BIOLOGICALLY INTEGRATED FARMING SYSTEMS (BIFS) PROGRAM

A Progress Report to the California State Legislature
on the Implementation of Assembly Bill 3383
(Chapter 1059, Statutes of 1994)

University of California
Office of the President
Division of Agriculture and Natural Resources
Statewide Special Programs and Projects

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EXECUTIVE SUMMARY

On September 28, 1994 Governor Pete Wilson signed Assembly Bill 3383 (Bornstein, Brown, and Snyder). The bill requested the Regents of the University of California to establish a pilot demonstration program to provide extension services, training, and financial incentives for farmers who voluntarily participate in pilot projects to reduce their use of agricultural chemicals. The resulting program is known as Biologically Integrated Farming Systems (BIFS). Funds were provided from the California Department of Pesticide Regulation's Food Safety Account and the US Environmental Protection Agency (US-EPA) to support the first two pilot projects. This report describes the implementation of the BIFS program between January 1995 and December 1996.

The University of California Sustainable Agriculture Research and Education Program (UC SAREP) was selected to administer the pilot program. A 13-member program advisory review board was appointed and policies and procedures were developed in accordance with AB3383. A Request for Proposals among the agricultural and research communities to identify the first two pilot demonstration projects. The program director selected, with advice from the program advisory review board, the first two pilot demonstration projects: one involving winegrapes in the Lodi-Woodbridge Winegrape Commission ("Winegrape BIFS") and one involving cotton and row crops in the West Side of the San Joaquin Valley ("West Side BIFS").

In its first year of the Winegrape BIFS project, 31 growers have allocated 47 vineyards as BIFS demonstration sites, a total of 2023 acres. These 31 growers manage about 50 percent of the acreage of vineyards in the Lodi-Woodbridge Crush District #11. Cover crops and monitoring of pests, two practices noted in AB3383 as characteristics of the desired farming systems, are used in over 90% of the Winegrape BIFS vineyards. In-season pest monitoring and a computer database for managing the monitoring information are particular strengths of this project.

The West Side BIFS project involves twelve farms that manage a total acreage of approximately 90,000 acres. Each farm has dedicated one or more field sites of 80 acres or more to BIFS—a total of 1,653 acres in 16 field sites. The most notable success in this project is in the area of soil-building. All 16 plots received either compost (12 plots) or a cover crop (4 plots).

Annual results from both projects have been reviewed by the program advisory review board and the program director. Specific suggestions and requirements for continued funding have been identified and communicated to the project coordinators.

New funding from US-EPA and the University of California Division of Agriculture and Natural Resources now permits us to fund at least one additional project. The Request for Proposals has been prepared and is scheduled for distribution in January 1997.

INTRODUCTION

On September 28, 1994 Governor Pete Wilson signed Assembly Bill 3383 (Bornstein, Brown, and Snyder). The bill requested the Regents of the University of California to establish a pilot demonstration program to provide extension services, training, and financial incentives for farmers who voluntarily participate in pilot projects to reduce their use of agricultural chemicals. **Attachment 1** provides the complete text for AB 3383 as chaptered (Chapter 1059, Statutes of 1994). The goal of AB3383 is "… to expand the use of integrated farming systems that have been proven to decrease the use of farm chemicals," through integration of the following elements (Section 591):

(1) Relying on biological and cultural control to protect crops from pest outbreaks.
(2) Creating on-farm habitats that harbor populations of beneficial insects and mites.
(3) Using cover crops to provide some or all of the nitrogen needed by the crop plants.
(4) Directing overall attention to soil building practices.
(5) Reducing reliance upon chemicals.

The Legislature requested that the University of California establish a program of pilot demonstration projects with the following features (Section 592 (b)):

(1) The program should consist of up to five pilot demonstration projects, each project involving a different commodity or cropping system and each located in a different county.
(2) The program should be designed to extend integrated farming systems through the proven technique of farmer-to-farmer communication, with technical support provided by farm advisors, scientists, and pest control advisers.
(3) The structure of each pilot demonstration project should be patterned, to the degree feasible, after the successful Biologically Integrated Orchard Systems (BIOS) program coordinated by the Community Alliance with Family Farmers in Merced County.
(4) Pilot demonstration projects should be selected through a competitive process that supports the goals specified in Section 591. The proposals for the projects selected should demonstrate the applicant's experience in the farming systems described in subdivision (b) of Section 591, should contain documented financial and technical support, and should provide for a breadth of private sector cost sharing.
(5) Funding for the program should consist of a combination of federal, state and private sector funds…

The bill appropriated $250,000 from the Food Safety Account to the California Department of Pesticide Regulation (DPR) for the purposes of this bill. Additional funds were provided by the U.S. Environmental Protection Agency (US-EPA) Region IX ($420,000). These funds were sufficient to support the first two pilot projects for three years. It was understood that additional pilot projects would be supported only if additional funds were made available. New funding from US-EPA ($195,000) and the University of California Division of Agriculture and Natural Resources ($100,000) now permits us to fund at least one additional project. The Request for Proposals has been prepared and is scheduled for distribution in January 1997.

The resulting program is known as Biologically Integrated Farming Systems (BIFS). This report describes the implementation of the BIFS program between January 1995 and December 1996.

PROGRAM ESTABLISHMENT

The Regents of the University of California approved a resolution in January 1995 to establish the pilot demonstration program. The University of California Sustainable Agriculture Research and Education Program (UC SAREP) was selected by the UC Division of Agriculture and Natural Resources to implement the pilot program in consultation with a program advisory review board.

PROGRAM ADVISORY REVIEW BOARD

AB3383 calls for the appointment of a 13-member program advisory review board (Section 593. (a)) The board was appointed in February 1995 by UC Vice President—Agriculture and Natural Resources. Members appointed to the program advisory review board were:

Table 1. Members appointed to the program advisory review board.

Name and Affiliation	Category Specified in AB3383, Section 593
Steven Weinbaum, Dept. of Pomology, UC Davis	University of California
Lonnie Hendricks, Farm Advisor, Merced County	University of California
Kathy Taylor, US-EPA Region IX	Relevant Federal Agencies
Larry Plumb, USDA-Consolidated Farm Services Agency	Relevant Federal Agencies
Sherman Boone	Grower
Wynette Sills	Grower
Greg Nelson	Grower
Susan Temple, Bio-Integral Resource Center	Nonprofit Organization
Mike Spezia, Community Alliance with Family Farmers Fnd.	Nonprofit Organization
Judy Stewart-Leslie	Pest Control Advisor
Paul Gosselin	Department of Pesticide Regulation
Steve Shaffer	Department of Food and Agriculture
Bob Curtis	DPR Pest Management Advisory Committee

POLICIES AND PROCEDURES

AB 3383 states that pilot demonstration projects should be selected through a competitive grants process (Section 592. (b) (4)) and lists the duties expected of UC SAREP (Section 594):

> ... an appropriate program whose director, in consultation with the program advisory review board, shall perform the following duties:
> (a) Develop policies and procedures to guide the implementation of the pilot demonstration projects. These policies and procedures shall include, but shall not be limited to, a mechanism for monitoring and summarizing pesticide and fertilizer use for each project with an assessment of overall reductions in pesticide and fertilizer use on each project.
> (b) Develop and issue requests for proposals for the pilot demonstration projects.
> (c) Review and select the proposals to be funded.
> (d) Annually review pilot demonstration projects and determine which projects shall be renewed.

