the values embodied in the traditional family farm - self-reliance, frugality, ingenuity, stewardship, humility, family, neighborhood, and community - are reflected in contemporary environmentalism and in the enthusiasm for entrepreneurship that is clearly sweeping the nation.<sup>3</sup>

At the same time, Strange points out that a new mandate for farm policy is both an economic and environmental land ethic: that the only motive for owning farmland is to make a living by farming it well, and pay for the land only by farming it well. Strange is among the few agriculturalists who has joined environmental consciousness with economic viability.

## Farm Operator Turnover

Enumerations of farm operators are often used to gauge changes in farm operator and farm resident populations. When supplemented with demographic information, these statistical summaries are also helpful in characterizing the same populations. Simple enumerations, however, tend to paint a static picture of a group at a specific point in time and rarely capture the dynamics of farm operator turnover.

Two approaches are utilized to measure economic viability: attrition rates and turnover rates. By attrition we refer to measuring farm business closures. How many farms were operating in a given region in a specific year, and how many had closed down within a five-year period.

In this case study the term "turnover" refers to the establishment of new farm businesses as well as to the more commonly studied occurrence of farms going out of business. Often, new farm operators replace operators who have terminated their businesses, but in other cases they represent a net addition to the farmer population.

We follow the definition of "farm operator" as it is used in the *Census of Agriculture*: any individual or business entity which produces, or seeks to produce, at least \$1,000 worth of agricultural commodities for sale in the course of a year. Whether the operator self-identifies as having the occupation "farmer" or not is immaterial, rather it is the "production for sale" aspect of the operator's agricultural activities that matters.

The 1992 *Census of Agriculture* identified 77,669 farms in the state of California, about half of which were operated by individuals or businesses whose principal occupation was farming.<sup>4</sup> In other words, the census found that nearly half of all individual farm operators stated that their principal occupation was something other than "farmer". Our strict adherence to the Census Bureau definition outlined in the preceding paragraph and *not* the self-identification of farmers obviously has significant impact in determining the population of interest. Clearly, measuring the economic activity of all farm operators is essential, as opposed to studying just those who depend on an individual's own self-definition of occupation. Increasingly, farm families gain their livelihood from a multiplicity of sources, of which farming is but one.

This report summarizes a direct analysis of individual farm operators in two California counties

during each of the five years 1990-1994. Continuity of the farm operators was examined, noting those who discontinued business as well as those who entered the business of farming during this time frame. Farms were identified primarily from holders of *annual* Restricted Use Materials Permits or Operator Identification Numbers. These are required under California law for every farm using registered pesticides.

Additionally, records of licensed producers of ornamental horticultural products (nurseries) and of dairy producer license holders were merged into the files of farm operators. Finally, farm operators registered under the state's organic farming registration laws were also consulted.

The CIRS Farm Operator data base extends back to 1987, potentially allowing the tracking of farm operator continuity. However, changed permit requirements that went into effect in 1990, newly adding farm operators who only use unrestricted pesticides, precludes direct comparisons with data for earlier years.

The two counties were selected for analysis based on several considerations, especially geographic, crop, and farm size representation. Both the San Joaquin Valley, with about half of the crop production in the state, and the coastal region are represented. Fresno County is the largest agricultural county in the United States based on the volume of annual commodity production. Monterey County is the nation's most important producer of vegetables and is also a major center of fresh strawberry producers.

In reflecting on the findings discussed in this report, it is quite important to recall that identification of farms in this way means that nearly all farm operators studied are **crop farm operators**. With the notable exception of dairies, identified from dairy producer license holder records, few livestock businesses are reflected in the records we consulted.

Owing to the heavy reliance in this study on farm operators identified as holders of pesticide permits, a brief review of the permit process is appropriate. Starting in the early 1970s, state law has required all commercial users of restricted materials (pesticides) in California to obtain annual permits, file notices of intent to apply these materials, and promptly file post-application reports detailing actual use. Restricted materials are those considered to be the most dangerous, and the permit system was intended to track their use and to assist in monitoring enforcement of regulations designed to protect the health and safety of farmers, farm workers and the general public.

In January 1990 the permit process was expanded to include full reporting of commercial use of *all* pest control materials registered for use in the state, both restricted and unrestricted. The State of California, in principle, has records of all agricultural chemical use and identifies businesses and the actual sites where these materials are applied, whether they are used in agriculture, for structural pest control, or in recreational settings.

Since agricultural pest control accounts for an overwhelmingly large share of commercial chemical applications in the state, the California permit system is administered by County Agricultural Commissioners. The rationale behind this arrangement is that farm operators can readily access their local County Department of Agriculture and comply with the permit process with minimal inconvenience. Staff of these departments are also likely to be familiar with local production practices and understand pest control strategies. Often, these county-based departments will impose local restrictions on application methods that are more severe than required by state or federal law in order to protect human populations or the environment. Clearly, local knowledge is crucial in such circumstances.

In the principal agricultural counties of the state, nearly all permits are issued to farm operators, who may choose to hire a commercial pest control operator to carry out the actual application of the chemicals. However, whether or not a commercial applicator is used, state regulations normally require that permits be issued in the name of the farm operator. In certain relatively limited circumstances, usually when decision-making authority does not rest with the farm operator, the permit may be issued to a landowner or to a farm management business. Typically in these cases, the individual signing for the permit will identify their relationship to the business ("landowner" or "farm manager") and the locations where chemicals are to be applied.

Pesticides and other agricultural chemicals are not normally needed for the production of most livestock or livestock products, so permit records usually do not include many livestock operations. On the other hand, nearly all crop production requires the use of registered agricultural chemicals, whether synthetic or natural. Organic farmers are allowed to use "natural" chemicals while still retaining their organic certification under the state's system of verification. In fact, the leading agricultural chemical used in California (as measured by volume) is sulphur, a naturally occurring chemical element that is permitted for organic production. It is the single most important fungicide in the grape and fruit

industries.

Non-farm businesses which obtained pesticide permits, nursery producer licenses, or dairy producer licenses, or those who register as non-producers under organic agriculture laws, were carefully screened by CIRS staff from data sets intended to refer only to farm operators. In classifying permits into the two main categories "farm" and "non-farm", care was taken to review both the permit holder's name and the application for which the permit was obtained. In all but a few cases non-farm permit holders were public agencies (schools, parks, etc.), golf courses, food processing facilities, water or reclamation districts, non-production nursery businesses (retail or wholesale), or lawn and gardening services. Usually, these permit holders could be readily identified from their name and self-described pesticide application. For a few permit holders it was necessary for CIRS staff to conduct further research to determine the nature of the holder's business activity for proper classification.

The largest number of "farm" permit holders is composed of individuals who directly operate the farm property described in the permit. Usually the individual or spouse will file the permit and sign as permittee. In a minority of cases the permit holder is a business entity (usually a partnership or corporation), and an agent of the business will sign for the permit. In a very much smaller number of cases the permit holder is an individual or a business who delegates the operation of the farm to a manager, either an individual or farm management company. The permittee in this case is usually the farm manager, and will identify as such when signing the permit.

## Analysis of Farm Turnover

Data files for the two counties were developed in electronic form, and the raw data was imported into the CIRS Farm Operator data base using the MUMPS language and hierarchical data base system. Data handling procedures and the criteria applied to study the continuity of individual farms are discussed in detail in Appendices I and II.

The attrition rate utilized in this report is the number of farm operators active in 1990 but which had left the business by 1994, divided by the total number active in 1990, expressed on an annualized basis. Care is taken to properly account for family member succession in measuring farm business discontinuances. The attrition rates reported here refer to genuine business terminations, whether for economic or personal reasons (death, divorce, family disputes, etc.). Thus, attrition rates reported herein directly measure the likelihood of going out of business.

It is important to realize that the farm attrition described in this report does not refer primarily to farm land going out of production, although that does occur in some instances. Rather, we refer only to the continuance or discontinuance of farms as business entities. In the overwhelming majority of cases of farm operator attrition we have examined in Fresno and Monterey counties, another entrepreneur simply takes over the business once the former operator leaves. While farm land disappearance is an important contemporary policy issue, especially in Fresno County, we find that the total of all farm land losses in the county by conversion to non-agricultural uses is dwarfed by the amount of land represented by operator turnover.

The second measure of entrepreneurial dynamics used in this report is farm operator turnover. Turnover is measured in this report as one-half of the sum of the number of farms which had discontinued their operations by 1994 but which were active at some time in the period 1990-93 plus the number of farms which started up after 1990, divided by the average number active in the five years 1990-94. This definition allows us to measure both discontinued farms and new farm business formation.

The attrition rate is simpler conceptually since it directly measures the loss of farm operators. From a policy perspective the attrition rate is a clear and useful concept. However, the attrition rate does not take account of new farm operators starting up during the period and, as well, ignores farm operators

that started up after 1990 but had discontinued their operations by 1994.

The most important finding of the present study is that the yearly turnover rate is unexpectedly large and is quantitatively similar for the five-year interval in both counties. Since the turnover rate includes groups of farms not enumerated by the attrition rate, it is numerically larger.

#### Fresno County Farm Operator Turnover

The Fresno County farm operator attrition rate, based solely on the five-year continuity of farm operators active in 1990, was 26.8%, or 5.4% per year. A total of 1,477 of the 5,512 farm operators active in 1990 had discontinued their operations by 1994. The attrition rate of 5.4% can be interpreted to imply that all 1990 Fresno County farm operations would be out of business in just 19 years. However, new businesses continually started up throughout this period, and this phenomenon is best measured by the turnover rate.

For Fresno County we find the five-year farm operator turnover rate to be 38.5% for 1990-94, equivalent to 7.7% per year. The turnover rate is larger than the attrition rate because it takes account of farm operators which started up after 1990 but had gone out of business before 1994. Also, the effect of the large number of new farm business start-ups in this period is included.

On its face, the 7.7% per year turnover rate implies a nominal 100% turnover of farm operators in Fresno County in just 13 years. Of course, there are a considerable number of farm operators who discontinued their business after just a few years as well as a large number who have successfully operated their business for decades.

The difference between the farm operator turnover rate and the farm operator attrition rate is significant and reflects important components of the dynamics of the farm entrepreneurship. In particular, the turnover rate takes account not only of the 1,477 farm operators which were in business in 1990 but gone by 1994, but also of the 792 farm operators which started up after 1990 but were gone by 1994, as well as the large number of additional farm operators that started up after 1990 and remained in business in 1994.

As shown in Figure 1, there was a net decrease in the number of Fresno County farm operators during this five-year interval amounting to 10% of the 1990 total. Our analysis finds that 2,269 farms reportedly left the business, and 1,792 **started up** during the same period. When compared with the

average of 5,274 farm operators who were active in Fresno County during the five years, these are astonishingly large numbers.

