

Economics of Strawberry Production with Alternative Fumigants

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Objective

- ❖ To estimate application rates of alternative fumigant treatments that result in profits equal to MBr-PIC 67-33 profits.
- ❖ To estimate application rates that maximize profits for each alternative fumigant treatment
- ❖ To estimate the effect of using virtually impermeable film (VIF) rather than high-density polyethylene (HDPE)
- ❖ To estimate the effect of using VIF and/or metam sodium on profits (*separate trial*)

Field Trials

- ❖ Locations (Oxnard, Watsonville)
- ❖ Years (2002 – 2003, 2003 – 2004)
- ❖ Fumigation (12 treatments)
 - PIC (50, 100, 200, 300, 400 lbs per acre)
 - Inline (50,100, 200, 300, 400 lbs per acre)
 - Methyl Bromide (350 lbs. per acre)
 - None (control)
- ❖ Two tarps for each treatment (VIF, HDPE)

Approach

- 🍅 Yield and weeding time data from trials
- 🍅 Fumigant and tarp prices provided by industry members and suppliers
- 🍅 University of California cost studies provided information on other costs
<http://coststudies.ucdavis.edu>
- 🍅 Profits calculated for each year, location, tarp and treatment combination.

Costs and Returns

- 🍅 Costs that vary:
 - 🍅 VIF versus standard film (HDPE)
 - 🍅 Fumigant
 - 🍅 Hand weeding
 - 🍅 Harvesting labor and materials
- 🍅 All other costs assumed to be constant
- 🍅 Returns:
 - 🍅 Yields vary by treatment
 - 🍅 Quality assumed to be constant

Caveat

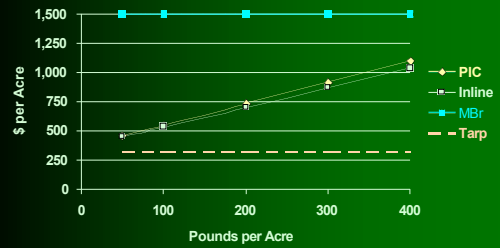
Results are only as good as the data.

- 🍅 Field trial conditions may differ from field conditions.
- 🍅 Cost studies use information from a number of growers and suppliers but not a random sample.
- 🍅 Prices change over time.
- 🍅 Price of broadcast application of methyl bromide is **high** relative to drip application of chloropicrin or Inline.
 - 🍅 If your cost of drip applying fumigants is substantially higher than \$50/acre, then your application rates of Inline and PIC EC that generates the same profits as MBr-PIC will also be higher.

Statistical Analysis

- ▲ Relative profitability
 - ▲ Chloropicrin (PIC)
 - ▲ 1,3 – D (Inline)
 - ▲ Methyl bromide
- ▲ Breakeven application rates (PIC, Inline)
- ▲ Profit maximizing rates (PIC, Inline)
- ▲ Change in profits from switching to VIF from HDPE