UC SAREP drafted a Request for Proposals (RFP) for pilot demonstration projects and reviewed and finalized this RFP with the program advisory review board in March 1995 (**Attachment 2**). The program was entitled Biologically Integrated Farming Systems (BIFS), to indicate that it is

distinct from, yet modeled after, the Biologically Integrated Orchard System (BIOS) program, in accordance with AB3383. (Section 592. (b) (3))

Specific policies and procedures to guide the implementation of the pilot demonstration projects were developed by UC SAREP in consultation with the program advisory review board as part of crafting the RFP (**Attachment 2 and Table 2**).

Table 2. Corresponding sections of AB 3383 and the UC SAREP Biologically Integrated Farming Systems Request for Proposals for pilot demonstration projects.

AB 3383 Section Citation	Request for Proposals Section
591. (a) - (c), 592. (a) & 592. (b)	Introduction
592. (b) (4)	Funding
598. (a) & (b)	Use of Funds
592. (b) (3), 592. (b) (4) & 594. (a)	Criteria
594. (a), 592. (b) (3) & 592. (b) (4)	Procedure and Timeline for Application, Evaluation, and Awards
594. (a)	Publications and Annual Reports
596.	Evaluation and Renewal of Funding
592. (b) (3)	Appendix: A Brief Description Of BIOS Projects

SELECTION OF PILOT DEMONSTRATION PROJECTS

The RFP was mailed to potential applicants and interested parties in May 1995. Completed proposals were due to UC SAREP on July 6, 1995. UC SAREP received five proposals in the first funding cycle of the competitive grants process:

Table 3. Cropping system, applicant, county(s), and funds requested for proposals received in response to the 1996 UC SAREP Biologically Integrated Farming Systems Request for Proposals

Commodity or Cropping System	Applicant	County(s)	Funds Requested (per year)
Winegrapes	Mark Chandler & Cliff Ohmart, Lodi-Woodbridge Winegrape Commission	San Joaquin & Sacramento	$100, 000
Row Crop Rotations	Jeff Mitchell & Pete Goodell, University of California	Fresno	$91,912*
Citrus	Benjamin Faber, University of California	Ventura	$56,000
Winegrapes & Pears	Glenn McGourty, University of California	Mendocino	$130,000
Cotton & rotational crops	Will Allen, Sustainable Cotton Project	Madera & Merced	$146,039

* The initial budget request was for $86,000.

The program advisory review board was mailed completed proposals for review and met in late July 1995 to evaluate proposals and award grants. Available funds ($670,000 over three years)

allowed for the full funding of two projects for three years each. Upon recommendation of the program advisory review board, the UC SAREP director selected two proposals: (1) Implementing a Biologically Integrated Farming System for Winegrapes in the Lodi-Woodbridge Winegrape District ("Winegrape BIFS") submitted by Mark Chandler and Cliff Ohmart, Lodi-Woodbridge Winegrape Commission; and (2) Extending Biologically Integrated Farming Practices within The San Joaquin Valley's West Side ("West Side BIFS") submitted by Jeff Mitchell and Pete Goodell, University of California. **Attachments 3 and 4** are the Winegrape and West Side proposals, respectively. See **Attachment 5** for a copy of a press release dated August 18, 1995 which summarizes the projects for the media. Notifications of awards were made the week of August 1, 1995. The following table provides an overview of the competitive grants process:

Table 4. Overview of pilot demonstration project competitive grants process

Activity	Time Period	AB 3383 Section Citation
Establishment of program advisory review board	February 1995	593. (a)
UC SAREP & program advisory review board draft and review request for proposals (RFP)	March 1995	594. (b)
RFP finalized	March 1995	594. (b)
Printing and mailing of RFP	April 1995	594. (b)
Proposals due to UC SAREP	July 6, 1995	594. (c)
Proposals sent to program advisory review board	July 10, 1995	594. (c)
Proposal evaluation and funding decisions made by UC SAREP and program advisory review board	Week of July 24, 1995	594. (c)
Notification of awards	Week of August 1, 1995	594. (c)
UC SAREP & program advisory review board annual review of funded projects and determination of which projects shall be renewed	November 19, 1996 & Follow-up meeting to be held January 13, 1996	594. (d)

SAREP STAFF SUPPORT FOR PROJECT IMPLEMENTATION

To help implement the pilot projects, UC SAREP hired a project liaison in September 1995 to work with the funded projects and interface between the contractors and the University. The following objectives were developed to guide the project liaison's work:

1. Provide and/or facilitate natural and social science technical support to management teams in the areas of implementation (team facilitation, group meetings, information sharing, etc.); and monitoring and evaluation (develop appropriate protocols, analyze data, etc.).
2. Oversee the quarterly reporting process for the Winegrape and West Side BIFS projects.
3. Assist with the development and implementation of protocols for documenting and evaluating the overall BIFS program.

Within these overall objectives, the strategic priority for the start-up year of the projects was to establish the infrastructure for the projects, including staff, communications, coordination among management teams, field sites, grower participation, and outreach.

The project liaison has conducted the following activities to meet the above-stated objectives: site visits, field days, project team meetings, telephone and electronic mail consultations, review and feedback on project materials (e.g. monitoring protocols, data sheets, meeting agendas, etc.), review and feedback on project quarterly reports and newsletters, preparation of UC SAREP quarterly reports, and input into several grant proposals relevant to the BIFS program. Specific activities include:

Table 5. Summary of project liaison activities: September 1995 to December 1996[1]