On the positive side, there were nearly 1,800 farm business start-ups in five years, or about 375 per year. Clearly, this level of new business activity reflects a belief that Fresno County agriculture represents opportunity. The fact that nearly 2,300 farm operators left the business during the same period suggests that economic success in agriculture is elusive.

This report finds a net decrease of 477 crop or dairy producers in Fresno County between 1990 and 1994. This appears to be consistent with census findings between 1987 and 1992 of a net decrease of 526 farms reporting crop sales and of 6 dairy producers.<sup>5</sup> Of course, the census years refer to an earlier but partly overlapping time frame as compared to the benchmark years of the present study.

With regard to the absolute number of Fresno County crop and dairy producers, this study finds 5,512 farm operators producing crops or dairy products in 1990 while census data indicate that the

**Figure 1**

**Number of Fresno County Crops & Dairy Farm Operators**

**1990**

5,512  
Farm Operators

1,792  
Started up

2,269  
Discontinued

**1994**

5,035  
Farm Operators

**Five-Year Farm Operator Turnover Rate 38.5%**

number of crop producers was 5,937 in 1987 and 5,411 in 1992.<sup>6</sup> Thus, the present study's finding of an intermediate number of farm operators appears to be consistent with census enumerations.

As described above, the enumeration of discontinued farms shown in Figure 1 (2,269) actually has two components. First, there were 1,477 farm operators in 1990 which had left the business by 1994. Second, there were 792 farm operators which started their business **after** 1990 but discontinued their businesses **before** 1994. In most cases, the farms that they had operated were picked up by someone else, either an active farmer or an entry-level farmer.

Finally, this study's main finding that the average farm operator turnover rate is 7.7% per year appears to suggest that the tenure of the average Fresno County crop farm operator is 13 years. The latter figure is inferred from the fact, noted earlier, that an annual turnover rate of 7.7% would imply a nominal 100% turnover of operators in 13 years. However, because our definition of turnover rate directly measures only the number of Discontinued and Newly Active farm operators and not the actual duration of the tenure, it is not a true measure of tenure. This can be seen from the fact that the calculated turnover rate would be the same whether continuing farm operators have a five-year average tenure or whether they had been in operation for an additional fifteen years or more.

Census findings concerning duration of farm operator tenure were that the "Average number of years on present farm" were 17.4 years in 1987 and 18.1 years in 1992.<sup>7</sup> However, as discussed above, the census measure is not comparable to a determination inferred from the farm operator turnover rate.

A significant limitation of census measures of farm tenure is that the census is conducted only once each five years, so that operators who began farming after the prior census (1987) and then left farming before the current one (1992) were entirely missed. In the present study we find that nearly 800 entrepreneurs entered farming after 1990 but had quit by 1994. Thus, the census oversight artificially increases their measure of the "average number of years on the present farm" by excluding those with the shortest tenure. This effect could be quite substantial. As described above we find that 792 farms began farming after 1990 but discontinued their operation before 1994. Thus, 35% of all the discontinued farms we enumerated were in business for three years or less. It is important to note that fully 27% of all Fresno County farms enumerated in the 1992 census either did not report the number of years on the present farm or had been farming for four or fewer years, which also indicates that this effect may be quite important.

It is important to realize that a very conservative set of guidelines have been used to define "turnover." Family successions are not considered turnovers, nor are situations in which one or more partners leaves a business that the other partners carry forward (see Appendix II).

A significant aspect of the present study is that it is possible to examine producer attrition on a crop-by-crop basis. That is, the continuity of producers of specific crops can be separately examined for each of a number of individual crops, or groups of crops. In each case, the number of producers of a specific crop in 1990 can be compared with the number producing that crop in 1994, and the number of farm operator discontinuances can be tabulated.

However, unlike the overall county-wide turnover or attrition discussed previously, in these commodity-specific analyses farm operators may discontinue or newly produce a specific commodity without necessarily leaving farming or starting up for the first time. Thus, the producer attrition rates described in Table 1 have a fundamentally different meaning than the farm operator turnover or attrition rates. Producer attrition rates represent both the combined effect of operators switching commodities as well as farm operator turnover.

These commodity-specific farm operator discontinuance rates are also unexpectedly large, implying 100% attrition in less than ten years in some crops. Since our definitions do not consider a farm to have experienced turnover in a succession of generations of the same family surname, the large attrition rates we find refer, in most cases, to successions by unrelated parties. The specific crop producer data that was the basis for the analysis presented in Table 1 was verified by comparing specific crop acreage figures represented in the CIRS Farm Operator data base with the corresponding harvested acreage figures reported by the County Agricultural Commissioner (see Appendix III).

One of the main findings shown in Table 1 is that producers of fresh vegetables in Fresno County, such as those growing green beans and cherry or market tomatoes, appear to have far less economic stability than producers of certain permanent crops, such as grapes or almonds. Producers of stone fruit, processing tomatoes and dairies exhibit intermediate stability by this measure. That producers of perennial crops might exhibit a lower turnover rate may be understood in terms of the relatively longer duration, typically several years, between the planting of vine or tree stock and the harvest of a commercial crop. Such a long-term investment suggests a level of resources that might not be available to some producers of annual crops.

**Table 1**  
**Commodity-Specific Fresno County Producer Attrition**  
**Number of Producers, 1990, and 1990-94 Attrition Rate**

Commodity	1990	Discontinued	Attrition Rate
Alfalfa	481	99	21%
Cotton	734	147	20%
Lettuce	40	9	22%
Green Beans	135	92	68%
Cherry Tomato	105	83	79%
Fresh Tomato	163	85	52%
Process Tomato	193	52	27%
Almond	459	88	19%
Grape	3,088	643	21%
Stone Fruit	1,014	353	35%
Nursery	27	11	41%
Dairy	97	31	32%

In every case but nursery crops the number of Fresno County farm operators producing the specific commodities indicated in Table 1 decreased between 1990 and 1994. However, the results for nursery crops indicate a more than doubling of the number of producers in this period. Thus, the high attrition rate found for Fresno County nursery producers masks the expansion of the industry as opposed to a shrinkage.

The discontinuance rates described in Table 1 refer only to those farms producing the specified commodity in 1990 and whether they were still producing the same commodity in 1994. No account is taken of whether the farm operator may have switched to another commodity, and no account is taken of farm operators that may have started producing the specified commodity after 1990 but did not produce it in 1994.

The variation of farm operator attrition with farm size has also been measured in the present study. This was accomplished by examining just the 5,325 farms active in 1990 for which specific crop acreage data was obtained (96.7% of the total of 5,512 farms). These farms reported an average cropland of 237.2 acres (the median size was 40 acres).

In contrast, those farm operators who were active in 1990 but had discontinued their operations by 1994 had an average of 123.5 crop acres (median size was 20 acres). Thus, for discontinued farm operations the average and median size was roughly one-half the corresponding figures for all farms.

Table 2 shows the variation of the number of discontinued farms on farm size. The largest loss rate (42.3%) occurs among the smallest farms (1 - 20 acres), and the larger the farm the smaller the loss. The smallest loss (14.4%) appears to be for farms with 81-100 acres of cropland. However, the small number of farms for this size group as well as the small number lost indicates that we should be cautious, since statistical uncertainty could account for a portion of the difference as compared with the next smaller size group.

**Table 2**  
**Farm Operator Attrition by Size of Cropland, Fresno County, 1990-94**

<b>Size of Cropland</b>	<b>Number(90)</b>	<b>Discontinued (94)</b>	<b>Attrition Rate</b>
1 - 20 acres	1,888	799	42%
21 - 40	964	241	25%
41 - 60	415	85	20%
61 - 80	340	64	19%
81 - 100	188	27	14%
101 +	1,532	260	17%

This is a very significant finding; it directly demonstrates that risk is strongly correlated with farm size. The smaller the farm size, the greater the instability of the farm operation. For farms in the smallest size group (crop farms of 20 acres or less) the rate of attrition is three times larger than for the bigger farms. Whether size alone is the best predictor of farm business longevity can not be stated with any degree of certainty, but our finding suggests that it is of central importance.

#### Monterey County Farm Operator Turnover

The attrition rate among Monterey County farm operators active in 1990 was found to be 31%, or 6.2% per year, about 15% higher than the corresponding attrition rate for Fresno County. Monterey County crop agriculture is dominated by fresh vegetable production, as contrasted with the dominance of grape and cotton production in Fresno County. Recalling that the attrition rate for producers of certain fresh vegetables in Fresno County was substantially higher than for producers of most other crops, the higher attrition rate found for all Monterey County farms may reflect the predominance of fresh

vegetables in the county.

We find that the five-year Monterey County farm operator turnover rate is 54%, implying an annual turnover rate of 10.8%. This rate is more than one-third higher than the rate found for Fresno County and indicates a nominal 100% farm operator turnover within a decade. That the turnover rate is much larger than the attrition rate reflects the considerable number of Monterey County farm operators who started up after 1990 but who had quit by 1994, as well as the large number of start-up farms that continued in business in 1994.

As shown in Figure 2, there were only 30 fewer Monterey County crop and dairy farm operators in 1994 compared with 1990, a decrease of just 3.7% in total number. This contrasts with Fresno County, where the total number of farms declined by 10% in the same period.

The results of the present study indicate that while roughly 440 Monterey County farm operators terminated their farming activities in this period, more than 410 new farm operators started up in agriculture. This suggests that farming is seen as an economic opportunity, albeit with relatively high risk.

Census findings indicate that there were 821 Monterey crop producers in 1987 and 786 in 1992, for a net decrease of 35, and just 10 dairy producers in 1992, down from 15 in 1987.<sup>8</sup> Clearly, our finding of 810 Monterey County crop and dairy farm operators in 1990 is intermediate, and is consistent with census enumerations.

The nominal 10.8% per annum crop farm operator turnover rate indicates that the tenure of Monterey County farm operators is just 9.1 years. However, as discussed earlier, the farm operator turnover rate is not a direct measure of operator tenure because the duration of operation of continuing farms could not be directly measured.

The 444 Monterey County farm operators we report as discontinued by 1994 is comprised of 278 who were active in 1990 but left the business by 1994, and 166 who started up after 1990 but quit by 1994. In this context it is important to also note that 414 farm operators started farming in Monterey County after 1990, again underscoring the fact that this is a dynamic process, with one entrepreneur succeeding another.

Census findings for Monterey County farm operators indicate that the average number of years

**Figure 2****Number of Monterey County Crops & Dairy Farm Operators****1990**

810  
Farm Operators

414  
Started up

444  
Discontinued

**1994**

780  
Farm Operators

**Five-Year Farm Operator Turnover Rate 54.0%**

on the present farm were 14.1 years as of 1987 and 16.0 years in 1992.<sup>9</sup> As was the case for Fresno County, census findings for the duration of farm operator tenure suggest a longer average period than indicated by the results of the present study. But, as in the case of Fresno County, census determinations refer to all types of farmers, not just crop and dairy farm operators. However, 31% of operators did not report to the census their average number of years on present farm or had been farming for four or fewer years. Thus, it appears likely that census findings are overstated.<sup>10</sup>

Commodity-specific farm operator attrition rates are presented in Table 3 (below).

