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Organisation for Economic Co-operation and Development

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English - Or. English

**ENVIRONMENT DIRECTORATE
JOINT MEETING OF THE CHEMICALS COMMITTEE AND
THE WORKING PARTY ON CHEMICALS, PESTICIDES AND BIOTECHNOLOGY**

**REPORT OF THE OECD SEMINAR ON INDICATORS FOR INTEGRATED PEST MANAGEMENT -
ANNEX 7 (PRESENTATIONS)**

**Series on Pesticides
No. 75**

JT03354892

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This document only contains Annex 7 of the REPORT OF THE OECD SEMINAR ON INDICATORS FOR INTEGRATED PEST MANAGEMENT. Annex 7 includes slides of all presentations made during the seminar.

The main part of the seminar report, as well as Annexes 1-6, is published under the reference ENV/JM/MONO(2014)7.

ANNEX 7: List of presentations

**OECD Seminar on IPM Indicators
Tuesday 27 November 2012, Queenstown, New Zealand**

Presentation 1

OECD: IPM indicators: where are we?
by Beatrice Grenier, OECD Pesticides Programme

Presentation 2

Germany : A scoring system for IPM evaluation on demonstration farms in Germany
by Silke Dachbrodt-Saaydeh, Julius Kühn Institute (JKI)

Presentation 3

New Zealand: Sustainability initiatives in New Zealand horticulture
by Jim Walker, Plant & Food Research

Presentation 4

Pesticide industry: Measuring IPM: a tool for measuring uptake and identifying gaps
by Keith Jones, CropLife International

Presentation 5

US: IPM: Answering the “So what?” question
by Tom Green, IPM Institute

Presentation 6

BioPesticide industry: How the biocontrol industry contribute to and view IPM indicators
by David Cary, IBMA

Presentation 7

Australia: Exploring the potential IPM indicators for Australia
by Bronwyn Walsh, Department of Fisheries and Agriculture Western Australia

Presentation 8

Grower association from Canada: Food Systems 2002, IPM Approach and Evaluation, Ontario Canada
by Craig Hunter, Ontario Fruit and Vegetable Growers' Association

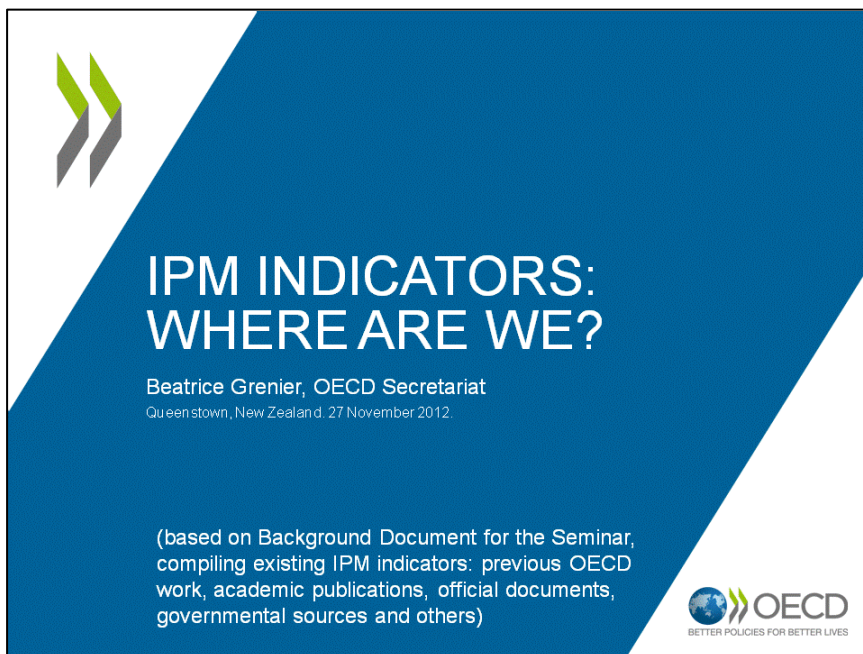
Presentation 9

IOBC: Guidelines for Integrated Production and Endorsement' performance indicators
by Barbara Barratt, Global IOBC

Presentation 10

Germany: An approach to use the environmental risk indicator SYNOPSIS for the assessment of IPM
“performance” on regional level
by Silke Dachbrodt-Saaydeh, Julius Kühn Institute (JKI)

Presentation 1
OECD: IPM indicators: where are we?
by Beatrice Grenier, OECD Pesticides Programme