Site Visits, Field Days, Project Team Meetings, and other BIFS-Related Meetings

- Participation in West Side BIFS joint management team/grower-participants, Five Points. 9/18/95.
- Initial meeting with Winegrape BIFS project coordinator to review expectations and discuss technical support available from UC SAREP, Lodi. 9/26/95.
- Meeting with UC SAREP Director and staff to provide an update of BIFS activities, Davis. 11/1/95.
- Meeting with Winegrape BIFS project coordinator to discuss grower outreach program, Lodi. 11/2/95.
- Meeting with Department of Pesticide Regulation (DPR) grant manager to BIFS program, to discuss UC SAREP reporting process to DPR, Davis. 11/14/95
- Participation in mock Winegrape BIFS neighborhood grower meeting with Winegrape Research Committee. Lodi. 11/15/95.
- Participation in West Side BIFS meeting on organic soil amendments, Five Points. 12/15/95.
- Winegrape BIFS Annual Winter Research/IPM Grower Seminar, follow-up meeting with project coordinator, Lodi. 1/10/96.
- Participation in NRCS/US-EPA/BIOS/BIFS Partnership meeting, Lockeford. 1/11/96.
- Meeting with UC SAREP Director and staff to provide an update of BIFS activities, Davis. 1/12/96.
- Participation in West Side BIFS joint management team/grower-participants meeting, Five Points. 2/2/96.
- Meeting with project coordinator to discuss Winegrape BIFS project, Lodi. 2/22/96..
- Participation in three Winegrape BIFS neighborhood grower meetings, Lodi. 2/23/96.
- Meeting with DPR grant manager to discuss progress of projects, Davis. 3/27/96.
- Site visits to the Winegrape BIFS prototype vineyards -- Lange Twins Twin Oaks Farm and John Kautz Farm Field 1 -- as part of the Winegrape Field Day. 4/11/96.
- Participation in NRCS/US-EPA/BIOS/BIFS Partnership meeting, Lockeford. 4/25/96.
- Participation in Winegrape BIFS Leafhopper Management meeting at Vino Farms, Lodi. 6/12/96.
- Site visits to three Winegrape BIFS farms with project coordinator, Lodi. 6/12/96.
- Participation in West Side BIFS mid-year general meeting, Five Points. 6/18/96.
- Site visits to three West Side BIFS plots, Five Points area. 6/18/96.
- Participation in USDA-NRCS Soil Quality Institute tour to Winegrape BIFS sites, Lodi. 9/25/96.
- Meeting with project coordinator to discuss Winegrape BIFS project, Lodi. 8/20/96.
- Meeting with consultant in UCD Human and Community Development (HCD) department (hired under US-EPA grant) to discuss his work on sociological assessment of BIFS projects, Davis. 8/20/96.
- Participating in Pest Management Advisory Committee meeting, Sacramento. 8/23/96.
- Meeting with UC SAREP Director and staff to provide an update of BIFS activities, Davis. 8/23/96.

Table 5, continued. Site Visits, Field Days, Project Team Meetings, and other BIFS-Related Meetings, Continued

- Meeting with UCD department and representatives from CAFF-BIOS, US-EPA, DPR, and UC SAREP to discuss sociological assessment of BIFS and BIOS program, Davis. 9/6/96.
- Meeting with US-EPA Region IX and UC SAREP to discuss monitoring and evaluation in BIFS projects, Davis. 9/10/96.

[1] This table does not include a list of the numerous telephone and electronic mail consultations.

- Meeting with project coordinator to discuss Winegrape BIFS project, Lodi. 9/11/96.
- Participation in West Side BIFS project evaluation meeting, Five Points. 9/30/96.
- Meeting with project coordinator and monitoring consultant from CRDA to discuss monitoring in Winegrape BIFS project, Lodi. 10/2/96.
- Participation in meeting with UCD HCD department and representatives from CAFF-BIOS, US-EPA, DPR and UC SAREP to discuss sociological assessment of BIFS and BIOS program, Davis. 10/18/96.
- Participation in meeting at Lodi-Woodbridge Winegrape Commission to discuss team building for Winegrape BIFS project, Lodi. 11/7/96.
- Presentation at Pest Management Advisory Committee on UC SAREP BIFS program, Sacramento. 11/8/96.
- Participation in meeting with representatives from CAFF-BIOS, US-EPA, USDA-NRCS, DPR, UC SAREP, and CRDA to discuss ways of improving cooperation, Davis. 11/12/96.
- Participation in BIFS program advisory review board annual meeting, Davis. 11/19/96.

Review and Feedback of BIFS Project Written Materials

- Outline of Winegrape BIFS Neighborhood Grower Meeting.
- West Side BIFS project meeting minutes from 9/18/95, 12/15/95, 1/4/96, 1/16/96, 2/2/96, 3/12/96, 4/8/96, and 9/24/96 management team and/or grower-participant meetings.
- Winegrape BIFS Weekly Monitoring Protocol for Vineyard Pests.
- Weekly IPM Data Sheets for BIFS Program.
- Winegrape Research/IPM Program Update, April, June, August, October 1996 issues.
- Winegrape BIFS Quarterly Reports: 9/1/95 to 12/1/95, 12/1/95 to 3/1/96 and 3/1/96 to 6/1/96.
- West Side BIFS Quarterly Report: 9/1/95 to 12/1/95, 12/1/95 to 3/1/96 and 3/1/96 to 6/1/96.
- Winegrape BIFS 1996 Annual Report.
- West Side BIFS 1996 Annual Report.

Written Work Products

- Preparation of UC SAREP BIFS Quarterly Reports to California Department of Pesticide Regulation: 10/15/95, 10/16/95 to 12/31/95, 1/1/96 to 3/31/96, 4/1/96 to 6/30/96.
- Preparation of UC SAREP BIFS Annual Report to California Department of Pesticide Regulation: 1996.
- Contributions to successful US-EPA Grant Proposal to the Central Valley Agricultural Initiative "Sociological Assessment of Biologically Integrated Farming Systems."
- Contributions to US-EPA Grant Proposal to the Pesticides and Environmental Stewardship Program "Beyond BIFS: Building Curricula for State and Community Colleges to Sustain Biologically Integrated Farming Systems."
- Contributions to successful US-EPA Grant Proposal to the Central Valley Agricultural Initiative "Building Partnerships for Sustainable Agriculture."

ANNUAL REPORTING AND REVIEW

AB3383 requires that the program director, in consultation with the program advisory review board, "annually review pilot demonstration projects and determine which projects shall be renewed." (Section 594. (d)) UC SAREP received annual reports from the two funded BIFS projects in November 1996 and mailed copies to the program advisory review board. The review board met on November 19, 1996 with the UC SAREP director and staff involved in the BIFS program to review the status of each project, determine if the projects should received continued funding, and make recommendations for future years. The remainder of this report is based on the BIFS projects annual reports, comments from the program advisory review board, and analysis by the UC SAREP.

SUMMARY OF FUNDED PROJECTS

WINEGRAPE BIFS PROJECT

This section summarizes the Winegrape BIFS project using excerpts from the Winegrape BIFS annual report. In addition, three Winegrape BIFS quarterly reports submitted to UC SAREP are included as part of the Winegrape BIFS annual report. **Attachment 6** contains copies of the annual report and quarterly reports.

The goal of the BIFS program in Lodi is to implement an area-wide BIFS program in Crush District #11. The program has been divided into two primary endeavors: 1) Grower outreach and 2) Implementation of practices. The entire Lodi-Woodbridge Winegrape Commission grower and pest control adviser (PCA) community is the target of the grower outreach program. There are approximately 650 growers who farm approximately 50,000 acres in the Lodi-Woodbridge district. A major emphasis of this component of the program has been to meet with each district grower and PCA and discuss the basic concepts of the BIFS approach so that everyone has the same understanding of BIFS. Another important aspect has been to present various BIFS techniques to growers which can be used in Lodi vineyards.

Two vineyards, Twin Oaks farmed by Lange Twins Farm, and Field 1 farmed by John Kautz Farms, were designated as 'prototype' vineyards in the original grant proposal. A large number of BIFS strategies are being applied to each of these vineyards and offer other growers a chance to view these strategies being applied on a commercial scale. Twenty-nine additional grower-cooperators have participated in the first year of the program. Their vineyards can also be viewed as demonstration sites where BIFS techniques are being applied in varying degrees, and growers and PCAs can come and observe how these techniques are working on different sites.