**Table 3**

**Commodity-Specific Monterey County Farm Operator Attrition**  
**Number of Producers, 1990, and 1990-94 Attrition Rate**

Commodity	Number (90)	Discontinued (94)	Attrition Rate
Broccoli	182	32	18%
Celery	101	12	12%
Lettuce	173	22	13%
Strawberry	178	65	37%
Other Berries	93	53	57%
Grape	43	6	14%
Nursery Crops	146	10	7%
Dairy	5	1	20%

As in the case of the analogous discussion of Fresno County commodity-specific attrition rates, it is important to note that these figures refer only to farm operators producing the particular commodity in 1990 and whether they were still producing that same commodity in 1994. No account is taken of whether a particular farm discontinued its entire business or simply switched commodities, and no account is taken of farm operators who may have begun operations after 1990 but left the business before 1994.

There is a substantial variation in the turnover rate of producers found in this study across specific commodities. Strawberry and other berry producers experience a very much higher turnover rate than is the case for vegetable, nursery or dairy producers. For grape producers, the turnover rate is substantially smaller than the county-wide farm operator turnover rate, paralleling the Fresno County finding.

According to Richard Nutter, Monterey County Agricultural Commissioner, the very high rate of turnover among berry producers is probably related to the high risks associated with berry farming. While capital requirements are not large to enter berry farming, the risk is so great that a substantial number of failures are noted each year. He commented that a substantial fraction of failures of berry farms are among Mexican-origin growers who today comprise a large, and increasing, fraction of the county's berry farmers.<sup>11</sup>

We have also determined the size characteristics for 690 Monterey County farms for which acreage data was available in 1990 (85% of the crop and dairy farm total of 810) and compared them with

those that left the business by 1994. First, overall, these farms had an average crop land acreage in 1990 of 585.2 acres (the median was 45 acres). For those farms that left the business by 1994, the average crop land acreage was only 309.1 acres (the median was 18 acres). Thus, the farms that left the business were, on average, substantially smaller than for all farms in the county.

Equally important, of Monterey County farm operators for which 1990 crop land data was available and which had 100 acres or less of such land, 40.5% had left the business by 1994. But only 17.9% of Monterey County farm operators for whom 1990 crop land data was available and who had more than 100 acres of crop land had gone out of business by 1994. Thus, the smallest size farms were more than twice as likely to be unable to continue in business as the larger farms.

## Strawberry Farm Operators in Monterey County

We have made a specific, detailed analysis of strawberry producer turnover in Monterey County. This is of special interest both because of the high annualized turnover rate for producers of this commodity and because support for entry-level strawberry producers of Hispanic origin has been the subject of various public and private agency efforts in Monterey County for more than two decades.

In Table 4 we show the size distribution of Monterey County strawberry producers who have been represented in the pesticide permit files in at least one of the five years 1990-94. However, unlike the summaries shown in Tables 1 and 3, in Table 4 we include any farm that produced strawberries in Monterey County in at least one year during 1990-94. Thus, the total number of farms represented is larger than the actual number growing strawberries in any one year, as is also the case for the strawberry acreage we report. Only strawberry acreage is indicated, including land in adjacent counties that a farm operator used for strawberry production. The latter inclusion is important if we seek to measure total strawberry acreage grown by a specific farm operator because a significant number of Monterey County strawberry producers also grow strawberries in neighboring Santa Cruz County, just across the Pajaro River near Watsonville. No effort was made to determine whether these farm operators also produced strawberries in Southern California.

**Table 4**

### Monterey County Strawberry Producers, Includes Any Year 1990-94

<b>Size of Strawberry Acres</b>	<b>Number of Farms</b>	<b>Total Strawberry Acres</b>
20 acres or less	133	1,174
21 - 40	55	1,604
41 - 60	20	980
61 - 80	14	951
81 acres or more	59	13,632
<b>Total</b>	<b>281</b>	<b>18,341</b>

Thus, there were 281 farm operators who obtained a pesticide permit and farmed strawberries in Monterey County in at least one of the five years. The average strawberry acreage was 65 acres per farm (the median is 19 acres), including strawberry acreage in adjacent counties. Analysis of the surname of the farm operator or of principals involved in the business indicates that 199 have Hispanic surnames,

representing 71% of the operators.

However, when we group these same farm operators according to Continuing (permit in all five years), Discontinued (no permit in 1994, but permit in one or more prior years), and New (permit in 1994, but no permit in 1990), we find strikingly different results for the three groups of farms.

For Continuing farms the average strawberry acreage is 90.9 acres, and 61% have Hispanic surnames. For Discontinued farms, the average strawberry acreage is 32.3 acres, and 76% have Hispanic surnames. Finally, for New farms the average strawberry acreage is 64.8 acres, and 83% have Hispanic surnames.

Of special interest is that for the Discontinued Hispanic strawberry farm operators the average strawberry acreage was only 17.4 acres, and the median strawberry acreage was just 10 acres. Thus, those Hispanic farmers who left the business had a strawberry acreage that was only one-fifth as large as the average for all Continuing strawberry farm operators.

This is a remarkable finding. It directly demonstrates that the likelihood of Hispanic strawberry farm operator success is strongly dependent on the size of their strawberry acreage.

Among the 199 Hispanic strawberry farm operators, only 77 (38%) grew strawberries in all five years. This contrasts with the 82 non-Hispanic strawberry farm operators, of which 49 (60%) were Continuing farms, i.e., producing throughout the entire period.

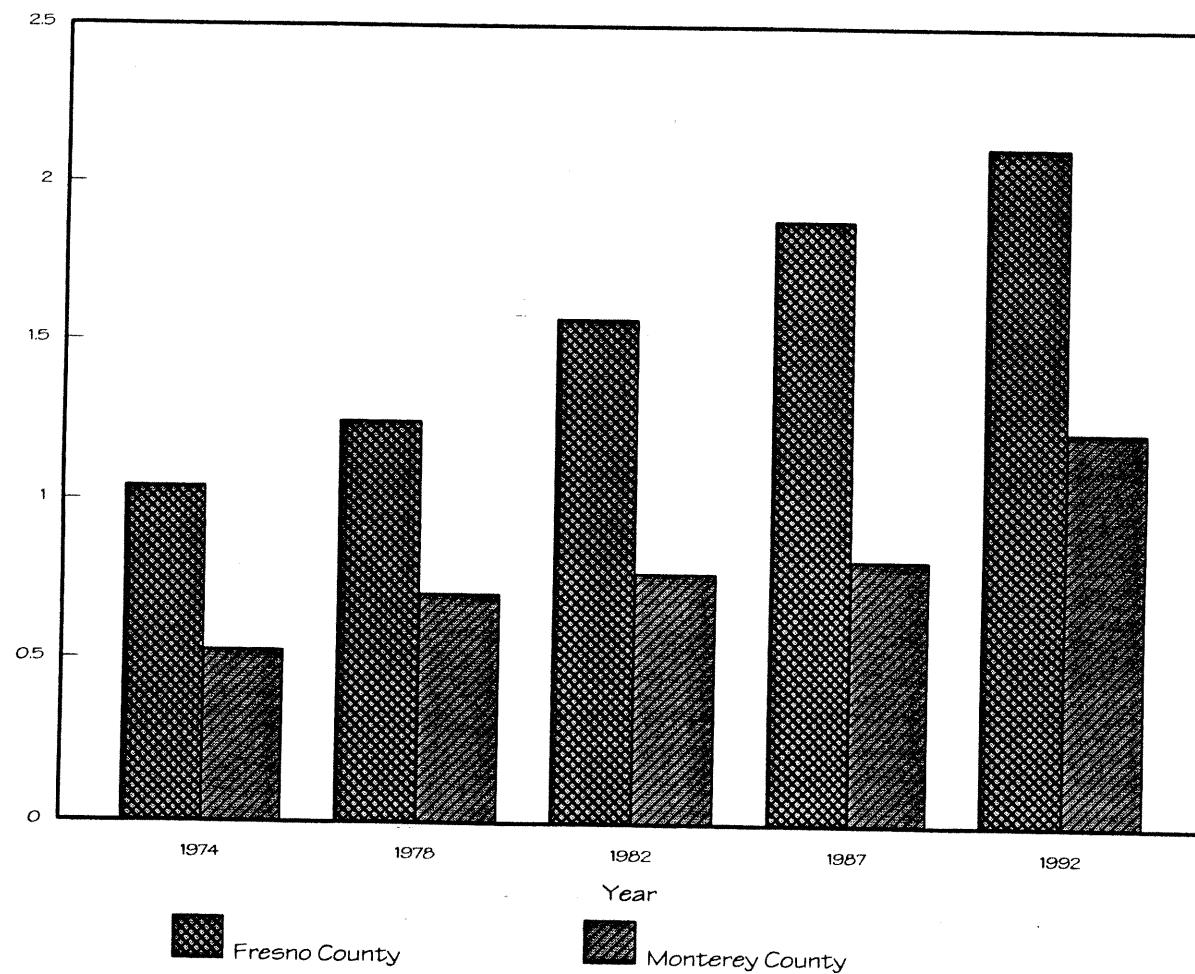
Therefore, the likelihood of Continuing as a strawberry producer in Monterey County is greatest among non-Hispanic, larger acreage farm operators and is least among small acreage, Hispanic farm operators. At the same time, the overwhelming preponderance of new entrants to the strawberry farm business are Hispanic farmers with a relatively moderate size strawberry acreage. Clearly, business opportunities are perceived to be substantial in this population, despite the rather high rate of economic casualties.

## Discussion and Conclusion

The high rates of farm operator turnover found in this study are strong evidence of the great risk that agriculture producers face in today's increasingly competitive economy. Yet, despite the evidence of high risk we have found, there are a very large number of agricultural entrepreneurs willing to enter the business and try to earn a livelihood by farming.

This important finding of high rates of business turnover stands in contrast to the robust rate of growth of farm production in these two counties over the past two decades. Figure 3 shows Fresno and Monterey County farm cash receipts from the sale of agricultural commodities between 1974 and 1992, expressed in constant dollars.<sup>12</sup> What is striking about these data is that, even when corrected for inflation, farm cash receipts have more than doubled in this period in each of the two counties, increasing by 5.8% per year in Fresno County and 7.3% per year in Monterey County.

