

# Understanding weed management strategies between BIFS and conventional growers



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# Objectives

- ✎ Assess pesticide use trends for BIFS and Conventional growers in San Joaquin County
- ✎ Investigate whether alternative weed management practices help BIFS growers reduce their use of pre-emergent herbicides





# What is the BIFS winegrapes program?

- ✍ BIFS: Biologically Integrated Farming System
- ✍ Overall goals for BIFS on winegrapes: reduce the use of harmful pesticides and promote the use of alternatives
- ✍ Winegrape BIFS: for this program, one objective is to reduce use of pre-emergent herbicides (e.g., simazine and diuron) by using alternative practices and/or reduced-risk contact herbicides
- ✍ Participants: from 1996-1998, Lodi-Woodbridge growers volunteered for the BIFS winegrape program

# Weed Management: Conventional vs. BIFS practices

## Conventional practices

- use of agrochemicals to suppress weeds – [Simazine, Karmex (diuron), paraquat, roundup (glyphosate), Goal (oxyfloufen) ]

## BIFS practices

- monitoring and need-based spraying
- Enviromist-type shielded sprayer with Roundup (requires less material per sprayed acre, but expensive)
- Mechanical weed management
- Use of cover crops



Source: Ohmart, 1998, Winegrape BIFS Final Report

# Methods

## ☞ Data Sources:

1. PUR data (1993-2001) from DPR
2. Weather data from CIMIS (DWR)
3. Pesticide economic and efficacy literature

## ☞ Study Location: San Joaquin County

- ☞ 49 BIFS fields (~ 3,000 acres)
- ☞ ~ 1100 non BIFS fields (~ 75,000 acres)

## ☞ Chemicals examined

- ☞ Pre-emergents: simazine, diuron, oryzalin, oxyflourfen, norflurazon
- ☞ Contact: glyphosate, paraquat dichloride



# Methods (continued)

## Measures:

- ✦ Lbs of active ingredients/ acre planted

## Ratios

- ✦ lbs of AI per acre planted of glyphosate over simazine

- ✦ lbs of AI per acre planted for BIFS over CONV

- ✦ Spatial analysis: to examine spatial patterns, we used the PUR – GIS, a program that links GIS functionality to the pesticide use records

- ✦ Characterization of fields (each field received a designation based on herbicide use):

- ✦ GLY: used glyphosate, but no simazine

- ✦ SMZ: used simazine, but no glyphosate

- ✦ BSG: used both simazine and glyphosate

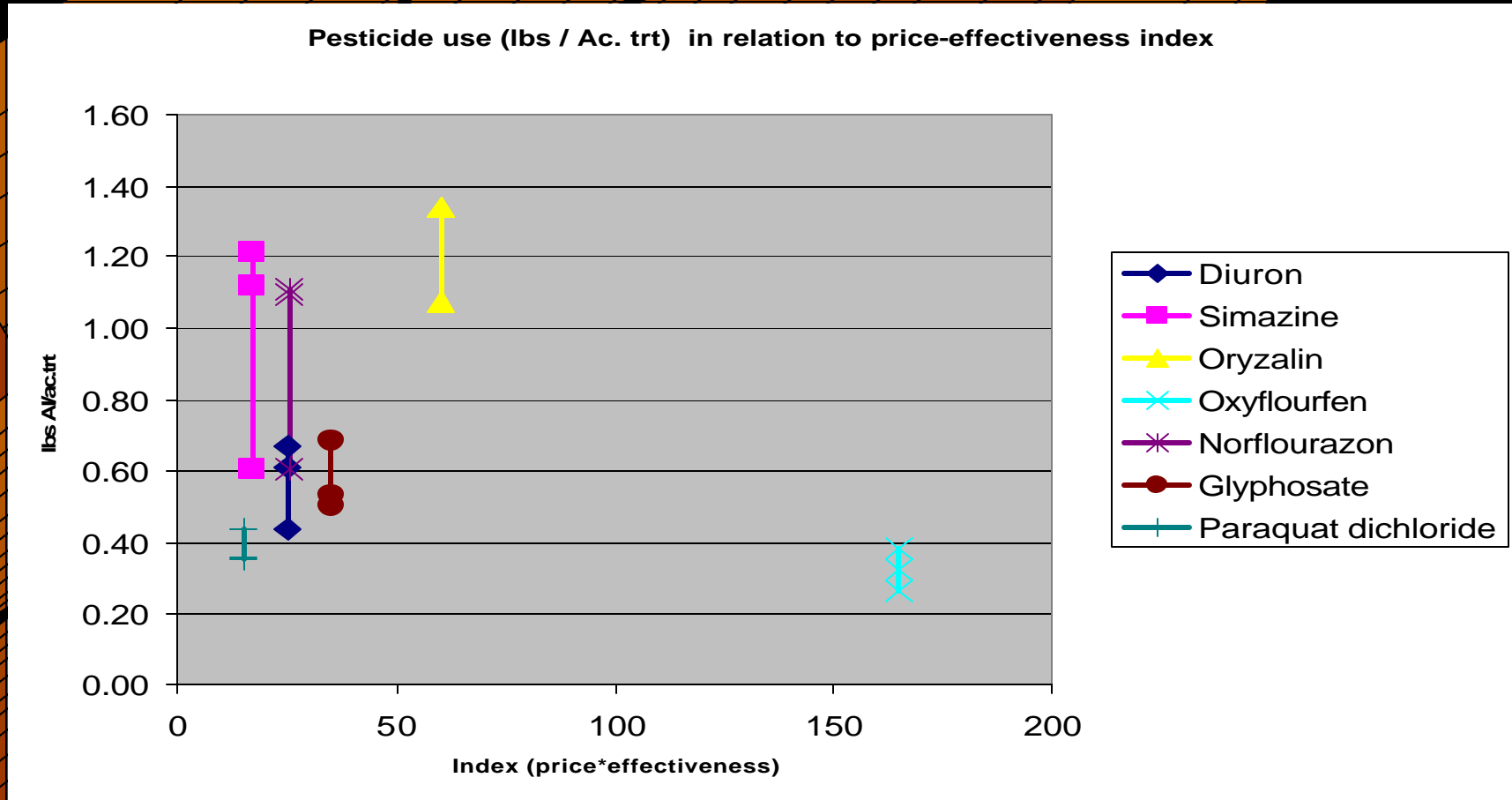
- ✦ NSG: used neither simazine or glyphosate