The Winegrape BIFS program involves large amounts of information and record keeping. Virtually all of the information and data for the BIFS program, from attendance at the neighborhood grower meetings to data obtained from the weekly monitoring of each vineyard, has been incorporated into a computer database. Because of the volume of information involved in the project it is only possible to present representative data and summaries in this report. However, all of the data are accessible through the database and their retrieval is straightforward.

Grower Outreach

Neighborhood Grower Meeting Program

The goal of the Neighborhood Grower Meeting (NGM) program is to sit down with every grower and PCA in the Lodi district in small groups and discuss an IPM framework and how this framework can be used as a problem-solving tool in farm management decision making. Once this has been accomplished, putting IPM in the BIFS framework becomes a much easier task. A

complete outline for a NGM is presented as Appendix 1 on page 8 of the 3/1/96 to 6/1/96 Winegrape BIFS quarterly report (**Attachment 6**).

During the first three months of 1996, 23 NGM meetings were held. They were attended by 267 growers (about 40 percent of the Lodi-Woodbridge growers), 30 PCAs and 15 winery personnel. Over 300 complimentary copies of the University of California's *Grape Pest Management Manual* (Flaherty et. al. 1992) and UC IPM's *University of California Pest Management Guidelines for Grapes* have been given out at the NGMs to Lodi growers and PCAs. No NGMs were held from April to October 1996 because it was too difficult to get growers together during the growing season. The meetings resumed in November to reach the remainder of the Lodi-Woodbridge Winegrape Commission growers.

The NGM program will be used during 1997 as a format for presenting specific BIFS/IPM topics to growers and PCAs. The small groups provide a learning environment in which to present topics such as monitoring for specific pests, use of on-line computer models, and detailed presentations of the ecology of pests.

Breakfast Meetings, Workshops, Field Days, Seminars and Tours

Breakfast meetings provide another format for presenting information on specific BIFS/IPM topics to Lodi-Woodbridge Winegrape Commission members. Usually an expert in the topic area is invited to give a talk and ample time is allowed for a question and answer period. Six breakfast meetings were held during the first year of the BIFS program. The following topics were addressed: cover crop establishment (10/11/95), rodent control in vineyards (11/20/95), the benefits of compost (12/12/95), new materials for the powdery mildew and leafhopper management (1/31/96), use of electrostatic sprayers (3/7/96) and integrated weed control (4/23/96). See page 3 in the Wine grape BIFS annual report for details of these events.

Workshops provide a format where growers and PCAs can explore BIFS/IPM topics using a 'hands-on' approach. A field day is organized so that growers can view BIFS/IPM techniques being used 'on-site' in the vineyard. Field days conducted during 1996 included a cover crop tour (2/26/96), a pest identification workshop for Spanish-speaking farm workers (5/21/96), a workshop on grape and variegated leafhoppers (6/12/96), and a workshop on the two important spider mite species on grapes in Lodi (7/6/96). See pages 3-4 of the LWWC BIFS annual report for details of these events.

Three half-day research seminars were organized for Lodi growers and PCAs during the first year of the BIFS program. On January 10, 1996, seven speakers gave talks on a range of viticulture and integrated farming topics. On March 18, a half-day research seminar was presented on irrigation in vineyards. On June 25, six speakers presented talks on a range of topics including grape diseases, pest management, and nematode/cover crop interactions.

One feature event during the first year of the BIFS program was "Farming's New Paradigm" a Winegrape BIFS project press day, held on April 11, where journalists from the Associated Press, *American Fruit Grower*, *Practical Wines and Vines*, *Vineyard and Winery Management*, *Western Fruit Grower*, the Lodi *News Sentinel* and KQED-Radio San Francisco, toured the Lodi district to see the BIFS/IPM program. Other guests represented the Community Alliance with

Family Farmers, California Department of Pesticide Regulation, California Energy Commission, California Department of Food and Agriculture, UC Sustainable Agriculture Research and Education Program, and Natural Resources Defense Council.

Newsletters

Six Lodi-Woodbridge Winegrape Commission Research/IPM newsletters were published and sent out to all Lodi-Woodbridge growers, PCAs and winery personnel during the first year of the BIFS program. Each newsletter usually featured an article on recent research results pertaining to IPM/BIFS topics in viticulture as well as a 'grower profile' on a Lodi grower implementing BIFS strategies. Copies of newsletters sent out in June, August, and October, 1996, appear as Appendices 2, 3 and 4, respectively, in the Winegrape BIFS annual report.

Implementation of Practices

Central to implementation of the Winegrape BIFS project are the grower-cooperators who have agreed to place one or more of their vineyards in the BIFS program. Also important are the PCAs who monitor these vineyards. The Winegrape BIFS project staff work with these two groups on implementing as many BIFS strategies as possible in the demonstration vineyards. There are presently 31 grower-cooperators with 47 vineyards in the BIFS program. These 31 growers manage about 50 percent of the acreage of vineyards in the Lodi-Woodbridge Crush District #11 and have enrolled a total of 2023 acres in the BIFS program. Most of these growers have PCAs who monitor the fields for them. There are 15 PCAs involved in the BIFS program. Three of them are 'in house' employees of growers, three are 'independent' PCAs who charge a fee for the monitoring and advising service and do not sell any products, and nine are employees of companies which sell agrochemical products. Six BIFS grower-cooperators act as their own PCAs doing the monitoring themselves.

Vineyard management was divided into six main categories: vine nutrition; floor management between the vine rows; under the vine vegetation management; disease management; insect management; and mite management. The implementation program began with BIFS staff sitting down with the grower-cooperator and their PCA and sketching out a 12-month management plan for the vineyard for 1996. See page 7, Figure 2 in the 9/1/95 to 12/1/95 quarterly report (**Attachment 6**).

Table 6 contains some of the basic management practices in the 47 BIFS vineyards. All of the major winegrape varieties grown in Lodi are represented in the BIFS program. The most important varieties—Cabernet Sauvignon, Chardonnay, Zinfandel, and Merlot—make up the bulk of the BIFS vineyards. All but four of the vineyards grew cover crops during the first year of the BIFS program. Five of the BIFS growers opted for mechanical weed management and in nine other vineyards no pre-emergent herbicides were used, the weeds being managed with contact herbicides only. Glyphosate (Roundup) and paraquat are the primary contact herbicide used in these situations. Under-the-vine weed management in the remaining 33 BIFS vineyards was accomplished with a combination of pre-emergent and contact herbicide applications. Documentation of these first-year practices is important to future years' evaluation of the changes in practices that take place during the course of the pilot demonstration projects.

Table 6. Categorization of Some Important Characteristics of the BIFS Vineyards (# vineyards in each category)

Irrigation System

Furrow	Drip	Sprinkler
17	27	3

Varieties Planted

Cabernet Sauvignon	Chardonnay	Zinfandel	Merlot	Sauvignon Blanc
14	9	14	10	2

Muscat	Chenin Blanc	Tokay	French Colombard
1	2	1	1

Cover Crops

Permanent Cover Crops

Natural Vegetation	Grasses	Legumes
11	12	2

Winter Annual Cover Crops

Forage Mix	Legume	Misc.
4	11	3

Under-the-Vine Weed Management

Contact Herbicide Only	Pre-emergent & Contact Herbicide	Mechanical Weeding
9	33	5

Soil Amendments/Fertilization

Synthetic Fertilizers	Synthetic and Organic Fertilizers	Organic Fertilizers Only
34	13	2

From C. P. Ohmart, 1996. Winegrape BIFS project Annual Report, Table 2

Piggy-Back Research

Research designed to improve understanding and success of BIFS management ("piggy-back research") is important to the continued success of the demonstration projects. Three piggy-back projects were begun in the first year of the Winegrape BIFS.

