THE PERFORMANCE OF INDEPENDENT PEST MANAGEMENT

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TABLE 1. SAN JOAQUIN COTTON, AVERAGE DOLLAR YIELD PER ACRE,* 1970 AND 1971

Cotton Acres	Nonusers 1970	Users 1970	Nonusers 1971	Users 1971	Nonusers 1970-71	Users 1970-71
0-49	247.50 (70.87)	228.75 (28.01)	264.60 (98.32)	292.95 (28.19)	254.80 (82.02)	259.00 (40.94)
50-199	241.25 (34.18)	216.25 (33.72)	311.85 (52.53)	250.43 (20.80)	273.00 (54.26)	236.60 (35.12)
200-999	272.50 (39.43)	251.25 (36.42)	321.30 (42.58)	281.93 (40.21)	295.40 (47.18)	264.60 (40.42)
1,000 or more	251.25 (.78)	285.00 (23.76)	192.15 (50.40)	281.93 (9.17)	232.40 (46.53)	274.40 (16.89)
Average**	255.00 (22.71)	271.25 (35.38)	221.65 (72.93)	281.93 (20.51)	247.80 (55.08)	270.20 (27.49)

SOURCE. Data collected from Willey-Norgaard research for the Ford Foundation.

NOTE. Standard deviations are indicated in parentheses.

*These figures are based on a 1970 price of $.25 per pound and a 1971 price of $.31 per pound. The 1970-71 price was $.28, an average of the two years.

These statistics are **not calculated by averaging the numbers given in this table. They are calculated using total acres and total yield for each category.

TABLE 2. SAN JOAQUIN COTTON, AVERAGE INSECTICIDE COSTS PER ACRE, 1970 AND 1971

Cotton Acres	Nonusers 1970	Users 1970	Nonusers 1971	Users 1971	Nonusers 1970-71	Users 1970-71
0-49	22.01 (6.92)	6.53 (5.52)	23.24 (10.67)	13.02 (9.02)	22.65 (9.09)	10.02 (8.26)
50-199	13.17 (10.26)	6.49 (3.49)	14.83 (8.19)	9.02 (3.21)	13.93 (9.41)	7.34 (3.67)
200-999	14.10 (7.77)	9.13 (5.07)	13.62 (9.95)	8.92 (7.08)	13.87 (8.90)	9.02 (6.23)
1,000 or more	7.84 (2.92)	4.65 (2.05)	15.54 (7.25)	2.79 (2.33)	11.25 (6.79)	3.41 (2.38)
Average*	9.34 (5.51)	6.13 (4.61)	15.16 (8.06)	4.21 (4.72)	11.97 (7.38)	4.94 (3.85)

SOURCE. Data collected from Willey-Norgaard research for the Ford Foundation.

NOTE: Standard deviations are indicated in parentheses.

*These statistics are **not** calculated by averaging the numbers given in this table. They are calculated using total acres and total insecticide costs for each category.

Cotton and citrus growers, the two largest users of pesticides in the United States, can reduce the amount of pesticides used on their crops and increase their returns per acre. This was the conclusion of a study undertaken through the Giannini Foundation of Agricultural Economics, University of California, Berkeley. The research, based on interviews with 42 cotton and 39 citrus growers in the San Joaquin Valley, suggests that growers can realize these gains by following the advice of independent pest management consultants. Research is continuing in order to measure the profitability of consultant programs to the growers and to learn how growers decide to use a consultant's services.

One function of integrated pest control programs is to reduce the use of pesticides that have long been recognized as, specifically, disruptive to the agro-ecosystem and, generally, harmful to health and the environment. Such programs systematically combine different chemical control methods with natural biological controls and cultural practices. The independent consultant checks fields and bases his advice on his estimate of the insect populations. Historically the programs have relied on natural predators and parasites as well as chemical controls when necessary.

Pest management programs

Pest management programs vary. Some consultants limit their services to counting pests while others pay considerable attention to predators, parasites, and crop conditions. A few consultants now emphasize total crop management and also advise on cultural practices and weed control.

A universal aim of the consultants' programs is to avoid unnecessary spraying in order to prevent killing beneficial insects and hence to prevent subsequent pest resurgence that would require further spraying. For example, the grower may need to spray lygus, a key pest in San Joaquin Valley cotton, early in the season to avoid substantial crop loss. Early treatments, however, can mean early destruction of beneficials, causing pest management problems throughout the rest of the season. Bollworm infestations, in particular, are aggravated by early spraying of lygus. A similar treadmill exists for thrips in citrus.