Fumigation Cost with HDPE, Oxnard



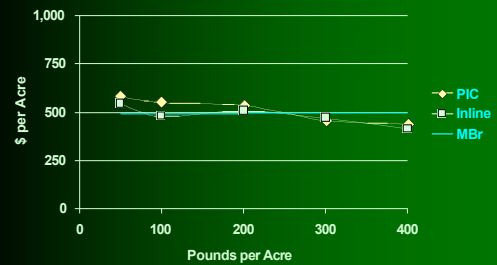
Hand Weeding Cost with HDPE, Oxnard

Average 2002 - 2003 and 2003 - 2004



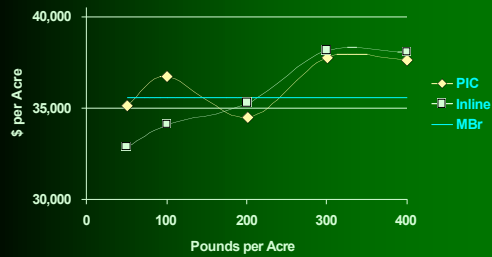
Hand Weeding Cost with VIF, Oxnard

Average 2002 - 2003 and 2003 - 2004



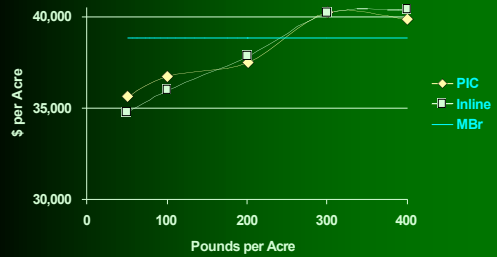
Revenue with HDPE, Oxnard

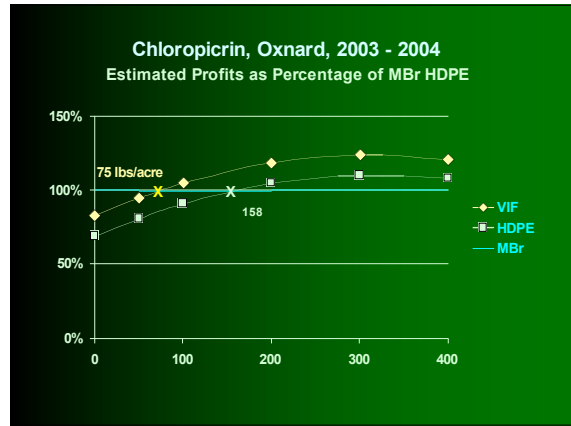
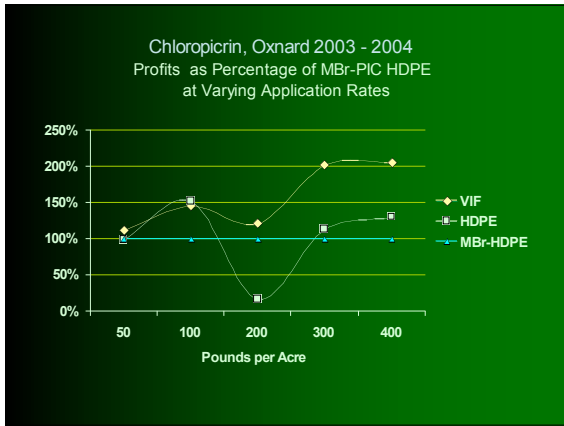
Average 2002 - 2003 and 2003 - 2004



Revenue with VIF, Oxnard

Average 2002 - 2003 and 2003 - 2004





- ### Results
1. Compare profits by treatment to profits from MBr-PIC, 350 lbs/acre
 2. Calculate profit-maximizing rates for PIC, Inline
 3. Compare profits with VIF to using HDPE

Oxnard Application Rates with Profits Equal to MBr-PIC Profits (lbs/acre)

	2002-03		2003-04	
	VIF	HDPE	VIF	HDPE
PIC	31	45	75	158
INLINE	33	53	108	219

Oxnard Estimated Profit-Maximizing Rates (lbs/acre)

	2002-03	2003-04	Both Yrs
PIC	276	317	293
INLINE	282	419*	326

* Estimated profit-maximizing rate outside observed range

Oxnard Estimated profit change from using VIF (\$ per acre)

	2002-2003	2003-2004	Both Years
PIC	\$448	\$1,136*	\$872**
INLINE	\$651	\$1,654**	\$1,108***

PIC application rate 300 lbs/acre
INLINE application rate 300 lbs/acre

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Oxnard
Estimated profit change from using VIF
(% HDPE profits)

	2002-03	2003-04	Both Years
PIC	4.9%	12.5%*	13.2%**
INLINE	7.9%	15.9%**	16.5%***

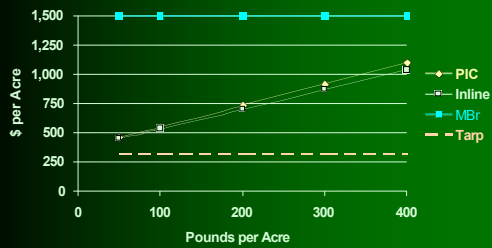
PIC application rate 300 lbs/acre
INLINE application rate 300 lbs/acre

* Significant at the 10% level
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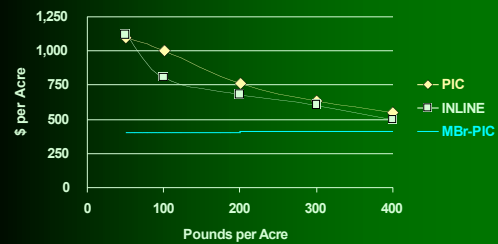
Summary: Oxnard

- Drip-applied chloropicrin and Inline more profitable than methyl bromide at common application rates (low breakeven rates)
- Profit maximizing rates
 - PIC approx. 300 lbs./acre
 - Inline has wider range: 282 – 419 lbs./acre
- VIF increases profits for PIC and Inline

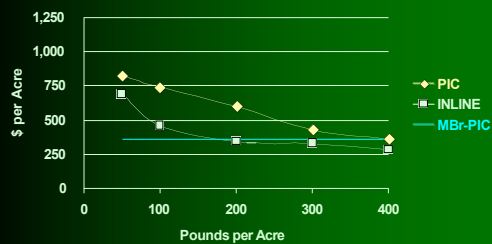
Watsonville
Fumigation Cost with HDPE



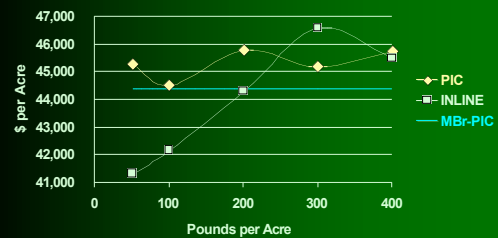
Watsonville
Hand Weeding Costs with HDPE