Alternatives to Methyl Bromide Use

In October, the Winegrape BIFS project began a three-year collaborative project with the Bio-Integral Resource Center (BIRC) and the California Department of Pesticide Regulation (DPR) to examine and test soil treatments that offer alternatives to methyl bromide use. BIRC is a Berkeley-based non-profit institution that conducts research and education in least-toxic methods for pest control. US-EPA is providing $150,000 over a three-year period for the project. A list of viable alternatives will be assembled and growers in Lodi will be surveyed as to their use of soil treatments prior to the establishment of a new vineyard. Growers interested in testing methyl bromide alternatives will be identified and decisions will be made, in consultation with BIRC and Winegrape BIFS project, on what specific alternatives will be tried. Trials will be established and monitored for results over a three-year period.

PestCast Grant Application

LWWC recently submitted a grant proposal to the University of California Statewide IPM Project as a part of the PestCast request for proposals. PestCast is a program of UC IPM, DPR, and US-EPA designed to expand the use of computer-based crop disease forecasting in California. The grant would provide for the purchase of three automated weather stations which would be incorporated into WEATHERNET, an automated pest phenology and weather information network in San Joaquin County, which is operated by University of California Cooperative Extension. WEATHERNET provides an on-line service to Lodi-Woodbridge growers where they can receive up-to-date meteorological, biometeorological, and crop water use data, as well as access to over 50 different pest and crop growth models. The grant would also provide funds to carry out a series of workshops to inform growers about WEATHERNET and help them learn how to access and use the system.

Cooperation With USDA Natural Resources Conservation Service

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) has taken a keen interest in the Winegrape BIFS project. Several areas will be addressed by NRCS over the next two years of the Winegrape BIFS project. Firstly, NRCS soil quality laboratory is in the process of developing a soil testing kit that can be used in the field to 'monitor' soils for effects on soil quality by various management practices. NRCS staff will fine-tune the kit for use in vineyards and then will begin comparing the quality of soils under different management practices such as cover cropped vineyards vs. no cover cropping, vineyards receiving compost vs. those receiving nitrate fertilizers, vineyard soils with no herbicide usage vs. vineyards receiving pre-emergent herbicides and those receiving contact herbicides alone. Secondly, an NRCS staff person who recently completed a workshop on measuring soil microbe populations in soils will use these techniques to measure microbe populations in soils under the above management strategies. The overall goal of this piggy-back project is to demonstrate to Lodi-Woodbridge growers that the various soil building BIFS strategies are beneficial to important soil characteristics.

WEST SIDE BIFS PROJECT

This section summarizes the West Side BIFS project using excerpts from the West Side BIFS annual report. See **Attachment 7** for a complete version of the annual report.

The West Side of the San Joaquin Valley is one of the most productive agricultural regions in the world, extending more than 200 miles from Los Banos in the north to Bakersfield in the south. This region has undergone considerable change in cropping rotations during the last 30 years, with an ever-increasing trend toward land planted to row crops of higher value like cotton and vegetables. A number of farmers in the region feel that this intensification of cropping has led to a decline in soil quality and increased pest management problems.

In 1995, 13 West Side farmers, in cooperation with research and extension advisors from University of California and other private and public agency consultants, initiated the *West Side On-Farm Demonstration Project* (West Side BIFS) to address these concerns and to begin to evaluate biologically integrated soil building and pest management practices within a participatory and on-farm demonstration context. The objectives of the project are to:

1. facilitate information exchange among West Side farmers, consultants and researchers on soil building practices and options for reduced reliance on agrichemical inputs;
2. monitor and evaluate on-farm demonstration of soil building practices, including cover cropping and organic soil amendment inputs;
3. determine the extent to which IPM practices are utilized in row crops on the West Side and identify constraints preventing further adoption of biologically intensive pest management practices;
4. provide community-based demonstrations of existing technologies to overcome constraints while making use of participatory research teams to develop and refine additional information;
5. provide technical assistance to farmers/PCA participants; and
6. provide intensive pest management monitoring of fields enrolled in the project.

Implementation of Practices

The twelve farms participating in the West Side BIFS farm a total of approximately 90,000 acres. Each farm has dedicated one or more field sites of 80 acres or more for the BIFS on-farm demonstrations—a total of 1,653 acres in 16 field sites. Most of these farms are within a 20-mile radius of the University of California West Side Research and Extension Center at Five Points, which serves as the center for the project's various activities. Project participation by farm varies in number and includes owners, managers, technical staff and consultants, and represents a broad and dynamic group with varying levels of skills and experience in biologically integrated farming system practices. This mix of participants reflects both the diversity and specialization of West Side row crop farms. Information outreach approaches take this factor in consideration.

The project has a support team and several technical advisors and consultants who provide direct farmer assistance or guide the research and extension aspects of the project. The interdisciplinary management/extension team initiates the outreach program and serves as a resource for participating farms and other interested individuals. There are 20 support staff representing

various public and private institutions and disciplines. The project is currently housed at the University of California West Side Research and Extension Center at Five Points. See Figures 2 and 3 in the West Side BIFS annual report for grower participants and members of the support team (**Attachment 7**).

The project is principally based on the *Biologically Integrated Orchard Systems (BIOS)* projects model developed for almond- and walnut- producing areas of Central California. Unlike the *BIOS* projects however, the cropping systems of the West Side region are generally dynamic rotations or sequences of annual crops including cotton, processing tomatoes, garlic, onions, melons and lettuce. In addition, the farming community of the West Side area is different in several ways from the communities where *BIOS* began. For example, farmer participants represent a diverse group with a broad range of technical and managerial skills and experience with biologically integrated farming principles and practices. Furthermore, the West Side agricultural community culture, farm organizational structure as well as decision channels within a farm unit have required a modified approach to information source and exchange channels. The extension model modified here for the West Side conditions, however, embraces the *BIOS* spirit of participatory research and extension with on-farm demonstrations being the center of efforts aimed at extending biologically integrated farm practices and information exchange.

The West Side BIFS management team meets each month to update project developments, address current issues and prepare plans for succeeding months. The management team is composed of seven technical/extension staff from UC and two farmer participants. Both farmers provide candid input that significantly impacts the direction, agenda and activities of the group at large.