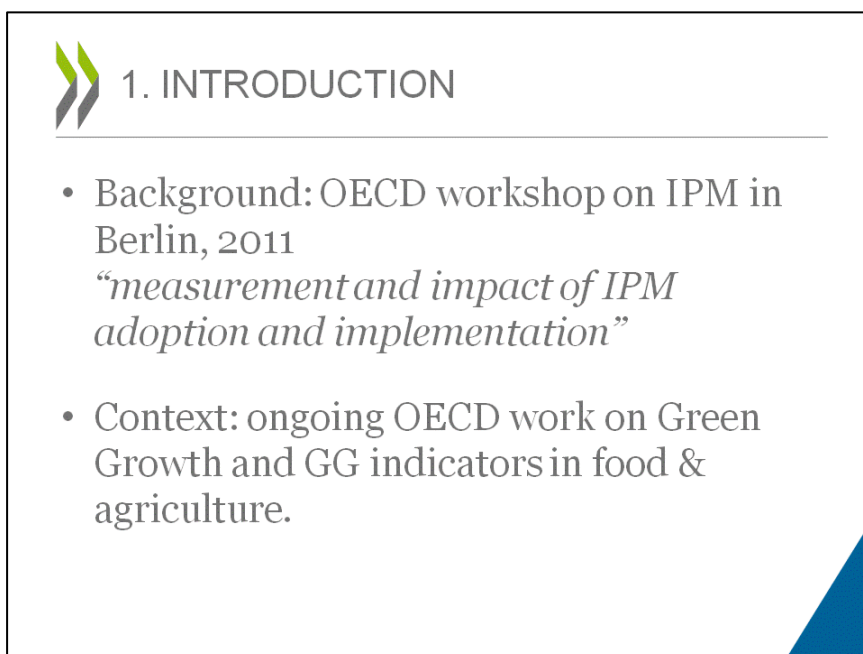
The slide features a blue and white diagonal design. In the top left corner, there is a stylized logo consisting of two green and grey chevrons pointing right. The main title 'IPM INDICATORS: WHERE ARE WE?' is written in large white capital letters on the blue background. Below the title, the presenter's name and the event details are listed. At the bottom left, a note in parentheses explains the source of the information. The bottom right corner contains the OECD logo and its slogan.

**IPM INDICATORS:
WHERE ARE WE?**


Beatrice Grenier, OECD Secretariat
Queenstown, New Zealand, 27 November 2012.

(based on Background Document for the Seminar,
compiling existing IPM indicators: previous OECD
work, academic publications, official documents,
governmental sources and others)

 **OECD**
BETTER POLICIES FOR BETTER LIVES



The slide has a white background with a blue triangle in the bottom right corner. It starts with a stylized logo of two chevrons pointing right, followed by the section title '1. INTRODUCTION'. A horizontal line separates the title from the content. Below the line, there are two bullet points. The first bullet point includes a reference to an OECD workshop and a specific report title in italics. The second bullet point describes the context of the work.

 **1. INTRODUCTION**

- Background: OECD workshop on IPM in Berlin, 2011
“measurement and impact of IPM adoption and implementation”
- Context: ongoing OECD work on Green Growth and GG indicators in food & agriculture.



1. INTRODUCTION

- IPM is crop- and location-specific.
 - Measurement & comparison are difficult.
- Need for a “general set of principles”.
- Two types of indicators:
 - Adoption.
 - Impact.



2. ADOPTION INDICATORS

- IPM adoption/uptake: “the extent to which farmers in a certain country or region apply IPM farming practices”.
- Why measuring adoption? For who?
- Degrees of adoption (Robertson et al. 2005; Hollingsworth and Coli 2001):
 - High
 - Medium
 - Low



2. ADOPTION INDICATORS

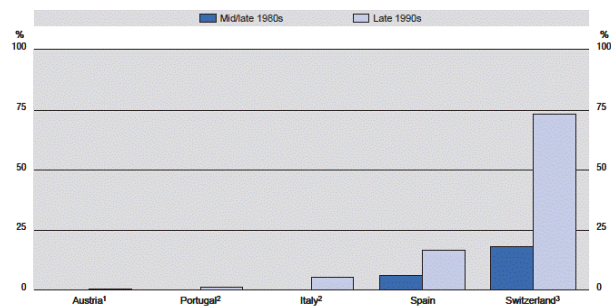
- Surveys are the most common measurement techniques (Hollingsworth and Coli 2001; Vandeman et al. 1994; Robertson et al. 2005); interviews; audits; & certification
 - Scouting, monitoring, and recordkeeping practices.
 - Cultural pest management and control practices (including the use of biological pesticides).
 - Pesticide usage and treatment thresholds.
 - Pesticide application practices.



2. ADOPTION INDICATORS

- Current OECD indicator (OECD 2001):

Figure 5. Share of the total arable and permanent crop land area under integrated pest management: mid/late 1980s and late 1990s





3. IMPACT (PERFORMANCE) INDICATORS

- IPM Impact: “the effect that IPM adoption has on the different involved stakeholders, on the environment (& on pesticide risk reduction)”

- 5 categories:
 - Farming, Pesticide, and Risk Impacts
 - Environmental Impacts
 - Health Impacts
 - Economic Impacts
 - Social Impacts

*



3.3. Health Impacts

- Health effects on both consumers and producers.
- Indicators:
 - Residue levels in food
 - Environmental Impact Quotient (EIQ) (Kovach et al. 1992).
 - Pesticide-related lost work days
 - Pesticide-related health expenditures



3.4. Economic Impacts

- They measure the economics profitability of IPM programs.
- Of special interest to from the farmer and policymaking perspective.
- Cost-Benefit Analysis and Contingent Valuation methods to evaluate the economic impacts of IPM (Fleischer et al. 1999).