- ✦ NR: no reported use

# Trends of BIFS practices

BIFS Management Practice	% of vineyards using practice			BIFS Management Practice	% of vineyards using practice		
	1996	1997	1998		1996	1997	1998
Source: Ohmart, 1998, Winegrapes BIFS final report	1996	1997	1998	1996	1997	1998	
Cover Crops: Annual	38%	34%	28%	Strip sprays: Pre-emergent herbicides	70%	57%	59%
Cover Crops: Perennial	53%	46%	44%	Strip sprays: Contact herbicides	19%	35%	39%
Weekly Monitoring	100%	100%	100%	Mechanical weed control under vine	10%	8%	7%

# Pesticide use and index (price x effectiveness)

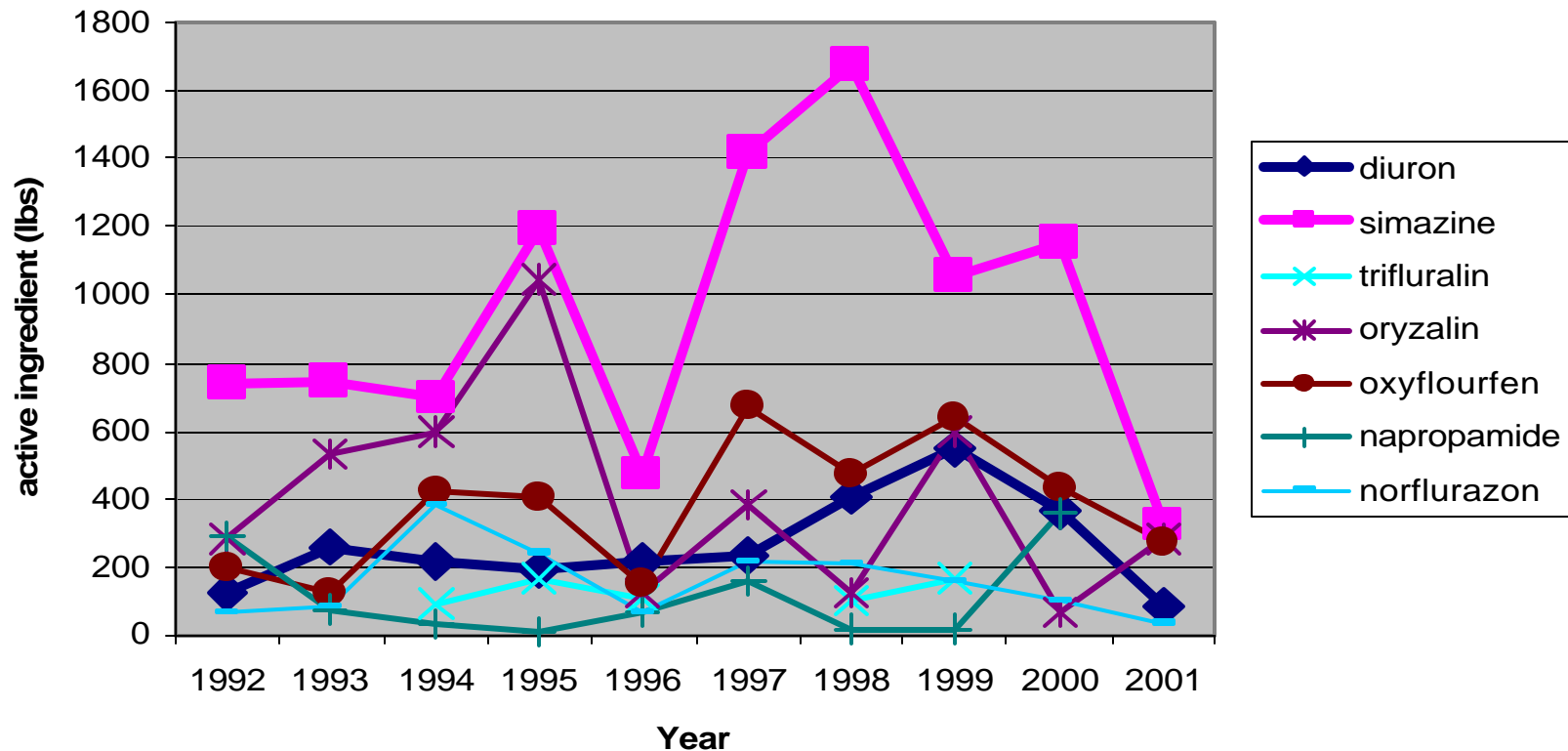


Source: effectiveness data from Pfeiffer et al, 2003; price data from Ohmart, 1998.



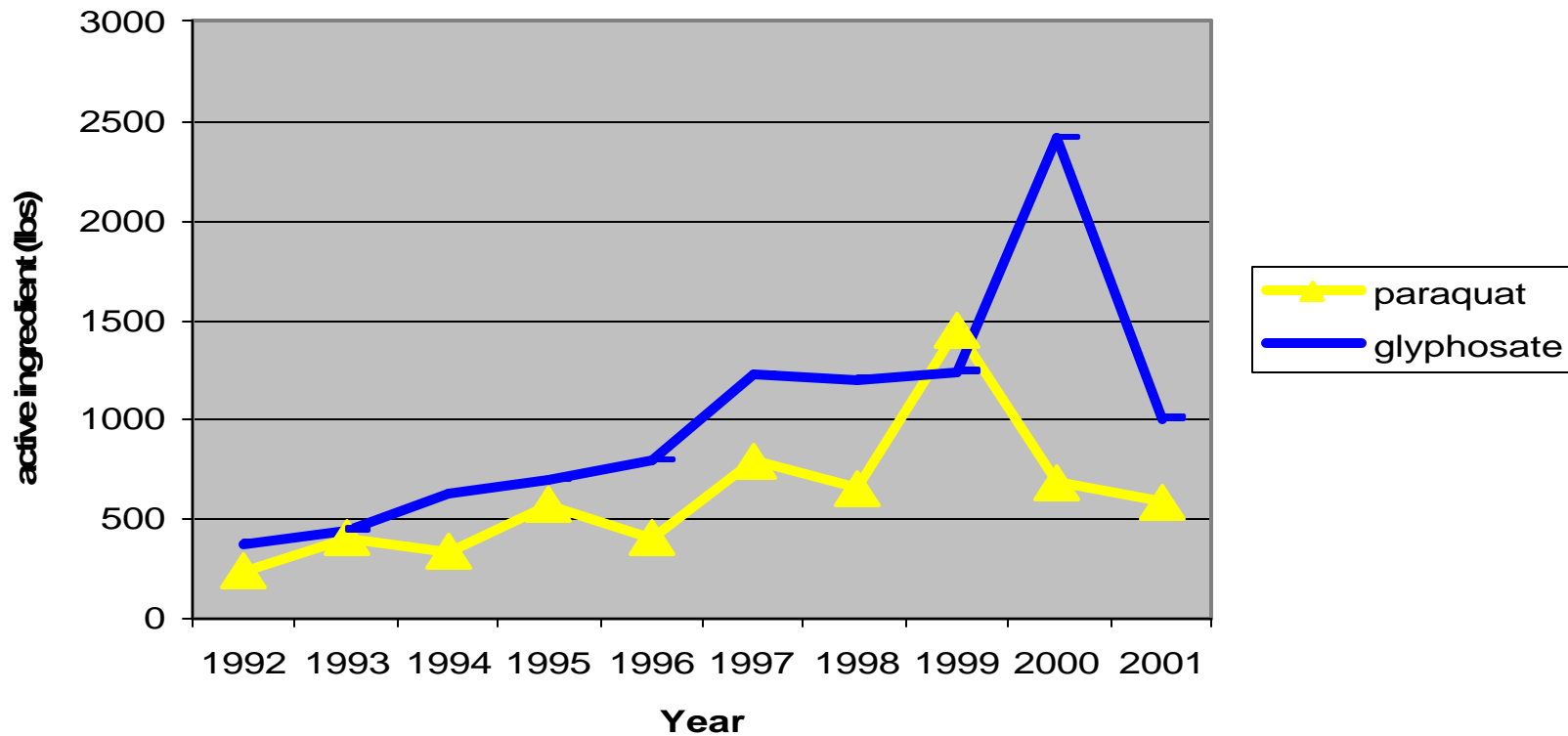
# Lbs of pre-emergent AI used on BIFS fields