**Figure 3**  
Cash Receipts from Agricultural Commodity Sales  
Census of Agriculture, Constant Dollars



Thus, . . . agricultural industries of both counties have enjoyed a very rapid expansion in recent years, a signature of vigorous economic success. Of course, county-wide growth of agricultural sales does not mean that every crop industry is performing well. Nor does it mean that all crop years have been good. Nevertheless, the impressive overall growth probably explains the attractiveness of farming to new entrepreneurs. But the very high attrition and turnover rates in both counties are puzzling in this light since opportunity is obviously increasing.

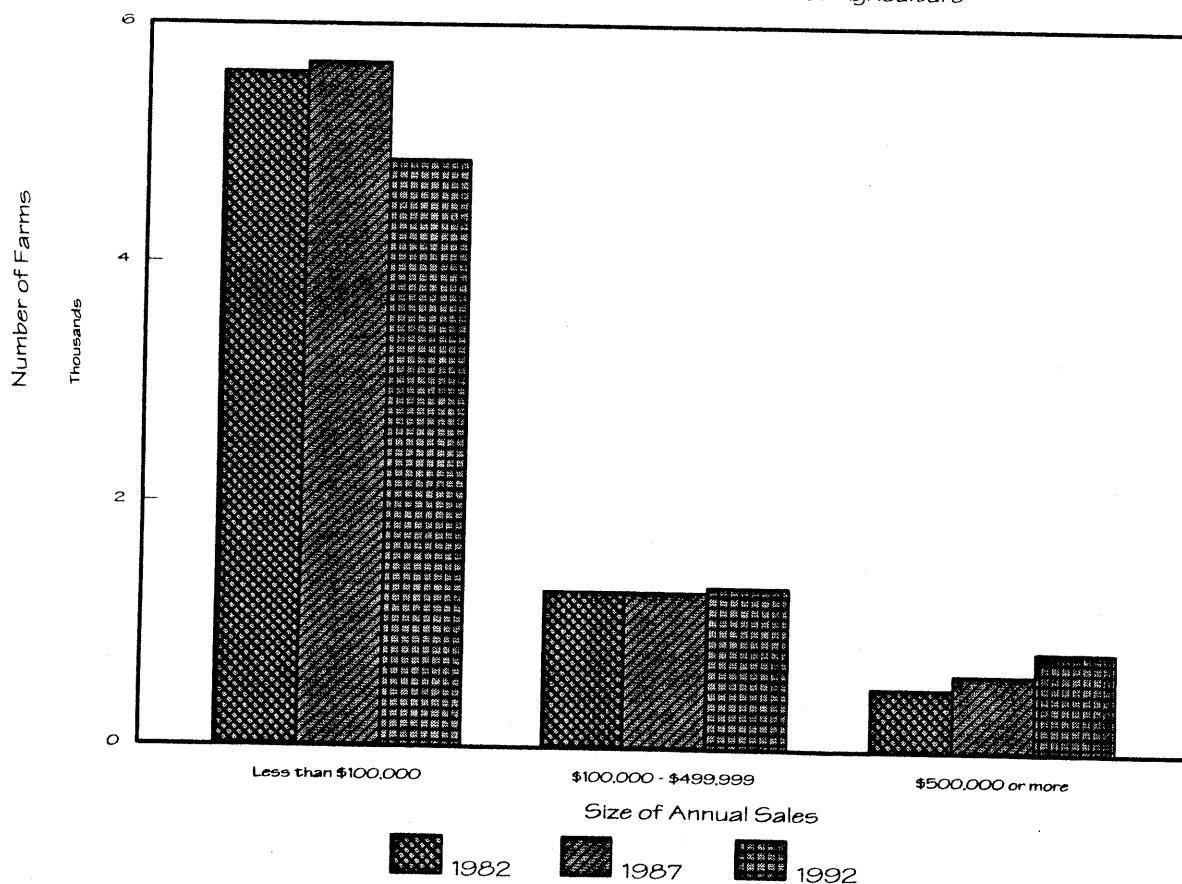
If we examine farm operators, however, the picture is not as sanguine. In both counties the number of small farms (annual farm cash receipts less than \$100,000) declined sharply between 1987 and 1992. Figures 4 & 5 show the number of farm operators enumerated in the three census years 1982, 1987 and 1992 grouped by size of annual farm cash receipts.

In Fresno County, the number of small farms fell by one-seventh between 1987 and 1992.

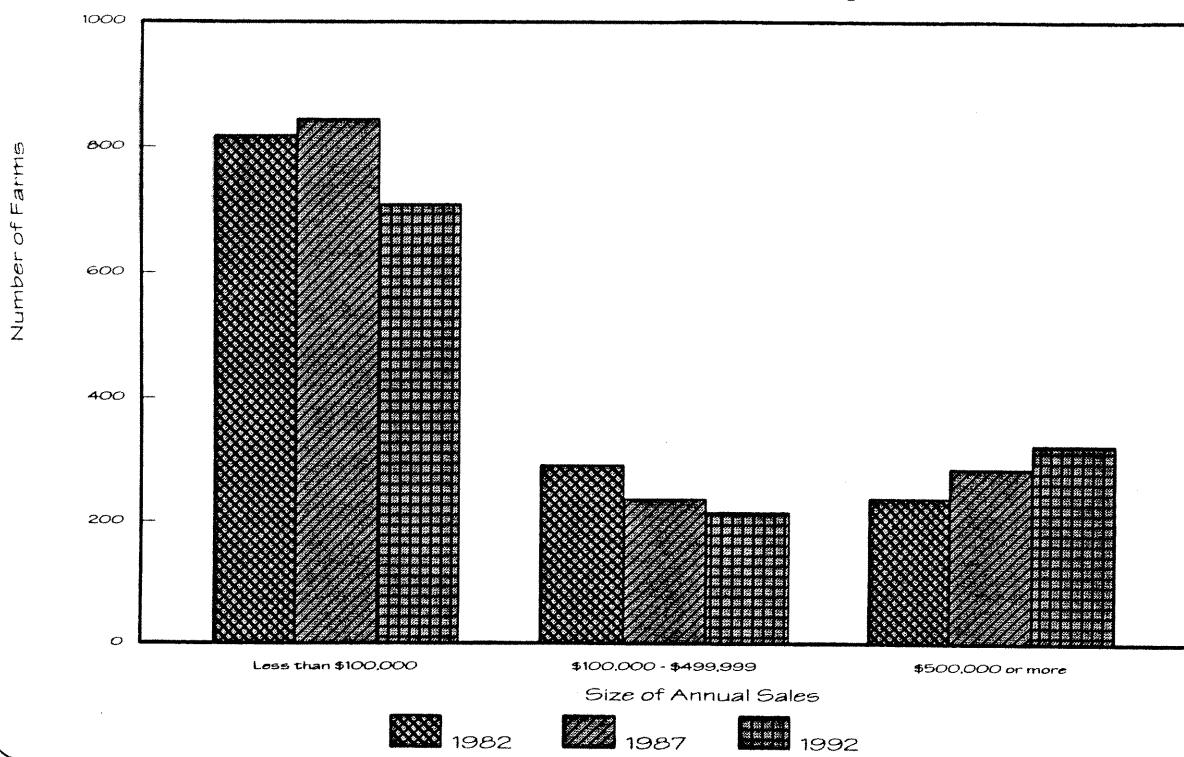
**Figure 4**

**Fresno County Farms, by Size, 1982-1992**

Size of Annual Sales, Census of Agriculture



**Figure 5**  
**Monterey County Farms, by Size, 1982-1992**  
 Size of Annual Sales, Census of Agriculture



Medium size farms fared much better, actually slightly increasing in number in this period.

In Monterey County, the number of small farms also decreased sharply between 1987 and 1992, in this case by about one-sixth. Medium size farms have also been declining in number in the county, down by one-fourth since 1987.

Less obvious in both counties was the steady increase in the number of large farms (annual farm cash receipts larger than \$500,000). In Fresno County the increase was by nearly one-third while in Monterey County it was slightly larger than one-third.

In Fresno County, the number of small farms decreased by 811 (-14%) between 1987 and 1992, while the county-wide total of all farms declined by only 569. This apparent discrepancy is resolved by noting that the increase in the number of large farms, from 628 to 823, accounts for nearly all of the difference.

In Monterey County, the situation is similar, with the county-wide number of farms declining by 119, but the number of small farms reportedly decreasing by 136 (-16%). Again, the increase in the number of large farms is responsible for the difference.

Strictly speaking, the data in Figures 4 & 5 should be corrected for the effect of inflation but this

did not prove to be practical. However, because there was only a very modest increase in prices received by farmers during 1982-92, to first approximation this effect does not affect the sizable changes in farm numbers in the different size classes.<sup>13</sup>

Of perhaps greater significance than the change in numbers of different size farms is the fact that between 1982 and 1992 the small farm share of all Fresno County farm cash receipts fell sharply, by some 30%, to just 5.7% of the total. In Monterey County in the same period, the small farm share of county-wide cash receipts from the sale of agricultural commodities fell by 44%, to just 1% of the county total. Table 5 summarizes the share of farm cash receipts accounted for by differing sizes of farm operators.

The squeeze on small and medium scale farms, evident in the declining share of agricultural commodity sales that these groups account for, is thought by some to be associated with the changes in land use patterns in a rapidly urbanizing state. We have examined the changes in farm land use in the two counties to determine whether this factor might be worthy of closer study.