3.5. Social Impacts

- The social dimension of IPM.
 - It can be difficult to measure.
- Indicators:
 - Farmer communication (advice giving)
 - Management skills
 - Level of public awareness about IPM




4. CONCLUSIONS

- IPM indicators can exist at a variety of levels (farm, regional, national) and contexts.
- For adoption: it would be important to agree on a “general set of principles” that could focus on the minimum/necessary criteria for IPM.
- For impact: agree on the “impact” categories to measure. Alternatively, IPM impact measurement could focus on case studies/success stories.

Presentation 2

Germany : A scoring system for IPM evaluation on demonstration farms in Germany
by Silke Dachbrodt-Saaydeh, Julius Kühn Institute (JKI)



Directive 2009/128/EC on the Sustainable Use of Pesticides 

First provision on pesticide use in Europe

Directive establishes a framework to achieve sustainable use of pesticides by:

- reducing the risks and impacts of pesticide use on human health and the environment,
- promoting the use of Integrated Pest Management (IPM) and
- of alternative techniques such as non-chemical alternatives

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Directive 2009/128/EC on the Sustainable Use of Pesticides



Article 14

Integrated pest management

- Member States ... ensure that **general principles of integrated pest management** are implemented by all professional users by 1 January 2014.
- Member States shall establish appropriate incentives to encourage professional users to implement **crop or sector-specific guidelines for integrated pest management** on a **voluntary** basis.

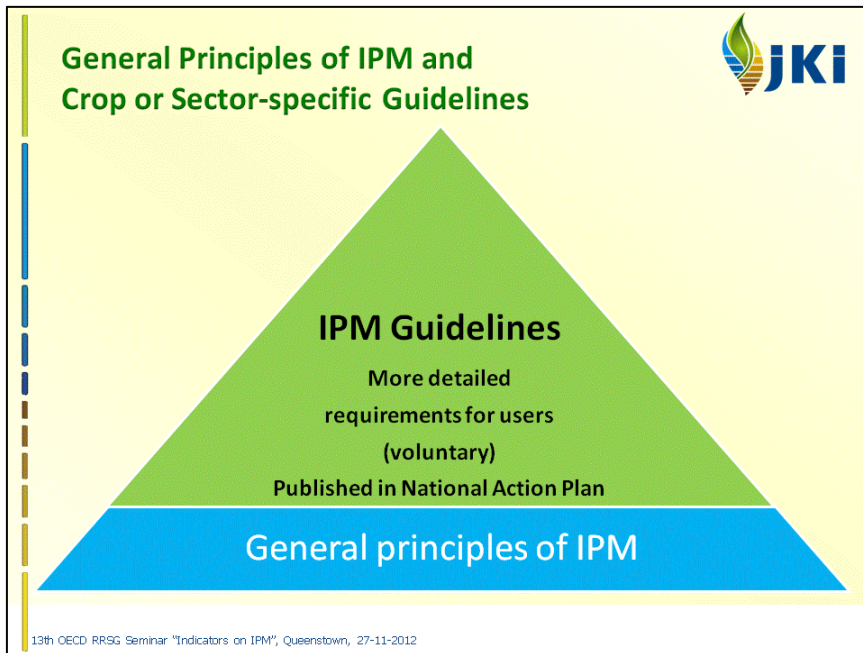
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General Principles of Integrated Pest Management (Directive 2009/128/EC, Annex III)



1. Prevention of harmful organisms should be achieved or supported (e. g. crop rotation, choice of resistant cultivars),
2. Harmful organisms must be monitored,
3. Use of thresholds and other tools for decision support,
4. Biological and other non-chemical methods must be preferred to chemical pesticides,
5. Use of specific pesticides with the least side effects,
6. Keep use of pesticides to necessary minimum,
7. Use of available anti-resistance strategies,
8. Record pesticide use and check the success of control measures

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Available Drafts of IPM Guidelines in Germany

Drafted by producers and other professional associations

- Arable crops (sector)
- Sugar beet
- Potato
- Apple
- Viticulture
- Spice & medicinal plants (sector)
- Golf courses
- Railway lines
- Amenity/Urban areas (sector)


Leitlinien des integrierten Pflanzenschutzes im Zuckerrübenanbau

IPM guideline sugar beet

JKI

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Demonstration Farms for Integrated Pest Management