**lbs of AI applied on BIFS vineyards  
PRE EMERGENT**

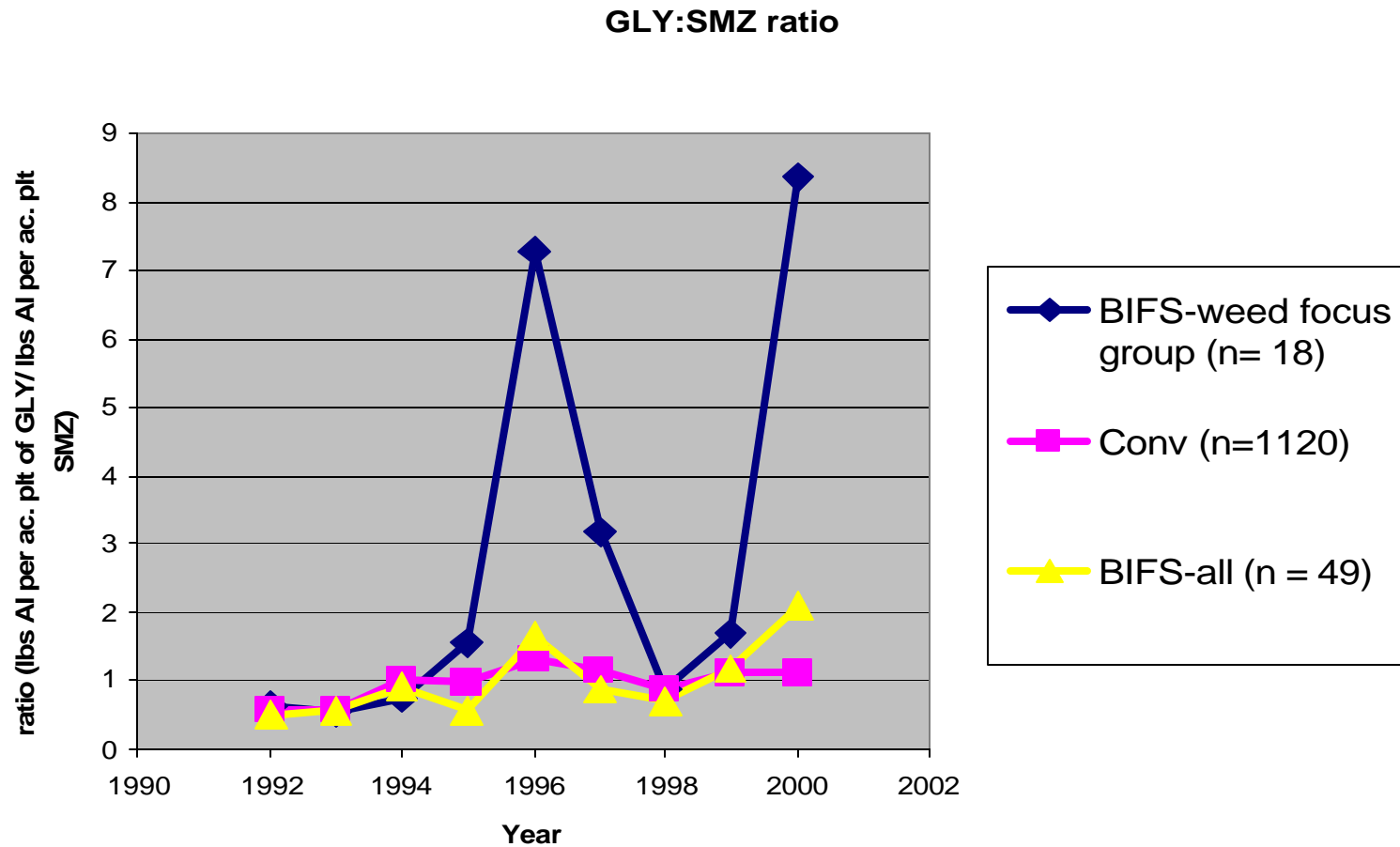


# Lbs of contact AI used on BIFS fields

**lbs of AI applied on BIFS vineyards  
CONTACT**