Integrated pest control programs have been operating in California for over 20 years. By 1970 pest management consultants were serving about 126,000 acres, or 20 percent of the cotton acreage in the San Joaquin Valley. They served an estimated 150,000 to 160,000 acres of cotton in the Valley in 1973 and 190,000 to 200,000 acres in 1974. Consultants operate in every county in which cotton is grown, though their share of total acreage has been larger in Kern County (40% in 1970) and Fresno County (25% in 1970) than in Kings, Madera, Merced, and Tulare counties (3% to 11% in 1970). Although the percentage of cotton acreage under integrated control by pest consultants is increasing rapidly, it did not keep pace with the rise in total cotton acreage during the cotton price increase up until 1974.

Approximately 4,500 acres, or about 6 percent of total citrus acreage in the Valley, were served by consultants in 1970. By 1972 they served 6,070 acres, also about 6 percent of total citrus acreage. Again, consultants' share of total acreage has been greater in Kern (9% in 1971) and Fresno (10% in 1971) counties.

The use of consultants is an unfamiliar practice to many growers, and those who do follow a

CONSULTANTS
in San Joaquin Cotton and Citrus

TABLE 3. SAN JOAQUIN CITRUS, AVERAGE DOLLAR YIELD PER ACRE, 1970 AND 1971

Citrus Acres	Nonusers 1970	Users 1970	Nonusers 1971	Users 1971	Nonusers 1970-71	Users 1970-71
0-25	252.79 (55.81)	477.50 (72.08)	396.10 (142.83)	505.64 (251.39)	324.45 (129.97)	491.57 (185.45)
26-100	449.72 (117.38)	390.33 (167.14)	472.44 (136.04)	517.83 (227.20)	461.08 (161.69)	453.32 (209.04)
Over 100	545.15 (180.22)	561.19 (243.35)	510.37 (104.03)	504.72 (286.60)	527.76 (125.15)	529.12 (269.72)
Average*	509.47 (187.36)	527.17 (237.22)	496.23 (118.79)	506.65 (274.81)	502.85 (157.00)	515.80 (260.64)

SOURCE: Data collected from Willey-Norgaard research for the Ford Foundation.

NOTE: Standard deviations are indicated in parentheses.

*These statistics are **not** calculated by averaging the numbers given in this table. They are calculated using total acres and total yield for each category.

TABLE 4. SAN JOAQUIN CITRUS, AVERAGE INSECTICIDE COSTS PER ACRE, 1970 AND 1971

Citrus Acres	Nonusers 1970	Users 1970	Nonusers 1971	Users 1971	Nonusers 1970-71	Users 1970-71
0-25	32.71 (22.27)	7.43 (3.76)	53.80 (16.19)	14.81 (14.88)	43.25 (22.29)	21.00 (21.40)
26-100	41.64 (19.81)	10.25 (8.99)	37.80 (16.96)	10.17 (9.40)	34.13 (19.36)	9.19 (9.27)
Over 100	47.63 (18.77)	27.92 (12.65)	44.73 (16.15)	19.44 (15.52)	46.18 (17.57)	23.11 (14.95)
Average*	45.64 (19.42)	24.58 (13.89)	42.97 (16.76)	17.99 (15.14)	42.35 (18.29)	20.53 (14.97)

SOURCE: Data collected from Willey-Norgaard research for the Ford Foundation.

NOTE: Standard deviations are indicated in parentheses.

*These statistics are **not** calculated by averaging the numbers given in this table. They are calculated using total acres and total insecticide costs for each category.

consultant's advice do not know if or how much their profits have changed as a result. Further, many growers see the consultant services as risky. The present study is aimed at assessing the profitability of consultant programs.

Research findings: cotton

A random sample of San Joaquin Valley cotton growers were interviewed. Those who agreed to participate spent three to six hours answering a detailed questionnaire about their farms. Data on total acreage, insecticide dosages, application dates and costs, irrigation, labor costs, total yield, total value of crops, and other farming practices were gathered.

From these interviews, some relative characteristics of cotton growers employing pest consultants emerged. Such growers are generally more experienced in cotton production than those who do not use consultants. Their farms are larger than average. (Size is related to consultant use, partly because the costs per acre of checking and advising on small fields are considerably higher than on large fields.) The vast majority of growers using consultants have more than 200 acres of cotton. The average size of their farms is 680 acres, approximately five times the average of 135 acres for the Valley as a whole. Nearly all of these large cotton growers also have considerable additional acreage in another crop — typically alfalfa — under consultant service.

A third characteristic of growers who employ consultants is their aversion to risk. They tend to see greater risks from pests, compared to those who do not use consultants. Careful field checking and the increased number of alternative pest controls through natural control and chemicals, if necessary, help to reduce the risk of crop damage by pests.

Data collected in 1970 and 1971 revealed that the average cotton grower who used consultant services produced and grossed more per acre than the nonuser. During 1970 and 1971, users earned $270.20 per acre, and nonusers earned $247.80, a difference of over $20 per acre (table 1). On the average, the increased returns occurred on farms with greater cotton acreage. Users with less cotton acreage seemed to have a slightly lower yield than nonusers with farms of comparable size.