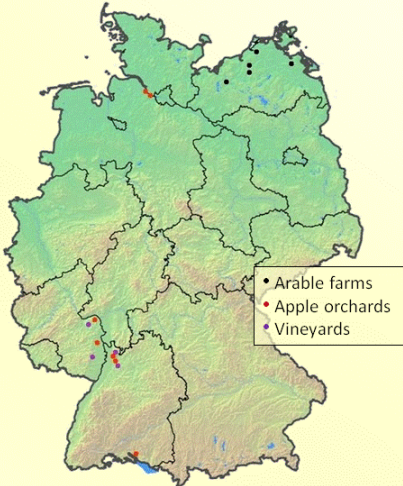


General objective:
To encourage the development and introduction of crop specific integrated pest management and of alternative approaches or techniques

Launched in 2011


IPM Demonstration farms (2012)

- 5 Arable crops (2013: 17)
- 7 Apple orchards
- 4 Vineyards



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Evaluation of Implementation of IPM by a Scoring System based on Checklists



The principle:
Checklists are based on the elements in IPM guideline
Requirements are formulated
The on-farm implementation of the requirements is evaluated by experts of state plant protection service
The degree of implementation is assessed with a score of 0 to 6

Checklist for the implementation of IPM in arable crops

General information

Farm name:	Agrargesellschaft Barteldshagen I e.G.
Address:	Sitz: Kuhnrade, MTS-Viertel 13, 18337 Marlow
Federal state:	Mecklenburg-Vorpommern
Location:	Marlow
Weather station:	Kuhnrade
Distance to weather station:	1 km
Scout:	Felix Mustermann
Address:	Mustermann-Str. 1 11011 Musterhausen
Total cultivated area:	3.500 ha
Marketing of main crops:	Agricultural Trade (e.g. Getreide AG) Direct marketing of poultry

• Scores: 3 or 5 to 6

• The performance fully meets the requirements of the IPM guideline

• Scores: 2 or 3 to 4

• The performance can be improved

• Scores: 1 or 2

• The performance does not meet the requirements of the IPM guideline

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Example: Assessment of the Crop Rotation

B. Cultural control measures

	Current on-farm situation
5. Cropping systems, crops and rotation shall be optimised to prevent or suppress infestation by harmful organisms.	Four crops in crop rotation

In a minimum 3 year crop rotation the proportion of each crop shall not exceed:

Cereals 67 %	6	46%
Winter oil seedrape 33 %, two year break	6	28%
Sugar beet 33 %, two year break	6	1%
Winter oil seedrape/ sugarbeet 33 %, two year break	5	29%
Potato 33%, two year break	-	Not grown
Maize no monoculture	6	6%, no monoculture

Evaluation (maximum score: 6)	6
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Example: Assessment of Enhancement and Use of Natural Control Mechanisms

C. Enhancement and use of natural control mechanisms

	On-farm situation
11. Maintenance and conservation of natural elements in the agricultural landscape	Special attention and participation in environmental programs (see table below)

Notes:

Setting up field margins, planting of boundary elements and woody plants preferring regional plant species	No special activities
--	-----------------------


Evaluation (maximum score: 3)	3
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Participation in agri-environmental programs

		Comment
Extensive environment-friendly grassland farming		
Participation in extensive guideline program		
Farms in unfavourable regions		
Unsprayed crop edges / conservation headlands	X	
Reducing erosion in maize rotations	X	
Winter cover crops, mulch and direct sowing methods	X	
Flower stripes and flowering areas for bees	X	
Protection of biotopes and species	X	

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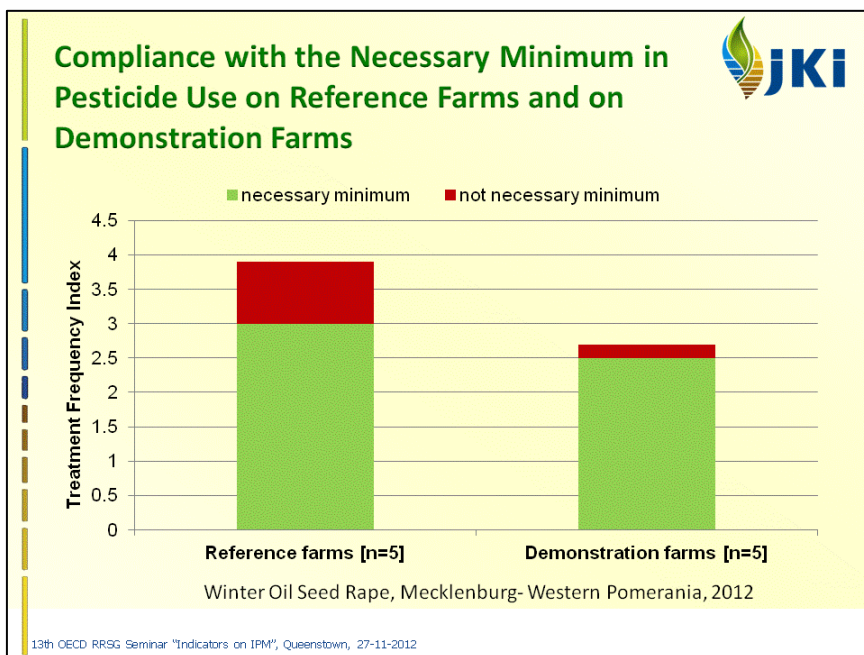
Example: Evaluation of Pesticide Use Intensity (TFI) in Terms of the Necessary Minimum in main Crops