Highlights of the West Side BIFS project first year accomplishments include:

Table 7. Highlights of the West Side BIFS project first year accomplishments

Initiated 16 on-farm comparisons of biologically integrated and conventional soil management practices at 12 farms extending from Huron to Mendota in Fresno County
Intensively monitored key soil physical, chemical and biological attributes of soil quality twice at each site
Standardized protocols and procedures for monitoring comparison plots
Initiated pest management monitoring activities including arthropod counts and plant mapping data in cotton farms of some BIFS participants
Developed IPM survey instrument
Initiated contact with PCAs for each participating farm
In process of collating pesticide use data used in the past two years in BIFS on-farm demonstration blocks
Table 7, continued.
Re-established West Side Research and Extension Laboratory as a location for routine analysis of soil and tissue samples
Increased group participants' knowledge of biologically integrated farm practices through meetings among farmers, scientists, extension agents and private and public consultants; farms visits, phone calls, field days and relevant

literature distribution

Expanded sphere of influence of the project through distribution of the West Side BIFS Newsletter (a project newsletter with 82 listed recipients), numerous press releases, two presentations to Central Valley Resource Conservation Districts, two presentations at annual meetings of national professional societies, overview presentations of project to West Side Station visitors and at commodity field days

Initiated ten adjunct projects in 1996 and planned or proposed additional projects for 1997 related to goals of the West Side BIFS group

Preparing a major day-long exchange workshop between BIFS and Sustainable Agriculture Farming Systems (SAFS) project participants planned for February 1997

Conducted visioning discussions among participants with focus on critical issues of concern to West Side region including profitability, information needs, plans for 1997 and ideas for new adjunct projects

Established a clear group identity and effective mechanism for information exchange among participants, related projects, public and private institutions and other interested farmers

Conducted on-farm trials of variable rate herbicide applications

Grower Outreach

Because of the diversity in cropping patterns, management styles among farms, the size of individual farms and the vast distances separating farms in this region, three types of meetings occurred: (1*) management team meetings* - held every month with the minutes and/or developments sent to each participant, (2) *general meetings* - scheduled at least four or more times a year for group discussion of major project topics, general action plans and project results and observations, and (3) *individual farm meetings* with participating growers - at least once within each crop season for continuity in information exchange. Other outreach activities such as field days and introduction of the project to other audiences are also part of the program.

General Group Meetings/Seminars

The following general group meetings/seminars were held during the 1995-96 season:

(1) September 18, 1995. Presented project status to the group, reviewed proposed on-farm demonstration rotations, evaluated current project objectives, structures and implementation plans for fall/winter of 1995 activities (sampling, baseline soil quality survey, information gathering on 1995 season).

(2) October - November 1995. Individual farm meetings with participating farmers to cover site selection/farm maps/baseline soil sampling.

(3) December 15, 1995. Discussions of fertility issues when using organic amendments with presentations by UC SAREP director, two UC Extension Specialists, and one farmer.

(4) January 18, 1996. Discussion of additional management options of interest within the West Side on-farm demo project, and developed more specific information sharing and compiling mechanisms.

(5) February 2, 1996. Discussed evaluating the effectiveness and utility of various "farmscaping" approaches to insect pest management including trap cropping, insectary cover crops and perennial buffer cropping areas, evaluation of various cover crop species that

might serve these roles, and consideration of how best to coordinate discussions and share information on 1996 management options.

(6) March 11, 1996. Introduction of information sources. Two staff from UC SAREP presented information sources of particular interest to project participants.

(7) June 18, 1996. Meeting focus was on cover cropping methods and strategies for BIFS growers addressing the varied planting time frames specific to each farm. A general discussion on the current pest management concerns/options for the West Side was included. A field visit of selected sites followed for interested participants.

(8) August 13, 1996. This meeting was held to establish specific objectives for on-farm demonstration comparison plots for 1996-97; draw individual farm plans; and update participants on data compilation and information sharing efforts.

Field Day/Visit

March 18, 1996. An informal field day or visit was held to showcase a cover-cropped field at Farming "D" Ranch. Discussions included post-cotton cover crop growth at three participating farms, presentation of data on cover crop water use, and early season insect pest sweeps. Also featured were other cover crops growing at the West Side Research and Extension Center. John Diener led a field discussion of various biological soil building practices he uses on his farm.

Piggy-Back Research

A wide range of adjunct projects are either underway or being proposed for the West Side BIFS projects. These include: Effects of Organic Compost on Cotton Nitrogen and Soil Physical Properties, Sustainable Methods to Control Soilborne Diseases of Tomatoes, Integrated Management of Soilborne Diseases and Aphid Transmitted Viruses in California Vegetable Crops--An On-Farm Demonstration, Using Buffer Crops to Protect Cotton from Lygus, Survey of Arthropod Fauna in San Joaquin Valley Cotton, Planting Date Evaluations of Prospective Late Summer Cover Crops for the San Joaquin Valley Row Crop Systems, Nitrogen Mineralization from Organic Amendments, Use of Cover Crop Mulches in Tomato Production Systems, and Applying Variable Rates of Treflan at Layby in Tomatoes. See pages 36-46 in the West Side annual report for details of these adjunct projects (**Attachment 7**).

ANALYSIS OF MONITORING ACTIVITIES

Section 594 of AB3383 requires that: "...policies and procedures shall include, but shall not be limited to, a mechanism for monitoring and summarizing pesticide and fertilizer use for each project with an assessment of overall reductions in pesticide and fertilizer use on each project." The following section of the RFP specifically addresses Section 594 (a):

Table 8. Section of UC SAREP request for proposals that sets the policies and procedures for monitoring programs in pilot demonstration projects

Section III. C. A proposed monitoring program to gather the following information at each participating farm:
(1) Baseline data documenting the previous year's crop yields and quality, fertilizer and pesticide use, and prior usage of elements of BIFS.
(2) In-season data collection to monitor key biological indicators (e.g., pests, biological control agents, and decomposers) and fertilizer and pesticide use.
(3) Weather data that are relevant to pest problems.
(4) End-of-season crop yield and quality, and pesticide and fertilizer use, and comparison to pre-BIFS data and to county averages.

Except where noted, the descriptions of the monitoring programs described below have been excerpted from the Winegrape BIFS and West Side BIFS annual reports.

WINEGRAPE BIFS PROJECT

Vineyard Monitoring

Each of the 47 BIFS vineyards were monitored by BIFS staff on a weekly basis. A data sheet was left with the grower as soon as the vineyard was checked and a copy of the data sheet was faxed to the PCA at the end of the day. The variables monitored were ones that the grower and PCA would use in making pest management decisions, such as pest numbers, life stages present, and numbers of natural enemies, if present. The most important pests problems monitored for in Lodi vineyards are grape leafhopper (*Erythroneura elegantula*), variegated leafhopper (*Erythroneura variabilis*), Willamette mite (*Eotetranychus willamettei*), Pacific mite (*Tetranychus pacificus*), omnivorous leafroller (*Platynota stultana*), powdery mildew (*Uncinula necator*) and bunch rot (*Botrytis cineria* and other fungi). The primary purpose of the monitoring program was to provide the Lodi-Woodbridge growers and PCAs an example of how a monitoring program might be carried out, its data interpreted and the results used in management decision-making. For details of the monitoring form and protocols see pages 4-7 in the 12/1/95 to 3/1/96 quarterly report (**Attachment 6**). Important highlights of the Winegrape BIFS monitoring program are discussed below.