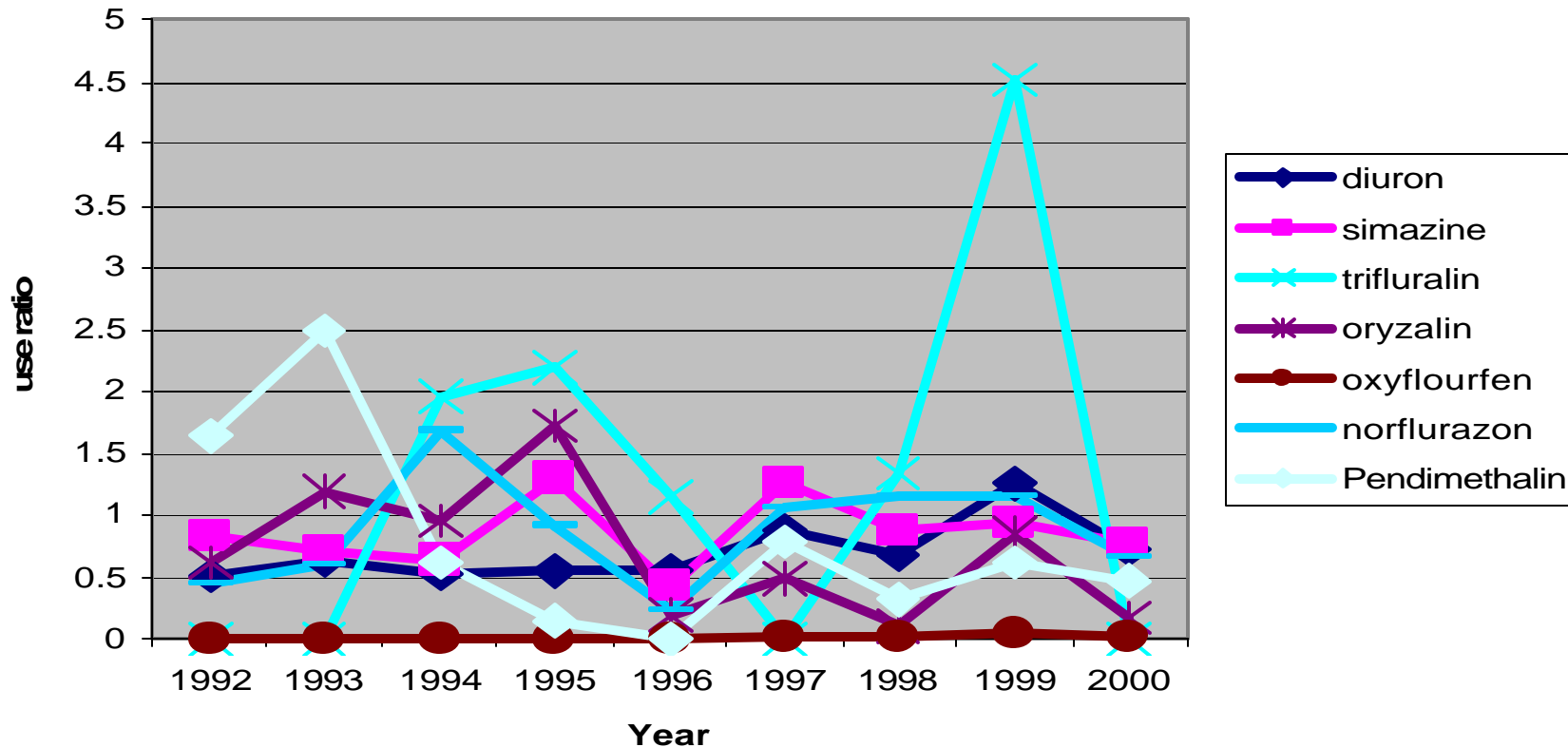
# Glyphosate to simazine ratio





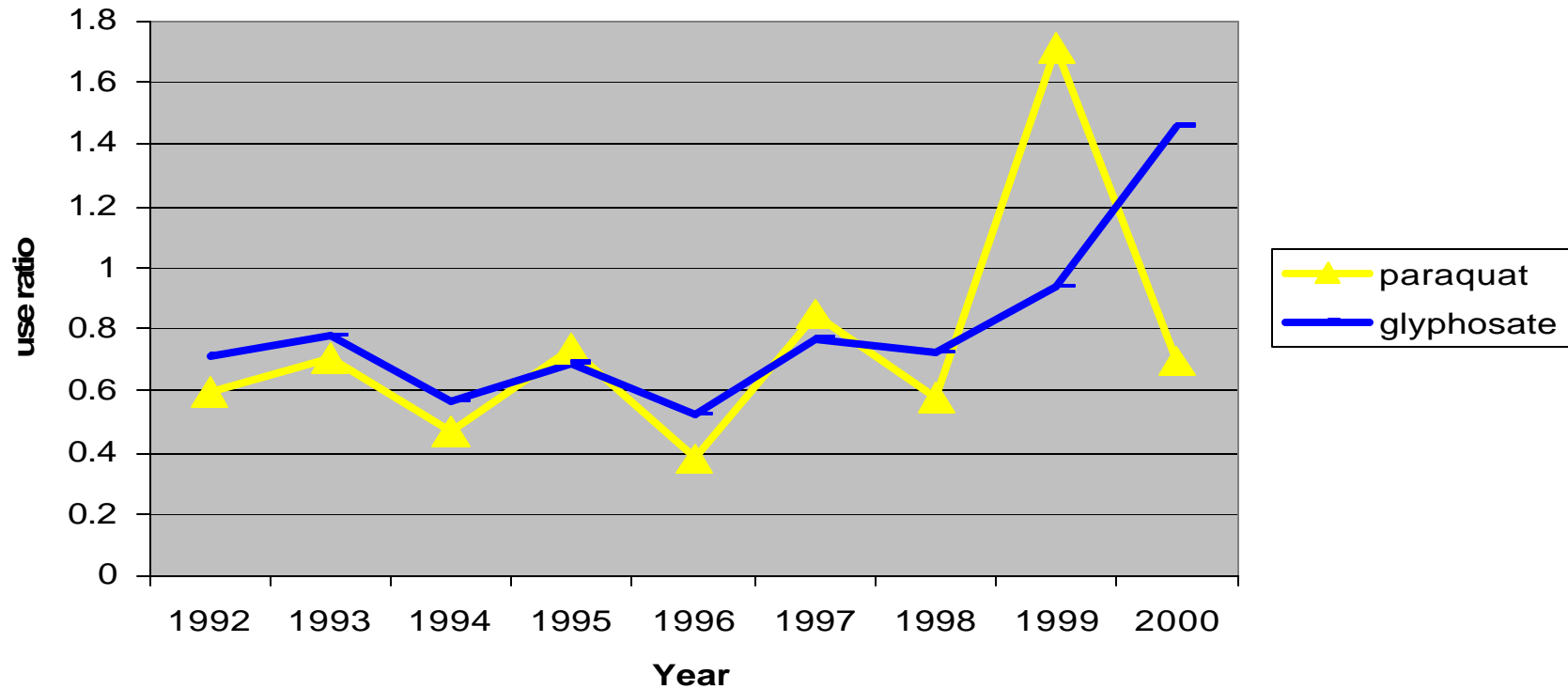
# BIFS/CONV use ratio for pre-emergent herbicides

Use Ratio (lbs of