E. Use of non-chemical and chemical plant protection measures

17. Use of pesticides shall be kept to the necessary minimum (using reduced doses and site-specific application of pesticides)	On-farm situation • Control of pollen beetle was not necessary • Site-specific application and reduced dose rates if possible
Notes:	
a) Recommendations of state plant protection service are considered	2 Recommendations were not always considered
b) The crop-specific and regional range of the Treatment Frequency Index (TFI) should be considered (Sources: NEPTUN-data, data of reference farm network)	3 Winter oil seed rape TFI on farm : 2.3 TFI on reference farm in respective region : 2.7 More details see table attached
Evaluation (maximum score: 3)	3

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General Findings

- The scoring system is a suitable method for evaluation of IPM implementation on IPM demonstration farms

Example for an assessment result

The five demonstration farms for arable crops achieved **70 to 89%** of the possible maximum score just at the beginning of project and reached **79 to 93%** of the maximum score after the first year of the project

- The scoring system helps to identify shortcomings of the on-farm implementation of IPM




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General Findings

Implementation of IPM requires:

- excellent field monitoring,
- the use of available decision support tools and
- the support from experts of state advisory service.

One scout (financed by project) supports **five farms** in the IPM demonstration farm project.



Demonstration Farm	Monitoring [n]	Time for Monitoring [min]	Farm-to-field time [min]
DF1	30	35	10
DF2	38	35	25
DF3	35	35	10
DF4	32	45	10
DF5	78	1650	300

Apple orchards (2011):
time needed for monitoring and decision-making

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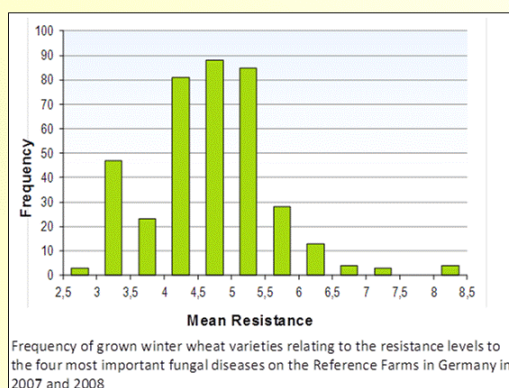
General Findings



Reference farms: The availability of varieties and resistance levels to fungal diseases (e.g. winter wheat and winter barley) are not fully exploited

Demonstration farms: The cultivated varieties have a moderate or good resistance

More recommendations needed about a better exploitation of resistance and the implications on fungicide use



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Conclusions



- Further development of scoring system for evaluation of IPM implementation, e. g. using **bonus-points** for measures of cultural and non-chemical control as part of (agri-)environmental protection programs
- Increase the number of participating farms in the IPM demonstration project to gain more experience with IPM and the scoring system for IPM evaluation

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Presentation 3
New Zealand: Sustainability initiatives in New Zealand horticulture
 by Jim Walker, Plant & Food Research

The New Zealand Institute for Plant & Food Research Limited

**Plant & Food
RESEARCH**

RANGAHAU AHUMĀRA KAI





**Sustainability initiatives
in
New Zealand horticulture**

Jim Walker
Senio entomologist – pomefruits, winegrapes
 Plant & Food Research, Hawke’s Bay

Kiwifruit - KiwiGreen
the first sector to adopt IPM

Pre-1992
Calendar spraying of organophosphate (OP) insecticides


- ~8 applications for scale insect and leafroller control
- compliant with EU residue tolerances

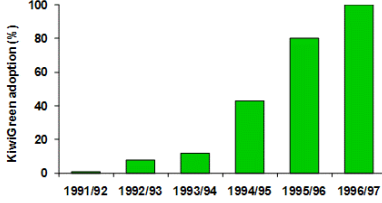
1992
Detectable residues in EU Markets

- KiwiGreen pilot study (50ha)

1993-96
Sector wide adoption of KiwiGreen

1997
KiwiGreen becomes the sector standard





Year	Adoption (%)
1991/92	0
1992/93	~10
1993/94	~15
1994/95	~45
1995/96	~80
1996/97	~95

Outcome

- a residue-free programme
- OP use declined to just 3 per season

KiwiGreen: evolution of a sustainability programme

KiwiGreen
Zespri™ (exporter) ownership of the IPM programme
Development of a pest monitoring infrastructure

- information on pests and monitoring
- recommendations when thresholds exceeded

To meet new customer demands
Food safety

- traceability, elimination of OPs

Environmental responsibility

- herbicide use and fertiliser use

To meet new phytosanitary issues



IPM today

- leafrollers & scale insects
- and new secondary pests
- 2-3 selective insecticides



Apples - Integrated Fruit Production: a mid-1990's response to market imperatives