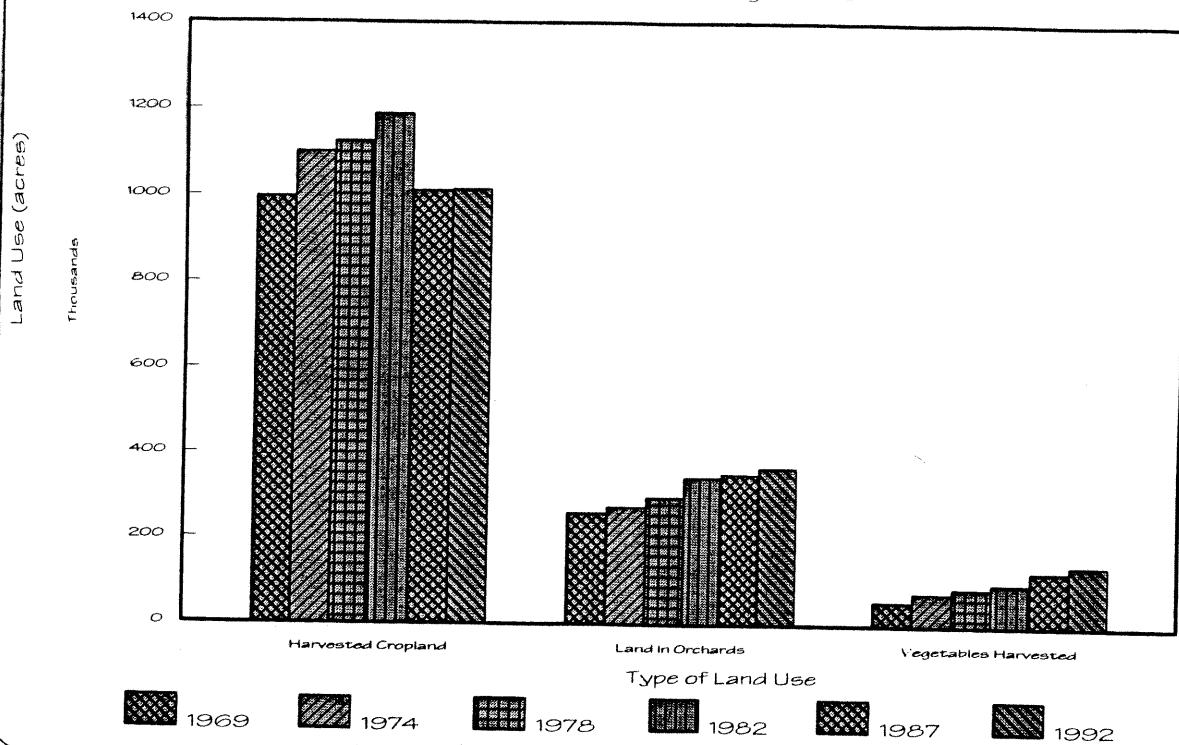
Figures 6 & 7 show the pattern of crop land use in both counties from 1969 through 1992. What is evident is that the amount of harvested crop land has remained somewhat steady, with a decline

**Table 5**  
**Farm Cash Receipts by Size of Farm**  
**Fresno and Monterey Counties, 1982 & 1992**

	1982	1992
<b>Small-size Farms</b>		
Fresno County	8.1%	5.7%
Monterey County	1.8%	1.0%
<b>Medium-size Farms</b>		
Fresno County	18.5%	14.3%
Monterey County	9.5%	4.7%
<b>Large-size Farms</b>		
Fresno County	73.4%	80.0%
Monterey County	88.7%	94.3%

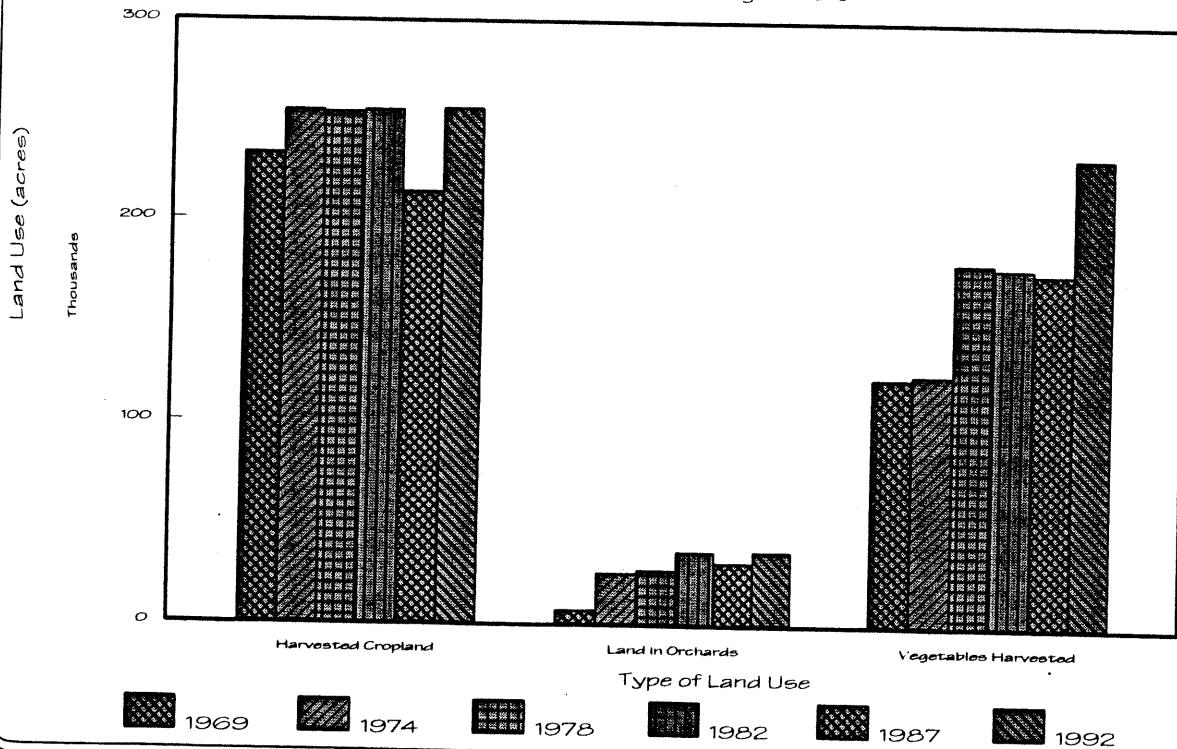
**Figure 6**  
**Crop Land Use, Fresno County**

Census of Agriculture



**Figure 7**  
**Crop Land Use, Monterey County**

Census of Agriculture



appearing in Fresno County in 1987 and 1992. The latter decline is more a result of idling of crop land due to the impact of the protracted six-year drought of the late 1980s and 1990s than of the impact of urbanization.<sup>14</sup>

Of greater interest is that, in both counties, vegetable harvested acreage and land in orchards has steadily increased throughout the period 1969-92, by 167% and 42%, respectively. Recalling that Fresno County vegetable farm operators exhibited a rather high rate of turnover, this may be an indication that the expansion of vegetable production in the county has proceeded at too rapid a pace. Overproduction, and the decline in farm prices that follows, may be a primary cause of instability among Fresno County vegetable producers. On the other hand, the slower growth of the amount of land in orchards may contribute to greater stability in commodity prices for these crops, in turn resulting in less farm operator turnover.

In Monterey County, the pattern of land use is strikingly different. The acreage of harvested cropland remains stable with no sign of any net loss to non-agricultural uses. But the acreage of harvested vegetables has literally exploded, almost doubling since 1969. And land in orchards has increased by an even greater factor. Once again, concern over possible overexpansion and depressed commodity prices would be suggested by the data.

Finally, we have examined the geographic distribution of changes in the number of farm operators between 1987 and 1992. Census enumerations, aggregated by community (zip code) show that nearly all of the reported decline in number of farms was concentrated in communities in central and eastern Fresno County (see Appendix IV). The east valley area of Fresno County is the traditional center of small-scale farms. Thus, our findings that the highest rates of operator attrition and turnover are among small-scale farms are fully consistent with the well-known geographic location of these farm operations.

### Sustainable Practices and Their Impact

Beginning in 1990 organic farm operators have been required to report their acreage, crop sales and certain other information to their respective County Agricultural Commissioners. These records were consulted to assist in identifying farms in both Fresno and Monterey Counties. The number of organic farms registered in either county was found to be quite small and their combined sales to be of

little significance. For example, there were 28 registered organic farms in Monterey County in 1994, representing 1,092 acres and \$11.5 million in commodity sales. Though this is a sizable increase from 1990 when 15 organic farms registered with 900 acres, the overall level of organic commodity sales is just over one-half of one per cent of Monterey County's total farm cash receipts.<sup>15</sup> In fact, as compared to 1991, reported organic farm sales in the county have actually declined somewhat relative to conventionally-grown commodities.<sup>16</sup>

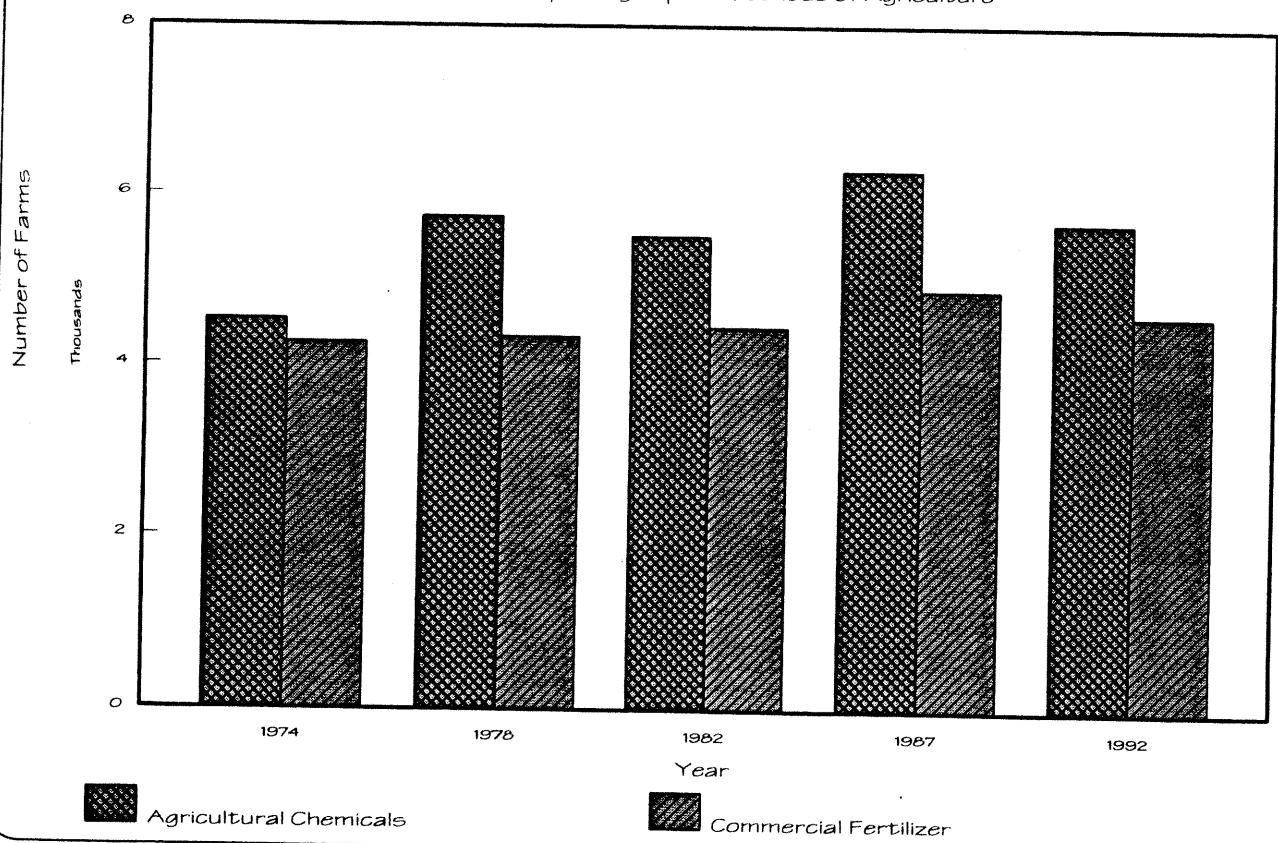
For Fresno County, the organic farm share is even smaller, amounting to just over one-tenth of one per cent of annual conventional production in the period 1992-93.<sup>17</sup> While there has been a steady increase in the number of organic farmers in the county, their share of total farm cash receipts has not kept pace with the growth of conventional producers.