Leafhoppers

Weekly monitoring of leafhopper populations allows for growers and PCAs to be presented with up-to-date numerical or graphical summaries of numbers for each vineyard. See Figure 4 in the Winegrape BIFS annual report (**Attachment 6**). PCAs and growers in Lodi generally agreed

that, on a regional basis, grape leafhopper numbers were not as high as in many years. Many scientists feel that Lodi is at the limits of distribution for variegated leafhopper and this past summer's monitoring reflected this fact; few vineyards had significant numbers of this pest. Eighteen BIFS vineyards had grape leafhopper populations that exceeded the economic threshold and they were treated with Provado insecticide.

Spider Mites

There were few BIFS vineyards with mite populations that exceeded the economic threshold. Six BIFS vineyards were sprayed for mites this season. Two BIFS growers whose vineyards were developing mite problems chose to purchase and release *Metaseiulus occidentalis*, a predacious mite, in their vineyards. In both cases the pest mites continued to build up and miticide treatments were still necessary.

Powdery Mildew and Bunch Rot

Powdery mildew can be a devastating disease in winegrapes and once an infection occurs it is very difficult to manage. Therefore prophylactic spraying is used to manage this disease. Because of the importance of this pathogen most growers have a very rigorous treatment program and as a result no mildew problems occurred in any of the BIFS vineyards this year.

Bunch rot is a complex of pathogens that becomes important in winegrapes after the sugar in the grapes begins to rise rapidly (about mid-summer). Levels of infection depend on a complex of factors such as weather conditions, presence of damage to the grape bunches, and canopy microclimate. There were no bunch rot problems in any of the BIFS vineyards this year, probably due in large part to the seasonal weather conditions, since bunch rot was not important throughout most of the region. Nevertheless, leaf pulling is very important in reducing bunch rot problems and 51% of the BIFS vineyards used this technique during the season.

Vineyard Management Practices

At the end of the growing season each grower-cooperator was asked to submit a summary of the management practices carried out in their BIFS vineyard(s) during the season. **Table 9** contains a summary of the types of practices that were recorded for each BIFS vineyard.

Table 9. General Vineyard Practices Recorded for Each BIFS Vineyard*

Compost Addition-dates and rates per acre
Weed management; if herbicide then dates, materials and rates per acre
Disking-dates
Mowing-dates
Fertilization-dates, rates and types of fertilizers applied
Leaf pulling-dates
Fungicide spraying-dates, materials and rates per acre
Insecticide and miticide spraying-dates, materials and rates per acre
Irrigation-dates
Cover crop planting-dates, type of seed used and rates of seed per acre

* From C. P. Ohmart, 1996. Table 3 in Winegrape BIFS Annual Report

WEST SIDE BIFS PROJECT

Side-by-side comparisons of conventionally managed and biologically-based production systems were established at 16 sites in the fall of 1995 on 12 participating farms. The sites consist of two adjacent 20 to 40 acre blocks at each farm. One block is conventionally managed with the other block receiving a biologically based treatment. Discussions of how best to "standardize" inputs and the meanings of "conventional" and "biologically based" were conducted by the entire group of farmers and scientists during the fall of 1995.

The biologically based treatment in alternative plots varied from farm to farm depending on material source, planned use of the area, and period of availability. Compost or manure was applied in late 1995 in "alternative" plots at 12 sites. Cover crops were planted at three additional sites over the 1995 - 96 winter. Relative benefits of compost vs. manure additions are being evaluated at an additional site. Except for two farm sites, all sites were planted to processing tomatoes. The two other sites were planted to corn and cotton, respectively. See page 16, Table 4 in West Side BIFS annual report for details (**Attachment 7**).

Compost/Manure Sampling

Representative compost samples were supplied by the BIFS participants and submitted to the DANR Analytical Service Laboratory for total content of C, K, N, Na, P, Ca, Mg and organic carbon. Based on the total compost N, and the soil P and K values, the attached guideline was prepared by the technical team and given to each grower for possible adjustments in their fertility programs.

Soil Quality Monitoring

To make useful evaluations, a number of key physical, chemical and biological soil attributes are being monitored at each demonstration site. A number of soil properties and sampling times have been selected for monitoring changes in soil quality. See pages 17-21 in the West Side BIFS annual report for details on soil quality sampling and analysis (**Attachment 7**).

Soil physical properties

About 50 percent of the fields differed with respect to soil textural class between the alternative and conventional plots. However, the plots were actually neighboring classes in the textural triangle, due to only slight differences in their clay content. The overall field textural class varied among sites with clay loam being the modal soil textural class. These data are presented on page 22, Table 6 in West Side BIFS annual report (**Attachment 7**). No significant difference ($p>0.05$) was determined between the initial water stable aggregates (WSA) values between the plots. This result suggests that the alternative and conventional treatments were allocated to homogeneous fields. The overall percentage of WSA under the slow wetting process was 80 percent, implying that the overall increase in WSA by the soil building practices would be at most 20 percent.

Soil chemical properties

No significant difference ($p>0.05$) between the initial values was consistently determined for initial soil pH, electrical conductivity (EC), cation exchange capacity (CEC), soil organic matter

(SOM) and total N values in each agricultural system. This result suggests that the alternative and conventional systems were allocated to homogeneous fields.

Productivity and Product Quality Measures

Yield data and fruit quality determinations from these sites were taken at harvest. Yield data were obtained by measuring the area harvested for one load (double trailer) and obtaining the weight of tomato for the particular load from records compiled by each farm office. Three loads (double trailer each) for each treatment were taken. In addition, random sampling of fruit was done on-board the harvesting machine for maturity and grade-quality evaluations.

Due to the different tomato varieties used by the participating farms, statistical yield analysis for yield was made only for within-farm comparisons. Results of analysis showed no significant differences in yield between the conventional and alternative treatments in all participating farms ($p>0.05$). These data are presented on pages 28-29, Table 11 and Figure 11 in the West Side BIFS annual report (**Attachment 7**).

Plant Stand Counts Following Cover Crops

Three participants grew cover crops following the 1995 cotton season. In addition to monitoring biomass production and major nutrient contents of the cover crop, succeeding plant stands were evaluated for each field for possible seedling pests or effects on plant establishment following cover crops.

IPM Activities

Cotton insect management continues to require insecticide inputs to achieve desirable levels of yield. During the past five years, the portion of the farm budget required for insecticides and acaricides has increased over the San Joaquin Valley. This trend raises problems for cotton profitability and long-term utility of these tools.

During the 1996 cotton season, four sites within the *BIFS* area were utilized as part of a Valleywide arthropod survey. Three of the sites were on *BIFS* cotton sites and the other was just west of the project community area. Weekly counts and plant development data were collected and summarized. Information from these fields were faxed weekly to BIFS participants for their information and guidance. In return, cooperators provided activity records for each field. In addition to pests, natural enemy populations were monitored. Analysis of data is incomplete but the populations of pests and natural enemies fell within a range of observations from other fields in the Valley. Fruit retention in these fields ranged from average to excellent. Data from the three cotton sites are presented on pages 32-34, Tables 15-17 in the West Side BIFS annual report (**Attachment 7**).