Pre 1995
Phytosanitary pest management


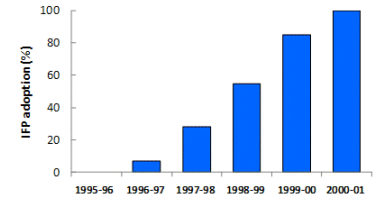
- calendar spray schedules of OP's
- residues always within 'legal' limits

Mid 1990s
Integrated Fruit Production (IFP)


- environmental responsibility
- food safety and traceability
- IFP - new export standard by 2001

2003 on
Customer Assurance programmes

- supermarket defined production criteria
- emergence of G.A.P. programmes
- new restrictions on pesticides and residues

Year	IFP Adoption (%)
1995-96	0
1996-97	~5
1997-98	~25
1998-99	~55
1999-00	~85
2000-01	100





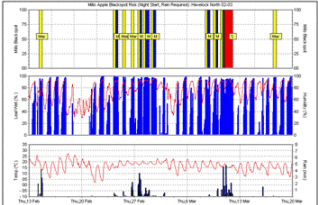
IFP pest and disease management

Pest management goals

- eliminate OP insecticides
- only justified use of selective insecticides
- maximise bio-control
- improve phytosanitary performance

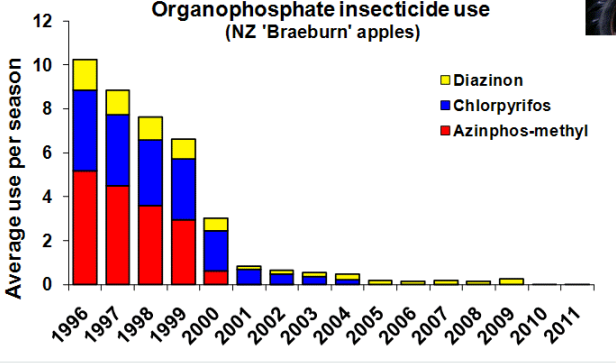
Disease management goals

- minimise use of mite disruptive fungicides
- use of decision support systems
- maximise early season scab control
- minimise late season scab sprays
- follow resistance management protocols

IFP insecticide outcomes: elimination of OPs




**Organophosphate insecticide use
(NZ 'Braeburn' apples)**



Year	Azinphos-methyl	Chlorpyrifos	Diazinon
1996	5.2	3.5	1.3
1997	4.5	3.2	1.3
1998	3.5	3.0	1.0
1999	2.8	2.8	0.8
2000	2.0	2.5	0.5
2001	0.5	0.5	0.0
2002	0.2	0.3	0.0
2003	0.1	0.2	0.0
2004	0.1	0.1	0.0
2005	0.0	0.1	0.0
2006	0.0	0.0	0.0
2007	0.0	0.0	0.0
2008	0.0	0.0	0.0
2009	0.0	0.0	0.0
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0

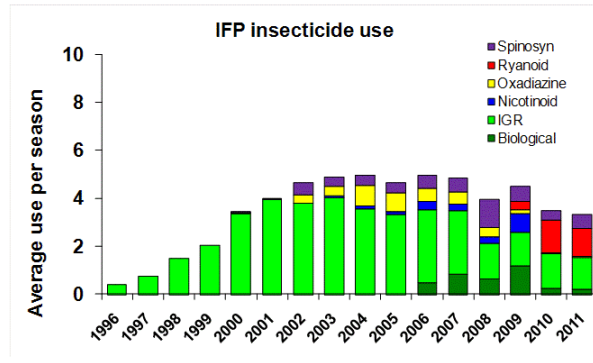
Organophosphates

- Gone: Gusathion in 2001, Lorsban in 2005
- 98% reduction in use by 2005
- all OP insecticide use by 2011

OP resistance in three pest groups

Apple IFP outcomes: selective insecticide use



- >60% reduction in insecticide covers
- only justified use of selective insecticides
- increasing use of mating disruption (~30%)
- post-harvest pest removal systems