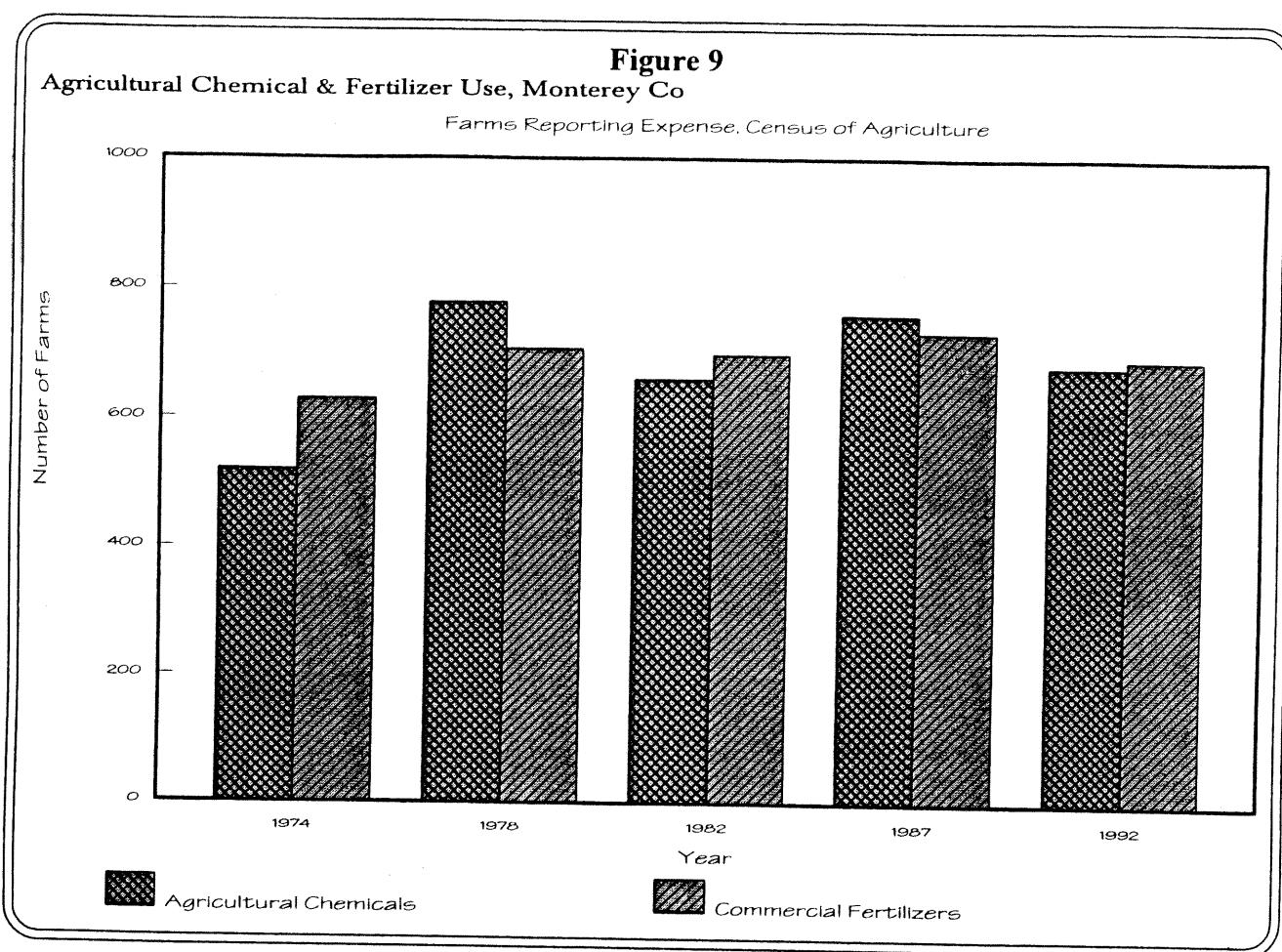
There are other measures of sustainable practices, notably reports by farmers of their reliance on agricultural chemicals. The two primary sources of data are the census enumerations of farmers reporting agricultural chemical use and tabulations of pesticide use reports from the California

**Figure 8**

**Agricultural Chemical & Fertilizer Use, Fresno Co**

Farms Reporting Expense, Census of Agriculture





Department of Food and Agriculture.

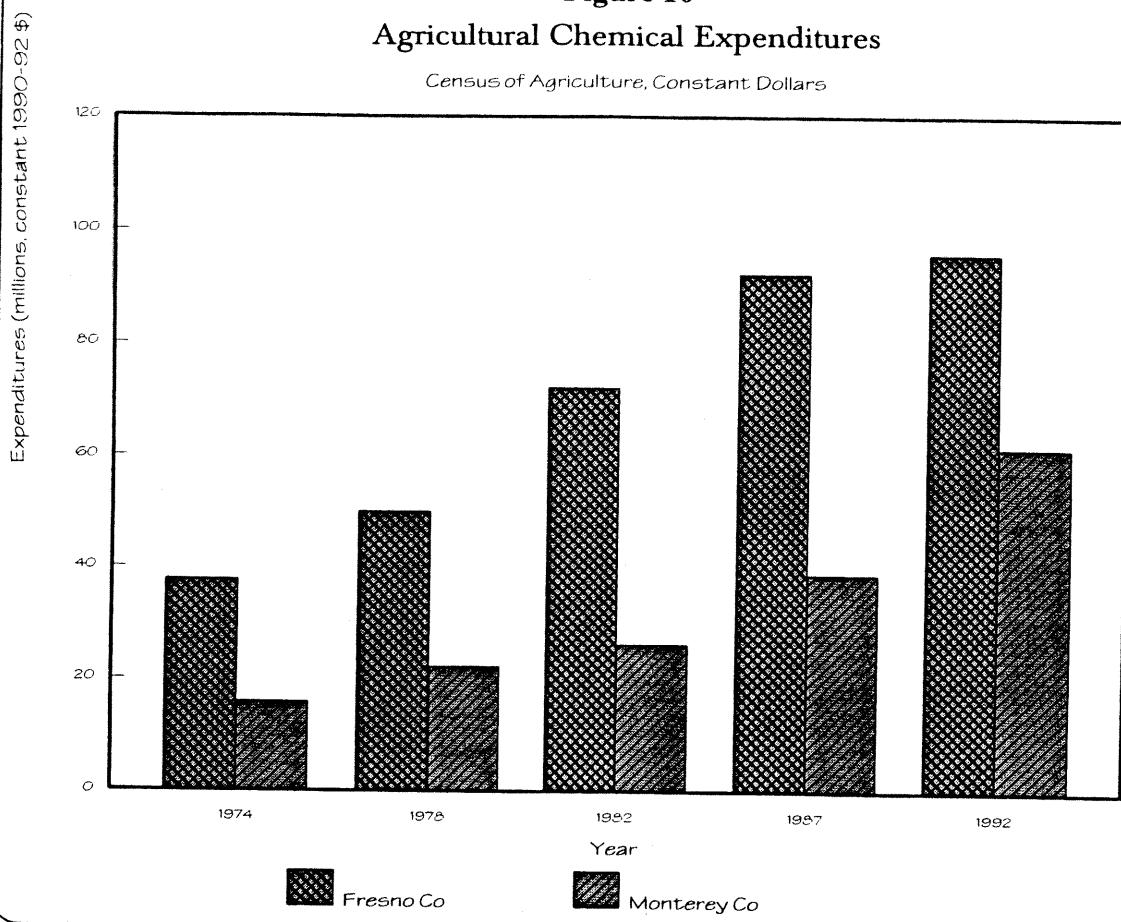
Census enumerations indicate that in both counties there has been an increase in the number of farms reporting purchases of agricultural chemicals and commercial fertilizer as farm production expenses. This is shown in Figures 8 & 9. The increase is most noticeable in Fresno County and is all the more significant for 1992 since, in that year, more than 100,000 acres of cropland was idled due to the six-year drought. It is likely that, absent the drought, the number of farms using agricultural chemicals and commercial fertilizer would have been even greater.

A second measure of the growth of agricultural chemical use is shown in Figure 10 where actual county-wide farm operator expenditures for agricultural chemicals, expressed in constant dollars, is shown for the period 1974 through 1992. The sharp increase in the amount of this type of farm production expense reflects increased agricultural chemical usage since the effect of price inflation has been properly taken in account.

There are two additional measures of the trend in agricultural chemical use. As a part of the

**Figure 10**  
**Agricultural Chemical Expenditures**

Census of Agriculture, Constant Dollars



pesticide permit and reporting process, all commercial users of registered pesticides must report their actual pesticide use. Starting in 1990 reports of unrestricted pesticide use by private applicators (farmers) was also required, for the first time. Thus, for 1990 and subsequent years, full use reporting became mandatory. Summaries of these individual use reports, both of restricted and unrestricted materials, are published annually by the Department of Pesticide Regulation (California E.P.A.).