AI per ac.plt, BIFS/ CONV)  
PRE EMERGENT



# BIFS/CONV use ratio for contact herbicides

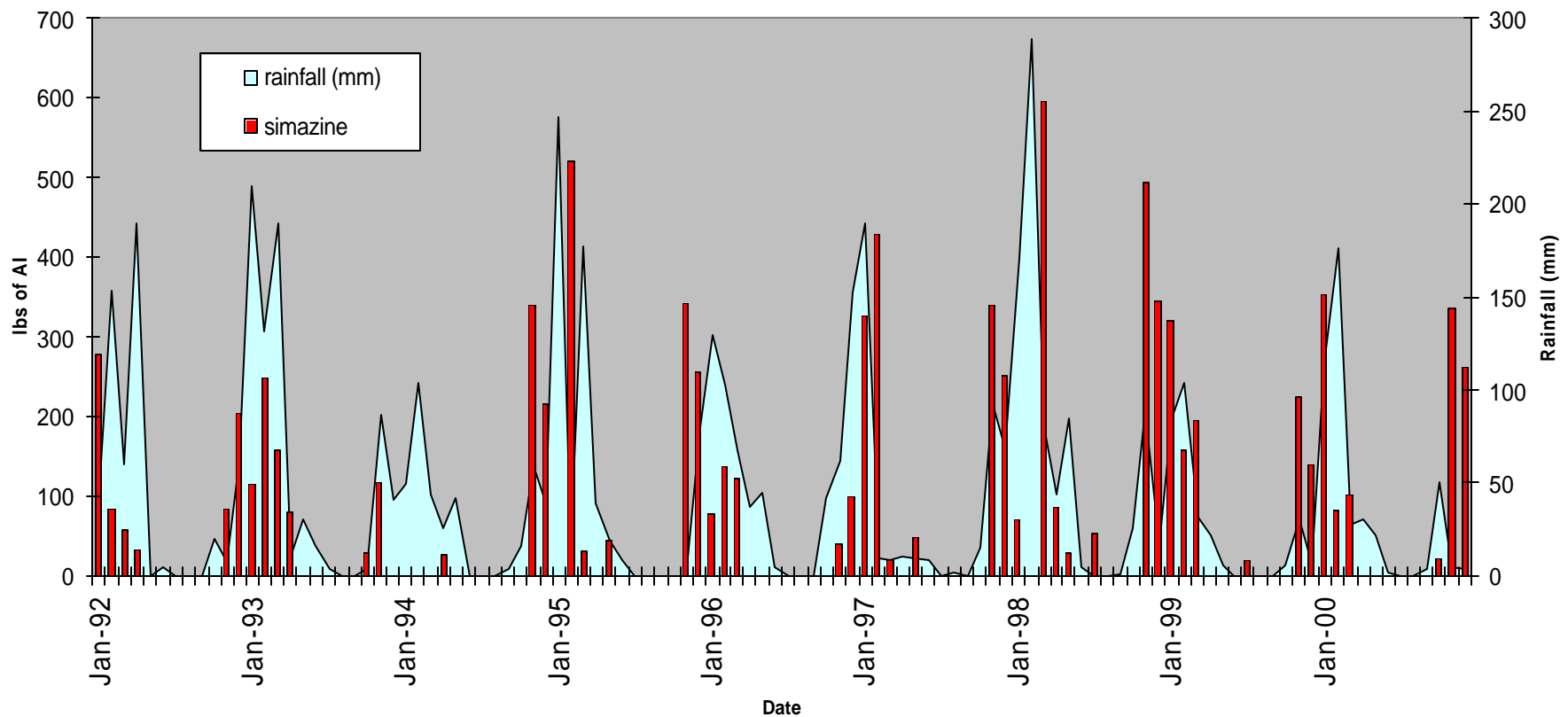
Use Ratio (lbs of AI per ac.plt, BIFS/ CONV)  
CONTACT