PESTICIDE AND FERTILIZER USE

This section provides a summary and assessment of pesticide and fertilizer use data for the Winegrape and West Side BIFS projects. As stated in **Table 8** above, the projects were

instructed to collect end-of-season pesticide and fertilizer use data and compare to pre-BIFS data and to county averages. After only one year of each project, these data are incomplete, but plans are underway to collect and analyze the required data in the coming year.

WINEGRAPE BIFS PROJECT

A consultant[2] is collaborating with the Winegrape BIFS project coordinator and UC SAREP staff in obtaining and analyzing 1991-1994 pesticide use data from the Department of Pesticide Regulations for winegrapes in Sacramento, San Joaquin, and Stanislaus counties. These data will be used to determine county pesticide use averages for winegrapes and then compare the averages to vineyards enrolled in the Winegrape BIFS project. These comparison data will be available during the first quarter of 1997. The consultant also contacted the San Joaquin County Agricultural Commissioner's office to obtain pesticide use data for 1996 in order to make comparison to 1996 pesticide use in BIFS vineyards. The consultant was informed that these data would not be available until January 1997 at the earliest. The Winegrape BIFS project coordinator did obtain 1996 pesticide use data for the 47 BIFS vineyards (**Figure 1)**.

WEST SIDE BIFS PROJECT

The California Department of Pesticide Regulation and the San Joaquin County agricultural commissioner's office has informed the project that data for comparison purposes will not be available from the counties until at least March 1997; useable summary data will be supplied to UC SAREP by the West Side BIFS project no later than June 30, 1997.

[2] Bill Settle is a Senior Scientist with Collaborative Research and Designs for Agriculture, a California not-for-profit corporation. Settle is working on a grant from US EPA Region IX to assist with monitoring and evaluation in the BIFS program.

Figure 1. 1996 Pesticide use for 47 vineyards (2023 acres) enrolled in Winegrape BIFS project. (Prepared by Bill Settle).

RESULTS OF FIRST YEAR REVIEW

AB3383 states that the biennial report from the University should include, in addition to the analysis of the monitoring activities and summary of pesticide and fertilizer use described above, an analysis of the success of each project in meeting the standards for integrated farming systems. (Section 597) The UC SAREP BIFS request for proposals defines integrated farming systems as systems where farmers integrate the following elements into their production systems:

(1) Biological and cultural control of pests;
(2) On-farm habitats for beneficial insects, mites, and spiders;
(3) A strong emphasis on soil-building practices, often including biological nitrogen fixation to supply all or part of the nitrogen needed by crop plants;
(4) Reduced reliance on agricultural chemicals.

This section presents an analysis of the success of each BIFS project in meeting the above-stated standards and the conclusions of the first annual review by the director and program advisory review board.

WINEGRAPE BIFS PROJECT

Growers with vineyards enrolled in the Winegrape BIFS project implemented a range of integrated farming systems practices during the 1996 season. These include the following practices: 91 percent of vineyards had cover crops; leaves were pulled in 51 percent of vineyards (leaf pulling lowers leafhopper numbers, improves spray coverage, reduces incidence of bunch rot by increasing air circulation around bunches); compost was applied to 30 percent of vineyards; no insecticides or miticides were used in 46 percent of the vineyards; predacious mites were released in two of the six vineyards where mite were at problem levels; 29 percent of the vineyards did not use pre-emergent herbicides for under-the-vine weed management (it was handled by mechanical means in 10 percent of the vineyards while 19 percent used contact herbicides only); 100 percent of the vineyards were monitored weekly during the growing season; and 57 percent of the vineyards have converted to drip irrigation (see **Table 10**).

Table 10. Integrated farming practices implemented in Winegrape BIFS vineyards in 1996

Practice/Procedure	Percent of Vineyards (N=47)
Cover cropping	91%
Leaf pulling	51%
No insecticides or miticides applied	46%
No pre-emergent herbicides applied	29%
Weekly monitoring	100%
Compost applied	30%

Growers enrolled in the Winegrape BIFS project have been able to integrate a wide range of practices and/or procedures important in integrated farming systems. However, without pre-BIFS data it is difficult to assess the impact of the Winegrape BIFS project on the adoption of integrated farming practices. These data are in the process of being collected and the project supervisor will report the finding to UC SAREP and the program advisory review board by June 30, 1997. In addition, the Winegrape BIFS project coordinator is working on a mail-out survey instrument that will be sent to the entire 650 Lodi-Woodbridge Winegrape Commission growers in January 1997. This survey will address grower attitudes, perceptions, and behaviors of integrated farming systems. The combination of pre-BIFS data and the survey results will provide a comprehensive information pool to assess the success of the Winegrape BIFS project.

The following list summarizes conclusions from the November 19, 1996 annual review meeting and subsequent analysis by UC SAREP of the Winegrape BIFS project:

- The in-season pest monitoring program is a strong point in this project. All fields enrolled in project were monitored weekly during the season for key biological indicators important for pest management. Monitoring for soil biological indicators can be improved.

- The development of a data management system (the relational database) and the scope of information monitoring entered into this database is an outstanding accomplishment. This system should be adapted to other BIFS and BIFS-style projects.

- Baseline data on the previous year's crop yields, fertilizer and pesticide use were not reported. The project supervisor has been directed to collect and analyze these data and to submit them to UC SAREP by June 30, 1997.

- Harvest data on crop yield and quality were difficult to collect prior to the annual report due date. The project supervisor will collect, analyze and report these data by June 30, 1997.

WEST SIDE BIFS PROJECT

The principal success in implementing integrated farming practices in the West Side BIFS project is in the area of soil-building. All 16 plots enrolled in the West Side BIFS project applied either compost (12 plots) or grew a cover crop (4). For many of the plots, this was the first time that organic material was added other than from crop residue. One of the adjunct projects, an on-farm demonstration of low-rate Treflan applications, also showed significant promise in reducing the rate of this herbicide by 30 to 60 percent. Treflan is currently applied to 95 percent of tomato acreage; large-scale adoption of this practice could lead to significant reductions in Treflan use. A number of the adjunct projects will involve demonstrating various biologically based practices in the 1997 season. In the 1997 season, soil building will remain the main strength of the West Side BIFS project. However, additional attention needs to be go into providing growers with pest management monitoring and technical support in biological and

cultural controls of key pests. The project leader has been directed to provide a plan for this monitoring and technical support by March 31, 1997.

The following list summarizes conclusions from the November 19, 1996 annual review meeting and subsequent analysis by UC SAREP of the West Side BIFS project:

- The soil quality monitoring program was excellent. This program involved collecting baseline and end-of-season data on key soil physical and chemical properties.

- The pest management monitoring program did a very poor job of monitoring pests and natural enemies. Only four of the 16 sites were intensively monitored. This component of the project must be improved in subsequent years. Renewed funding of this project is contingent on development and submission of a monitoring program by March 31, 1997.

- Baseline and end-of-season data on the previous year's fertilizer and pesticide use were not presented at the annual review meeting or in the annual report. The project supervisor has been directed to collect and analyze these data and to submit them to UC SAREP by June 30, 1997.

- Good data were collected on tomato yield and quality for the 1996 season.