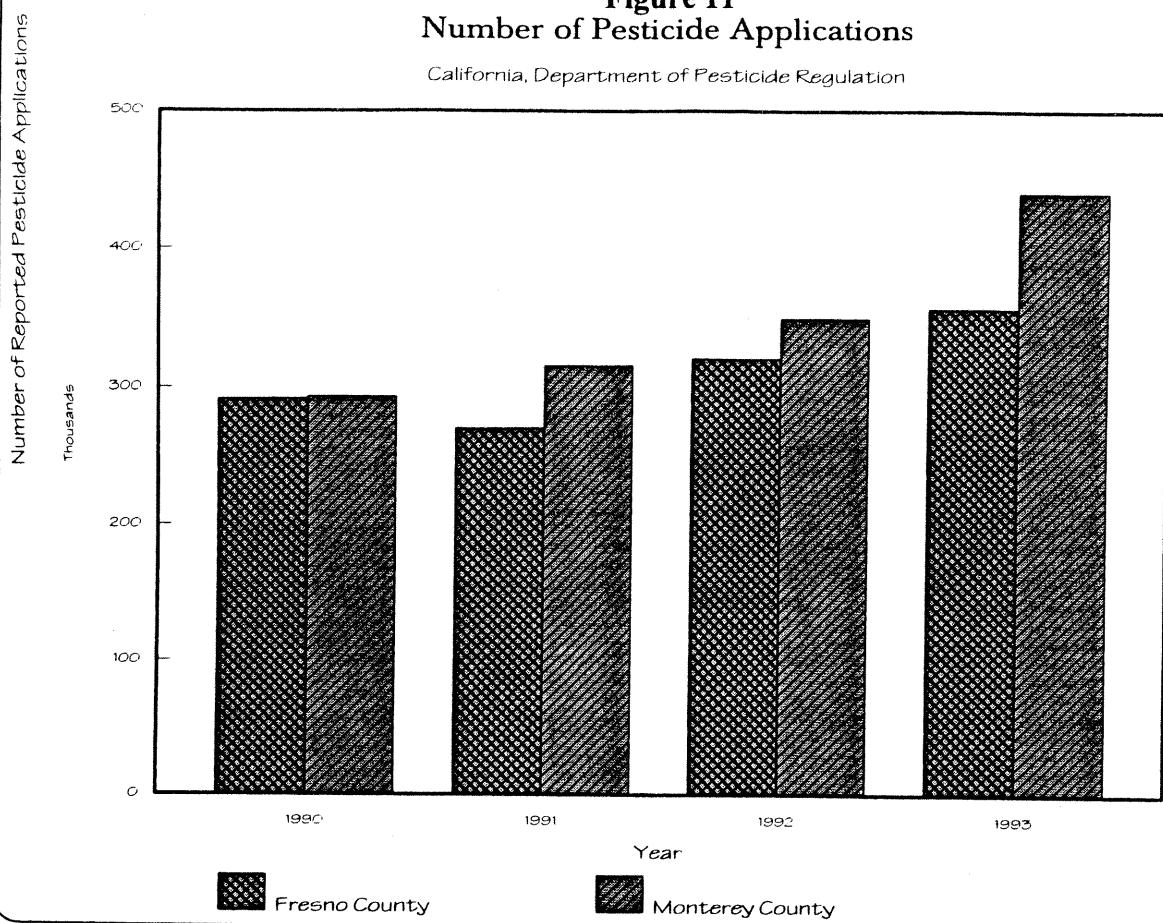
Figures 11 & 12 show, respectively, the number of individual pesticide applications and the amount of active ingredients of agricultural chemicals actually applied. The data are reported by county and year.

Using both measures - amount of pesticide used and number of individual applications - there has been a steady increase in farm operator reliance on agricultural chemicals over the four year period. This finding is consistent with census reports of increased expenditures for agriculture chemicals, when corrected for inflation, discussed above.

We have also measured the reliance of Monterey County strawberry producers on methyl

**Figure 11**  
Number of Pesticide Applications

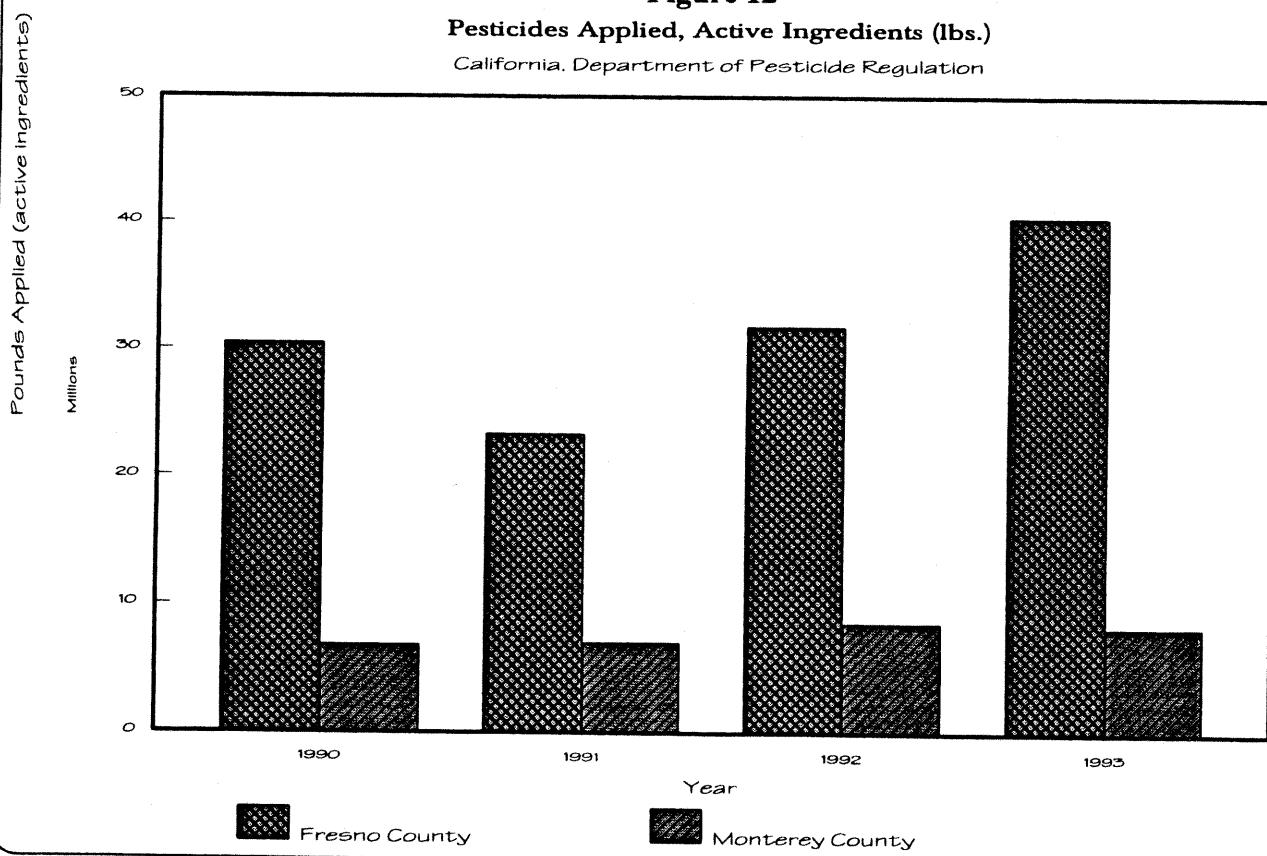
California, Department of Pesticide Regulation



**Figure 12**

Pesticides Applied, Active Ingredients (lbs.)

California, Department of Pesticide Regulation



bromide, a soil fumigant applied when nursery stock is transplanted for the new crop year. Individual pesticide use reports for Monterey County methyl bromide applications in strawberries in 1993 were carefully reviewed. The principal finding was that some 38% of new plantings did not require methyl bromide treatment, a much higher portion than widely believed by industry sources. Also, it was found that a full one-third of Monterey County strawberry growers did not report use of methyl bromide.

At the same time the average grower using methyl bromide treated 38 acres of strawberries, very close to the average size of a Monterey County strawberry farm. That is, we find that small-scale growers are just as reliant on methyl bromide as are large producers. Finally, we find that the amount of methyl bromide applied per acre is independent of farm size. This may reflect the fact that virtually all strawberry farm operators rely on commercial applicators to fumigate their strawberry plots. It is likely that commercial applicators use the same procedures throughout the county, including the rate of application per acre.

These findings suggest that, insofar as methyl bromide use reflects farm practices, small-scale producers and large-scale producers follow very similar protocols in their use of agricultural chemicals. However, the fact that one-third of Monterey County strawberry growers do not use any methyl bromide indicates that some producers have found other methods.

## Policy Recommendations

The main finding of this report is that there were unexpectedly high rates of farm operator attrition and turnover in both Fresno and Monterey Counties during the period 1990-94. These high rates occurred in a period of substantial economic growth in the agricultural industries of the two counties.

From our case study of strawberry farm operators in Monterey County it is clear that the turnover rate is greatest among small-scale Hispanic farm operators. Large-scale non-Hispanic farm operators have a much lower likelihood of attrition.

A strong spirit of farm operator entrepreneurship is evident in both counties. Nearly as many new farmers entered the business in Monterey County as left. In Fresno County, for every five farms that quit there were four new farmers willing to try their hands.

This finding of a strong entrepreneurial initiative is encouraging. It demonstrates the vigor of agriculture despite all of the factors of risk and hardship.

**1. Culturally appropriate outreach among new farmers is needed.** We recommend that private organizations as well as the University of California Cooperative Extension, through its statewide system of farm advisors, develop a systematic program of needs assessment, linguistically appropriate outreach programs and culturally appropriate materials to address the needs of the new farmers. It is not sufficient to simply develop publications, videos and other resource materials. Rather, in-field, hands-on advisors who speak the language of the new farmers are needed at the farm level. In Fresno County it is well established that both Hmong and Latino farmers today comprise about one-sixth of all farm operators.

**2. The experience of knowledgeable retired farmers needs to be tapped.** A network of Senior Farmer Practitioners should be developed among retired farmers in each county. Members of the network would be asked to pair a Senior Farmer Practitioner with newly established farm operator to provide peer support, oversight and advice.

**3. Sustainable agriculture practices among farm operators need to be strengthened.** We recommend that pesticide use report information be developed that tracks the actual pesticide use practices of individual farmers. If, as in the case of Monterey County strawberry producers' use of methyl bromide, evidence is found that there are significant departures from traditional practices, then

ethnographic field research should determine which alternative pest control strategies are actually being utilized. Established networks for sharing farm advice, such as the Lighthouse Farm network of the CAFF Foundation, should be strengthened through targeted outreach using this kind of information.

**4. Land use strategies need to be modernized, including supporting farmers for maintaining open space and sustainable farm practice “green belts” in the urban periphery.** European rural and farm policy experts have long ago recognized that farmers are caretakers of open space. By providing support, including tax incentives and other indirect payments, governmental policy can keep small farmers on the land and maintain open space.

**5. Discriminatory lending practices that exclude small farmers from capital markets should be outlawed.** More than a few private lenders now limit their loans to larger farm businesses. But these practices keep small producers from obtaining needed capital to make their businesses more stable. Thus, established lending practices sometimes prevent small farms from accessing the capital they need to survive.

**6. Natural resource policy that selectively disadvantages small farmers should be prohibited or mitigation funds should be established to provide assistance for the transition to other activities.** Water policy decisions designed to reduce water availability to agriculture or to increase its price are likely to add further instability to the lives of small farm operators. Natural resource policy initiatives, such as water pricing, should have size sensitive thresholds to cushion the adverse impact on small farms.

# Appendix I

## Identification of Farm Operators Using Pesticide Permit Files

Complete files of all permit holders for all five years were obtained from Fresno and Monterey County Agricultural Commissioners in electronic form. Table I summarizes the number of permits issued in each county for each year. Table I also shows a detailed profile of the complete set of permit records for the purpose of illustrating the type of records available. Note especially the significant number of non-farm permits in Monterey County. These have been carefully screened out in our analysis of farm operator turnover.