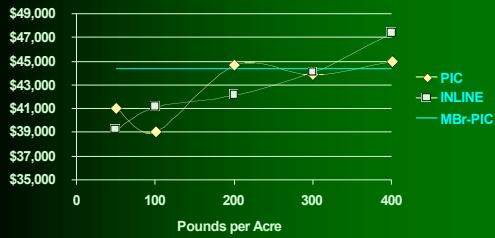
Watsonville
Hand Weeding Costs with VIF



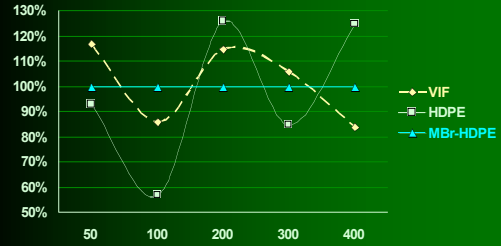
Watsonville
Revenue with VIF



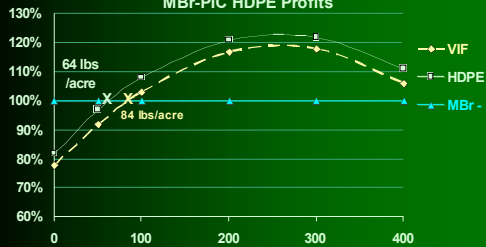
Watsonville Revenue with HDPE



Watsonville 2002 - 2003 Chloropicrin Profits by Application Rate as Percentage of MBr-PIC HDPE Profits



Watsonville 2002 - 2003 Estimated Chloropicrin Profits as Percentage of MBr-PIC HDPE Profits



Results

1. Compare profits by treatment to profits from MBr-PIC, 350 lbs/acre
2. Calculate profit-maximizing rates for PIC, Inline
3. Compare profits with VIF to using HDPE

Watsonville Rates with Profits Equal to MBr-PIC (lbs/acre)

	2002-03		2003-04	
	VIF	HDPE	VIF	HDPE
PIC	84	64	52	137
INLINE	203	44	90	212

Watsonville Estimated Profit-Maximizing Rates (lbs/acre)

	2002-03	2003-04	Both Yrs
PIC	259	267	259
INLINE	353	381	368

Watsonville
Estimated profit change from using VIF
(\$/acre)

	2002-2003	2003-2004	Both Years
PIC	-\$260	\$1,170	\$455
INLINE	-\$1,459**	\$1,350**	-\$55

PIC application rate 260 lbs/acre
 INLINE application rate 370 lbs/acre

** Significant at the 5% level

Watsonville
Estimated profit change from using VIF
(% HDPE Profits)

	2002-03	2003-04	Both Years
PIC	-3.7%	12.0%*	6.8%
INLINE	-19.2%**	13.8%**	-0.8%

PIC 260 lbs/acre
 Inline 370 lbs/acre

* Significant at the 10% level
 ** Significant at the 5% level
 *** Significant at the 1% level

- Summary: Watsonville**
- 🔴 Drip-applied chloropicrin and Inline more profitable than methyl bromide at common application rates (low breakeven rates)
 - 🔴 Profit maximizing rates
 - 🔴 PIC approx. 260 lbs./acre
 - 🔴 Inline approx. 375 lbs./acre
 - 🔴 Effect of VIF on profits isn't consistent

- VIF and Metam Sodium Field Trial**
- 🔴 Location: Oxnard
 - 🔴 Years: 2001 – 2002
 - 🔴 Fumigation (5 treatments)
 - 🔴 PIC EC (22 gallons per acre, drip-applied)
 - 🔴 Inline (36 gallons per acre, drip-applied)
 - 🔴 Telone C35 (33 gallons per acre, shank-applied)
 - 🔴 PIC (33 gallons per acre, shank-applied)
 - 🔴 Methyl Bromide (375 lbs. per acre, shank-applied)
 - 🔴 Two tarps for each treatment (VIF, HDPE)
 - 🔴 Metam sodium (45 gallons per acre, drip-applied separately)
 - 🔴 No Metam sodium

- Metam Sodium Study Approach**
- 🔴 Data collection, costs and returns same as in first study
 - 🔴 Statistical analysis
 - 🔴 Profitability of using VIF
 - 🔴 Profitability of using metam sodium
 - 🔴 Profitability of using both
 - 🔴 Can only do changes in profits, not profit-maximizing rates

- Profitability of Fumigants**
- 🔴 All alternatives in this trial less profitable than methyl bromide
 - 🔴 Only one application rate for each alternative fumigant, so result is only for those specific rates
 - 🔴 For PIC EC, profit-maximizing rates from other trial suggest may be partially because the rate was too high (approx. 360 lbs./acre)

Effect on profitability of VIF and Metam Sodium

(change as percent of MBr-PIC HDPE returns)

	Metam sodium	No metam sodium
VIF	45.9%	29.9%
HDPE	41.2%	---

Summary: Metam sodium and VIF

- 🍷 VIF increases profits
- 🍷 Metam sodium increases profits
- 🍷 Using both increases profits more than using either one alone
- 🍷 Results based on Oxnard-only trial