In calculating the returns to cotton growers, a constant price per pound of cotton was used. This is because the prices different growers actually receive for cotton can vary considerably within one year. Holding the price constant therefore reflects the change in quantity produced. The reduced uncertainty of dollar yield for those who used consultants is reflected in the lower standard deviation of estimates of average dollar yield in table 1.

In both 1970 and 1971 the per-acre cost of chemical insecticides for growers who employed consultants was cut substantially (table 2). This was true for farms of all sizes. Over the two-year period users spent an average of $7.00 less per acre on insecticides than nonusers.

In evaluating the profitability of employing an independent pest management consultant, the cost of the service must be considered as well as the increased yield and lower insecticide costs. On the average, consultants' advice in 1970 cost cotton growers $2.68 per acre; the cost dropped to $2.33 per acre in 1971. Even with the additional expense, users of consultant services in 1970 spent $.53 less per acre on insect control. In 1971 they spent $8.62 less per acre than nonusers due to considerable savings (nearly $11.00 per acre) on insecticide costs (table 2).

Given the increased yield and reduced insect control costs, those who used consultant services earned an average net amount of $16.78 more per acre in 1970 and $65.32 more in 1971 than nonusers. However, the data at this point do not indicate whether all the increase was due to the consultant or to other farm management factors. The current study is attempting to control for the differences in farm management ability by including data on each grower's age, education, and experience, although it is recognized that these factors are not entirely adequate. But even if none of the yield increase were attributed to the consultants, the cost of the consultant is more than offset by the decrease in pesticide costs. This leads to the conclusion

that growers can increase profits while reducing risks in dollar yield by using the services of independent pest management consultants.

Research findings: oranges

A similar study of 39 orange growers in the San Joaquin Valley also reveals certain characteristics that distinguish users from nonusers of pest management consultants. Those who follow a consultant's advice grow oranges primarily and usually have a smaller percentage of acreage in other crops. In this sample their land was of lower quality, as measured by the Storie Soil Index. They watered more often but with less water per application. In general, they had fewer trees per acre and younger groves. They were generally more educated, had less contact with farm advisors, and read more technical agricultural journals.

Orange growers who used the services of pest consultants over the two years grossed about $13 more per acre than those who did not use such services (table 3). This increased return generally occurred on smaller farms, particularly on those with 25 acres or less in oranges. In 1970 farms over 100 acres with consultant services also produced more per acre than farms of comparable size without consultants. But the uncertainty of the increased yield is greater, as reflected in the higher standard deviation of the estimates for users in table 3, perhaps because the consultants' pest management programs represent a lower degree of control.

As in cotton, the profit the average orange grower gains from employing an independent pest consultant can be estimated by considering the cost of the services — about $20 per acre during 1970-71 — and the savings on insecticides. In the orange study, users of consultant services spent an average of $20.53 per acre on insecticides over the two years; nonusers spent twice that much — $42.35 per acre (table 4). The variance of insecticide expenditures was also uniformly lower for users.

Orange growers who used consultant services on the average netted $18.74 more per acre in 1970 and $13.40 more per acre in 1971 than nonusers. In this sample it appears that one-third of those orange growers who did not follow the advice of a consultant could have increased their profits by doing so.

As in the case of cotton production, it is difficult to separate the effects of using consultants on yield from the effects of good management practices. This difficulty is compounded by the possibility that consultants may stimulate growers' management ability. However, even if none of the yield increase is attributable to the consultants, again, the cost of the consultant is generally more than offset by the decrease in pesticide costs. This leads to the conclusion that growers can increase profits by using the services of independent pest management consultants.

Additional considerations

Estimates of profitability resulting from a pest management consultant's services should be seen clearly as average estimates per acre. They should not be taken as true for every farmer every year. It was found that the effects of consultants on yield and on pesticide costs varied considerably: 1) from year to year for the same grower, and 2) between growers for any given year. (The amount of the variance is indicated by the numbers in parentheses in tables 1 and 3.) The advice of a consultant should be viewed as an investment that may take several years to start paying off. Some integrated pest management practices — for example, those that depend on natural enemies — take time to build up effectiveness. This is especially true in orange production. In these cases, a consultant recommends spraying or alternative strategies before "true" thresholds are reached, since farmers are generally not willing to consider reduced yields, and the consultant's reputation suffers from reduced yields.

The future of the project

To more precisely estimate the profitability of independent pest management consultants' services, data are now being collected from the same cotton and orange growers for 1972-74. In these interviews more systematic data on many other factors that affect yield are being gathered, and a report on the findings of the first study is being made available to the growers. A further analysis of growers' attitudes toward risk and the decision to adopt new technology, i.e., pest consultant information technology, is also planned. It is expected that data over a five-year period will help determine the profitability of the investment in pest management technology as well as show how growers receive information and make decisions. Such an analysis should indicate the best way to give information to growers on the most profitable means of reducing overall pesticide use.

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