**Table A-I**  
**Permits for Pesticide Use**  
**Fresno & Monterey Counties**

<b>County</b>	<b>Total Permits</b>	<b>Non-Farm</b>	<b>Farm</b>
Monterey, 1990	956	187	769
1991	939	173	782
1992	920	188	732
1993	842	173	669
1994	922	171	751
<b>Total unduplicated permits (5 years) = 1,451</b>			
Fresno, 1990	5,753	182	5,571
1991	5,585	139	5,446
1992	5,361	152	5,209
1993	5,353	253	5,100
1994	5,234	199	5,035
<b>Total unduplicated permits (5 years) = 8,780</b>			

Source: Fresno & Monterey County Agricultural Commissioner, Electronic Permit Files (Parts A, B & C).

Tracking of permit holders from year-to-year is simplified by the established practice of issuing a unique number to each permit holder and retaining that same number year-to-year. Permit numbers must be disclosed to pesticide vendors, who record this information when chemicals are purchased for commercial purpose. The permit number is termed an "operator ID number" in the case of permits which are exclusively for the use of unrestricted materials.

We have found that Monterey County does not strictly adhere to the practice of retaining the assignment of a unique permit number year-to-year and has been reassigning permit numbers to about one-fourth of that county's regular permit holders in a somewhat haphazard fashion each year. On the other hand, we find that Fresno county is very careful to keep the same number assigned to a given permit holder every year.

## Appendix II

### Description of Data File Records

Part A: Permit number, date permit filed, name of permit holder, name of permittee, mail address of permit holder, telephone numbers of permit holder (up to three), other data pertaining to pesticide applications.

Part B: Permit number, site i.d. number, commodity number, quantity, units, pesticide i.d. numbers.

Part C: Permit number, site i.d. number, township, range, section, map narrative description.

Raw data files were cleaned by CIRS staff for errors in spelling of place names, zip codes and other readily identifiable mistakes. Care was taken to standardize the format for all permit holder names to facilitate matching of records. Each record in the cleaned file was compared against the existing data base *before* the file was imported to seek a “match” based on permit number, permit holder name, mailing address, telephone number and permittee. Imported records that matched existing ones were added to the historical set for that farm operator. Supplemental material regarding partners, corporate officers, fictitious business names, and the addresses of other locations are also added to the file on annual basis.

There were six situations under which an operation could be classified as “continuing”:

- 1) If the permit number and name match exactly, regardless of changes of address, telephone number, or permittee name in successive years.
- 2) If the permit number, *surname* of individual permit holder and address or telephone number match.
- 3) If the permit holder name does not match, but the permittee in a given year is the permit holder name in the following year.

- 4) If the permit holder name changes from multiple individuals to just one of the original individuals, or vice versa, e.g., Jones & Smith Farms -> Jones Farms.
- 5) If -- as in a small number of Fresno and Monterey County permit holders -- the permit holder was in the files in one year, absent in one or more subsequent years, and then reappeared in the files in an even later year. Such cases were treated as though they were continuing operations in all years from first appearance to the last, although a permit was not filed in one or more intermediate years.
- 6) If -- as in a sizeable number of cases -- the permit number and surname are the same, but a female first name replaces a male first name in subsequent years. Cases of this type most likely represent wives succeeding deceased or divorced male operators, or a daughter succeeding a male family member.

A number of cases of family successorship were found: one year's permit holder had the same permit number, address, and telephone number, but also had at least one new name added to the permit holder name listed in a prior year. Cases like these represent the addition of children, siblings or spouses to some level of responsibility for the farm operation and were clearly continuations of the same farm operator. Only if the permit holder name *and* address *and* telephone number were all different was the farm considered to have a changed farm operator.

On the other hand, if a permit number did not correspond to a prior year's permit number *and* there was no match of permit holder name *and* no match of address or telephone number, then the permit holder was considered a new operator. In an analogous fashion, if a prior year's permit number was not represented in the subsequent year's file *and* there was no match of permit name *and* there was no match of address or telephone number, then the farm operator was considered to have disappeared, most likely by going out of business.

Most of the individual farm operator comparisons were accomplished successfully using customized computer programs written by Gretchen Bradfield, CIRS computer programmer. A relatively small share (a few hundred in all) required human review, and a few dozen cases required more thorough investigation, including review of data in other CIRS data files or of additional public records, such as corporation filings at the office of the California Secretary of State. In some cases, ambiguity was ultimately resolved by comparing the commodity and locations reported in Part B and Part C of the data

files.

The complete import process involves a careful assessment of whether the farm operator is represented in the data file already or whether it is a genuinely "new" record. Through such effort we potentiate the capacity to track farms on a longitudinal basis.

Finally, the data base file's internal reference number for each record was utilized to generate a listing of the full file for each county and computer counts of longitudinal histories were made. This universal listing was carefully reviewed to locate obvious errors and to exclude non-farm permit holders.

## Appendix III

**Comparison of Crops and Acreage, 1994**  
**Pesticide Permit Files and County Agricultural Crop Report**

Commodity	Permit Files	County Crop Report
alfalfa	68,383	68,000
almonds	49,005	42,016
apples	4,889	3,206
apricots	1,870	1,122
barley	14,560	15,025
beans, dry	20,018	22,000
broccoli	5,579	5,500
cantaloupe	40,901	28,000
corn, grain	2,409	3,100
corn, silage	18,644	18,500
corn, sweet	2,835	2,800
cotton	390,691	381,500
eggplant	760	760
figs	2,049	2,790
garlic	19,626	19,800
grapes, raisin	176,595	168,671
grapes, table	19,912	10,142
grapes, wine	46,855	34,575
honeydew	4,220	4,200
kiwifruit	436	427
lemons	1,090	881
lettuce, head	22,074	19,820
melons, mixed	2,006	2,000
nectarines	17,552	13,051
olives	1,230	1,157
onions	14,400	14,500
oranges	28,429	23,275
peaches	18,500	14,373
pears	943	676
pecans	280	279
peppers, bell	1,836	1,650
persimmons	465	392
pistachios	4,178	3,645
plums	19,151	16,169
pomegranates	1,271	966
prunes	3,798	1,429
rice	6,193	6,200
safflower	10,775	10,600
squash	768	770
strawberries	654	650

sugarbeets	27,815	22,600
tomatoes, fresh	10,557	10,550
tomatoes, processing	97,227	100,000
walnuts	3,549	2,969
watermelon	548	550
wheat	33,030	38,080
Total acres:	1,218,556	1,139,366

The figures in this table clearly demonstrate that crops reported in the pesticide permit process, and the corresponding acreage, represent quite well the actual acreage being farmed in Fresno County. In fact, the small differences between the acreage reported in the pesticide permit process and that reported to the County Agricultural Commissioner may be understood as primarily representing the difference between planted and harvested crop acreage. In the case of perennial plantings, vines and trees, it is likely that non-bearing acres accounts for the fact that the pesticide permit figures are somewhat larger than the harvested acreage reported in the County Agricultural Crop Report.

## Appendix IV

### Change in Fresno County Farms, by Zip Code Area

<b>Community - Zip Code</b>	<b>1987</b>	<b>1990</b>	<b>Change</b>
Auberry	31	40	+9
Cantua Creek	9	13	+4
Caruthers	240	204	-36
Clovis	552	473	-79
Coalinga	96	96	0
Del Rey	99	94	-6
Dos Palos	195	187	-8
Dunlap	17	14	-3
Firebaugh	106	100	-6
Five Points	14	34	+20
Fowler	253	218	-35
Fresno	2,701	2,495	-206
Friant	11	18	+7
Helm	7	10	+3
Huron	24	39	+15
Kerman	457	433	-24
Kingsburg	557	547	-10
Laton	150	121	-29
Mendota	16	18	+2
Miramonte	14	16	+2
Orange Cove	158	108	-50
Parlier	145	109	-36
Prather	21	20	-1
Raisin City	33	34	+1
Reedley	632	567	-64
Riverdale	151	135	-16
Sanger	668	626	-42
San Joaquin	37	30	-7
Selma	596	556	-40
Tollhouse	42	52	+10
Tranquillity	55	49	-6

## References

- 1 "A Farming Revolution: Sustainable Agriculture," *National Geographic*, Vol. 188, No. 6, December 1995, pp. 60-89.
- 2 The *Census of Agriculture* reported 2,087,759 U.S. farms in 1987, a decrease of 153,217 from 1982. By 1992 fewer than two million remained. See *Census of Agriculture*, Vol. 1, Part 51, United States, Bureau of the Census, U.S. Department of Commerce, Washington, DC.
- 3 Marty Strange, *Family Farming: A New Economic Vision*, University of Nebraska Press & Institute for Food and Development Policy, San Francisco, 1988, p. 244.
- 4 1992 *Census of Agriculture*, Volume 1, Part 5, California State and County Data, Bureau of Census, Economics and Statistics Administration, U.S. Department of Commerce, Washington, DC, September 1994, p. 1.
- 5 1992 *Census of Agriculture*, op. cit., County Data, Table 2, p. 175.
- 6 Ibid.
- 7 1992 *Census of Agriculture*, op. cit., County Data, Table 11, p.262.
- 8 1992 *Census of Agriculture*, op. cit., County Data, Table 2, pp. 176 and 185.
- 9 1992 *Census of Agriculture*, op. cit., County Data, Table 11, p. 264.
- 10 Ibid.
- 11 Richard Nutter, private communication, 1994.
- 12 *Agricultural Statistics* 1995, U.S. Department of Agriculture, Washington, DC, 1995, Table 554, Prices Received by Farmers, United States, 1985-94, p. IX-28. See also prior publications under this generic title for earlier years.
- 13 1995 *Agricultural Statistics*, op. cit. The Index of Prices Received by Farmers (1990-92 = 100) was 95 in 1982, 89 in 1987, and 98 in 1992. Thus, the farm producer Price Index varied by only 4% from its mean value throughout the ten-year period.
- 14 Don Villarejo, Impact of Reduced Water Supplies on Central Valley Agriculture, California Institute for Rural Studies, February 1995, Figure 2, p. 4.
- 15 Monterey County Agricultural Crop Report 1994, Monterey County Agricultural Commissioner, Salinas, California, 1995, p. 31. The organic share of total production is 0.595 per cent.
- 16 Monterey County Agricultural Crop Report 1991, Monterey County Agricultural Commissioner, Salinas, California, 1992, p. 31. The organic share was 0.643 per cent in 1991, as compared with 0.595 per cent in 1994.
- 17 Karen Klonsky and Laura Tourte, Statistical Review of California's Organic Agriculture 1992-1993, Cooperative Extension, Department

total of organic commodity sales was about \$3.6 million. The Fresno County Agricultural Crop and Livestock Report 1992 indicates that all farm commodity sales totaled \$2.64 billion. See Fresno County Agricultural Crop and Livestock Report 1992, Fresno County Department of Agriculture, 1993, Fresno, California, p. 17.