# Rainfall and BIFS simazine use

$r^2$ : before (93-95) .13 during (96-98) .38 after (99-2000) .05

Lodi Rainfall (Station 42) and BIFS simazine use



Data source: Rainfall from CIMIS, pesticide data from DPR



## Acreage composition of BIFS field categories

	1993	1994	1995	1996	1997	1998	1999	2000	2001
SMZ	27.9%	36.7%	36.1%	18.9%	8.1%	23.2%	28.3%	15.4%	7.4%
GLY	22.0%	14.6%	22.7%	36.5%	23.2%	21.7%	23.7%	30.0%	27.9%
BSG	13.4%	11.5%	12.2%	12.0%	33.3%	36.9%	18.9%	34.9%	12.6%
NSG	9.1%	2.3%	13.1%	1.6%	22.8%	3.0%	18.1%	0.0%	20.8%
NR	27.6%	34.9%	15.9%	31.0%	12.7%	15.2%	11.0%	19.7%	34.4%
TOTAL	3008	3105	3082	3256	3172	2989	3272	3023	3024
NSMZ	58.7%	51.8%	51.7%	69.1%	58.6%	39.9%	52.8%	49.7%	83.1%

# Ratio of CT to PE herbicide use on BIFS fields (by application)

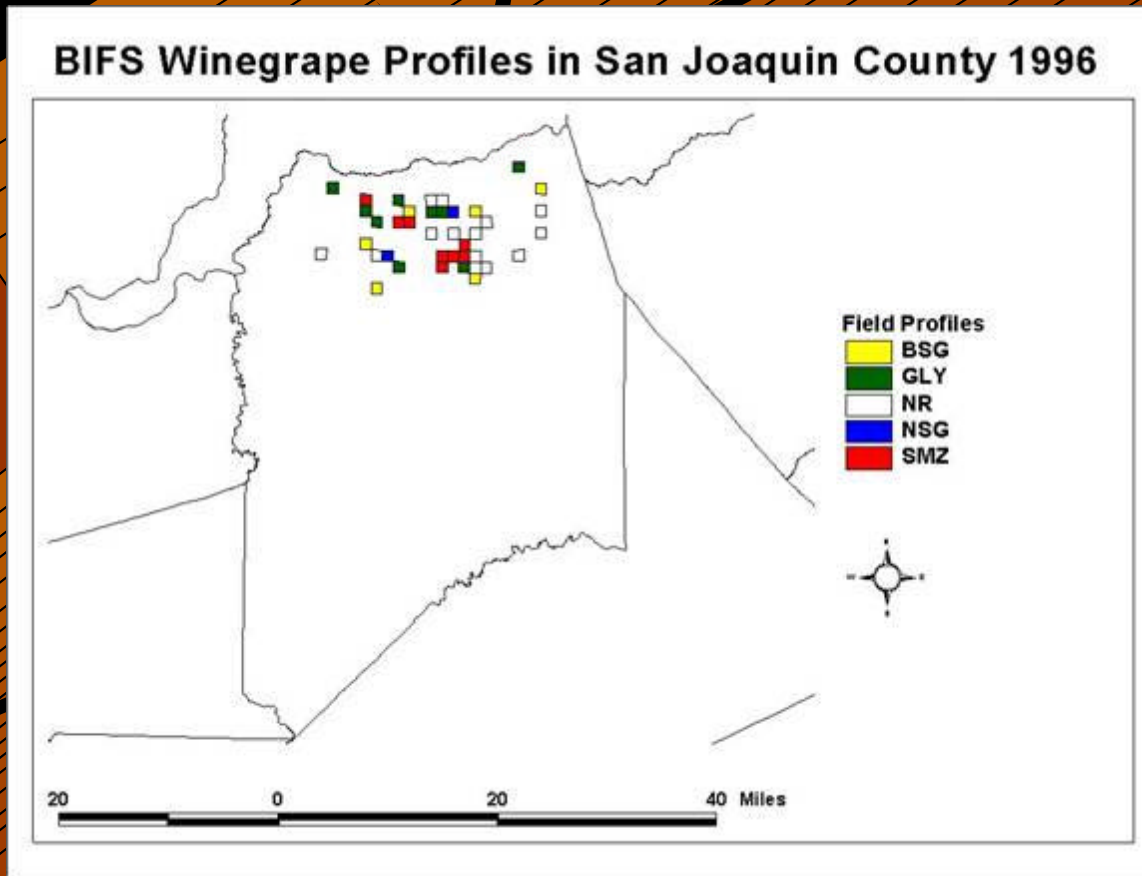
	1993	1994	1995	1996	1997	1998	1999	2000	2001
SMZ	0.64	0.65	0.78	0.67	0.75	0.50	0.38	0.45	0.44
GLY	7 to 0	2.00	7.00	3.20	2.56	2.83	1.31	3.00	4.67
BSG	1.00	1.50	1.38	1.20	1.14	0.93	0.95	0.70	0.58
NSG	1.00	1.00	2.25	2 to 0	1.00	1.25	1.11	0 to 0	1.25
TOTAL	0.98	1.10	1.41	1.18	1.27	0.97	0.85	0.77	1.07
NSMZ	2.40	1.56	3.83	3.60	1.78	2.20	1.23	3.00	2.71

## Chemicals use for BFS group

	1993	1994	1995	1996	1997	1998	1999	2000	2001
diuron	10.9%	7.6%	7.9%	9.1%	4.3%	6.5%	9.5%	9.4%	3.5%
glyphosate	13.9%	17.6%	18.3%	21.2%	21.5%	25.9%	20.3%	26.2%	32.6%
napropamide	1.5%	0.8%	0.8%	1.2%	2.4%	0.5%	0.6%	2.6%	0.0%
norflourazon	2.9%	8.4%	5.6%	3.6%	5.3%	4.2%	3.2%	3.1%	3.5%
oryzalin	8.8%	8.4%	4.8%	4.2%	2.4%	3.7%	4.4%	3.1%	1.2%
oxyflourfen-2xl	0.0%	0.0%	0.0%	1.2%	10.5%	8.3%	15.2%	15.2%	19.8%
oxyflourfen-g1.5	13.1%	15.1%	16.7%	10.9%	10.5%	7.9%	3.8%	4.2%	0.0%
paraquat dichloride	21.9%	16.8%	24.6%	29.1%	22.5%	24.5%	28.5%	16.8%	25.6%
pendimethalin	1.5%	1.7%	0.8%	0.0%	1.9%	0.5%	0.6%	0.5%	1.2%
sethoxydim	2.2%	4.2%	0.8%	0.0%	1.4%	0.0%	1.3%	0.0%	0.0%
simazine	23.4%	16.0%	18.3%	18.8%	16.3%	17.6%	11.4%	18.3%	12.8%
trifluralin	0.0%	3.4%	1.6%	0.6%	1.0%	0.5%	1.3%	0.0%	0.0%
thiazopyr	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%
TOTAL_APPS	137	119	126	165	209	216	158	191	86



# Spatial examination of BIFS fields



Examined years  
between 1995-1998.  
Generated using PUR-  
GIS in AGIS Lab.

# Conclusion

- Pre-emergent reduction on BIFS fields: BIFS program was successful in reducing several pre-emergent herbicides in the inaugural year: simazine, oryzalin, and oxyfloufen decreased in use on BIFS fields in the initial year (1996)
  - Particularly, weed focus group (n = 18)
- Increase in contact herbicides on BIFS fields: Ratio of contact to pre-emergent herbicide use has increased since the inception of the program
- BIFS vs Conventional field trends: BIFS fields incurred less simazine use in 1996 and between 1999-2000. Compared to conventional fields, BIFS fields witnessed increasing use of glyphosate and paraquat dichloride since 1996
- Field categories: since program started, the majority of acreages shifted from SMZ to GLY in 1996; then to BSG in 1997 and 1998 (more diversified approach)
  - GLY group: overall, this group used fewer applications herbicides per field (avg. 3). Of the ones they used, contact herbicides were favored by a 3 to 1 ratio
  - SMZ group: used more applications of herbicides per field (avg. 6) and favored pre-emergents by 2 to 1 ratio
- Spatial examination: there was no apparent pattern

# Discussion

➤ Potential factors contributing to initial reduction of simazine and other pre-emergents in 1996:

- Initial enthusiasm for project
- Low weed pressure in 1996
- Use of alternative practices
- Grower-driven program (meetings run by growers) – both small and large operations were involved

➤ Increase in pre-emergent use in 1998:

- Unusually high rainfall contributed to increased weed problems, thus higher simazine use

➤ After-effect: influence from program can be seen years after the program ends. (e.g., contact herbicide use on the rise)

➤ PUR data disagrees with LWWC (PUR shows more use than LWWC). One possible explanation is that field resolution within the PUR database is not good enough. PUR data might be including herbicide use from adjacent non-BIFS lots (but PUR recognizes it as one field).



# Questions ?