Sustainability programmes: analysis of pesticide risk reduction

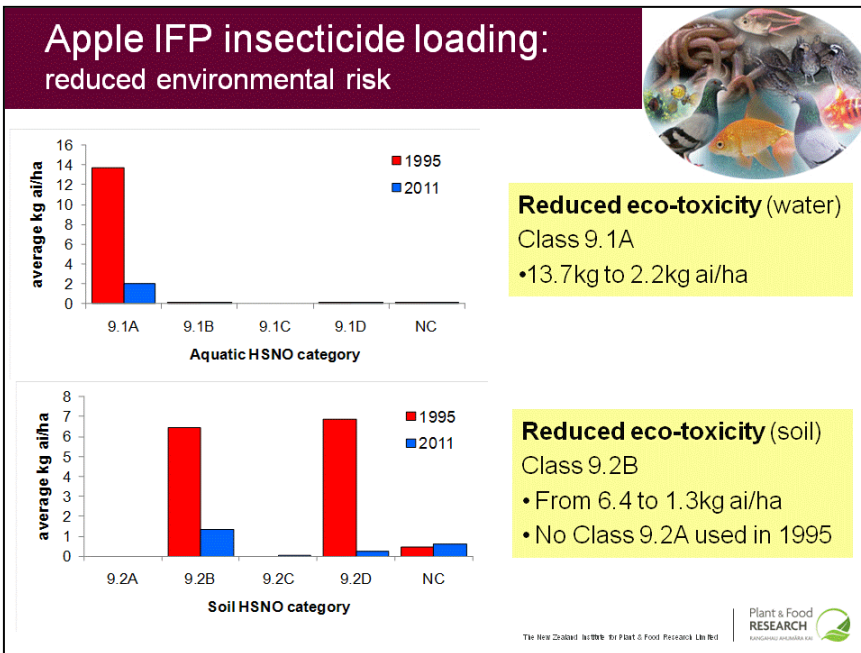
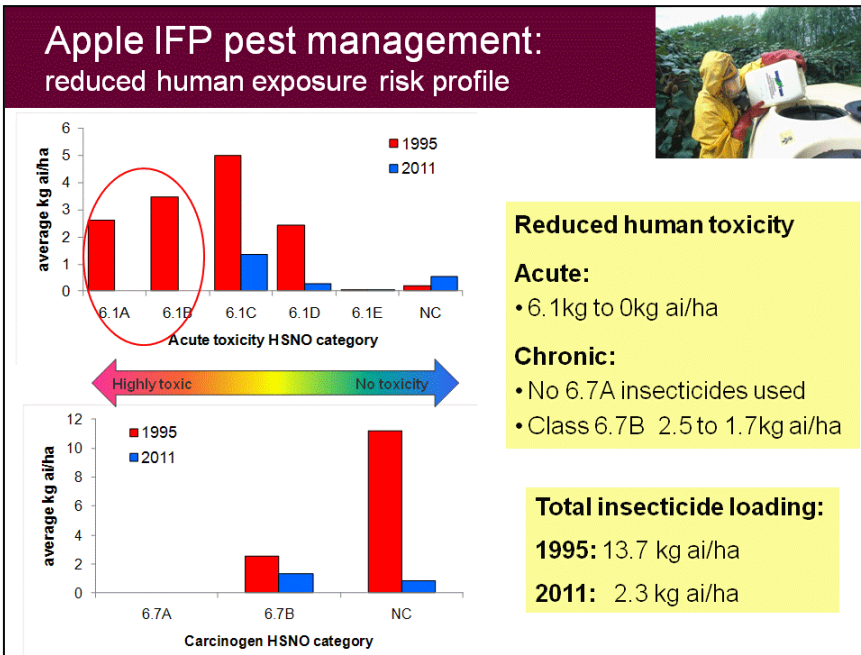
The HSNO Classification system

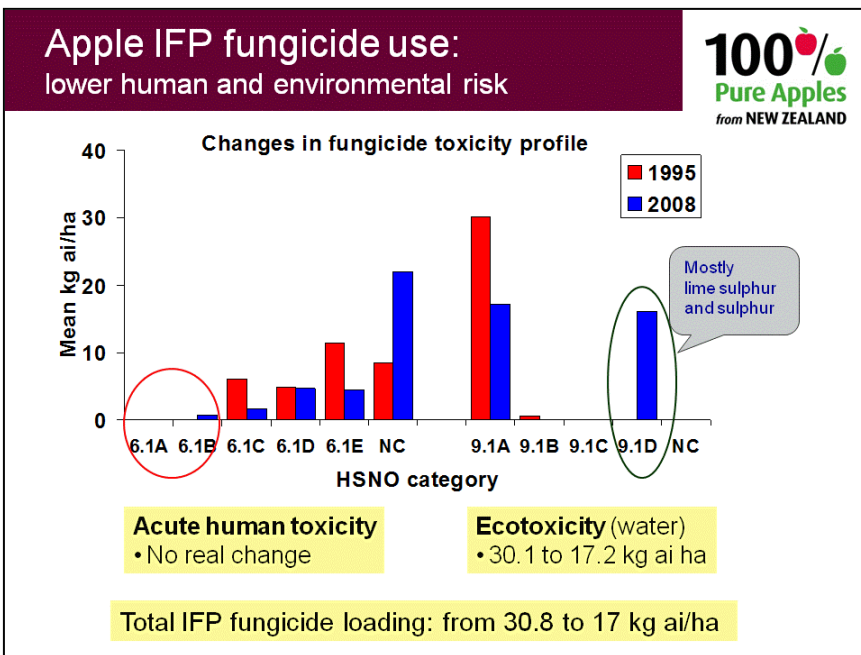
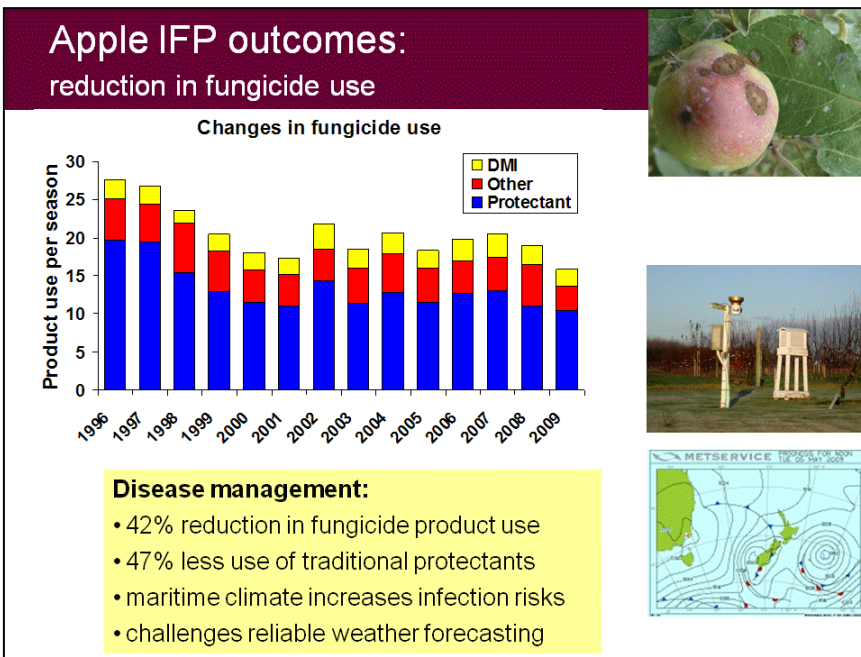
Analysis based on HSNO:

- Human toxicity – acute and carcinogens
- Eco-toxicity - aquatic and soils



Property	Human Toxicity								Corrosiveness			Eco-toxicity			
Class	Class 6								Class 8			Class 9			
Subclass	6.1 Acutely toxic	6.2 Skin Irritation	6.4 Eye Irritation	6.5 Sensitisation	6.6 Mutagen	6.7 Carcinogen	6.8 Reproductive/developmental	6.9 Target Organ	8.1 Metallic Corrosive	8.2 Skin Corrosive	8.3 Eye Corrosive	9.1 Aquatic toxicity	9.2 Soil	9.3 Terrestrial Vertebrates	9.4 Terrestrial Invertebrates
	Acute		Carcinogen						Aquatic Soils						
Hazard	6.1A	6.3A	6.4A	6.5A	6.6A	6.7A	6.8A	6.9A	8.1A	8.2A	8.3A	9.1A	9.2A	9.3A	9.4A
Most toxic	6.1B	6.3B		6.5B	6.6B	6.7B	6.8B	6.9B		8.2B		9.1B	9.2B	9.3B	9.4B
	6.1C						6.8C			8.2C		9.1C	9.2C	9.3C	9.4C
	6.1D											9.1D	9.2D		
Least toxic	6.1E														




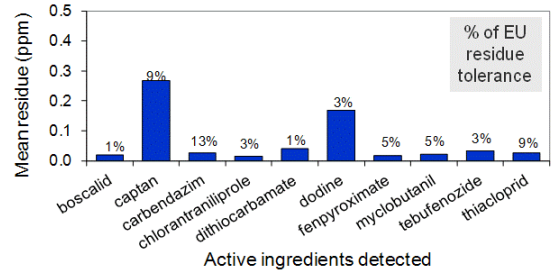


Apple Futures: ultra-low residue-free fruit production

Apple Futures – a response to a new EU market challenge

- Target <10% of EU residue tolerances
- Three years and \$3M to develop and implement






Active ingredient	Mean residue (ppm)	% of EU residue tolerance
boscalid	0.01	1%
captan	0.09	9%
carbendazim	0.13	13%
chlorantraniliprole	0.03	3%
dithiocarbamate	0.01	1%
dodine	0.03	3%
fenpyroximate	0.05	5%
myclobutamil	0.05	5%
tebufenozide	0.03	3%
thiacloprid	0.09	9%

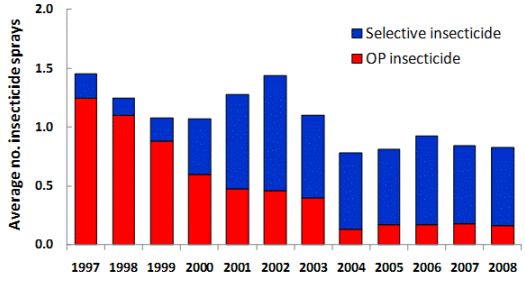
- No insecticide residues at all in ~70% of tests
- NZ apples consistently exceed most private standards

Sustainable winegrowing: SWNZ - sector sustainability outcomes:

Sustainable Winegrowing (SWNZ)


- 1995 - a pilot Integrated Wine Production programme
- 2002 - a comprehensive sustainability programme (SWNZ)
- 2007 - 100% adoption of SWNZ

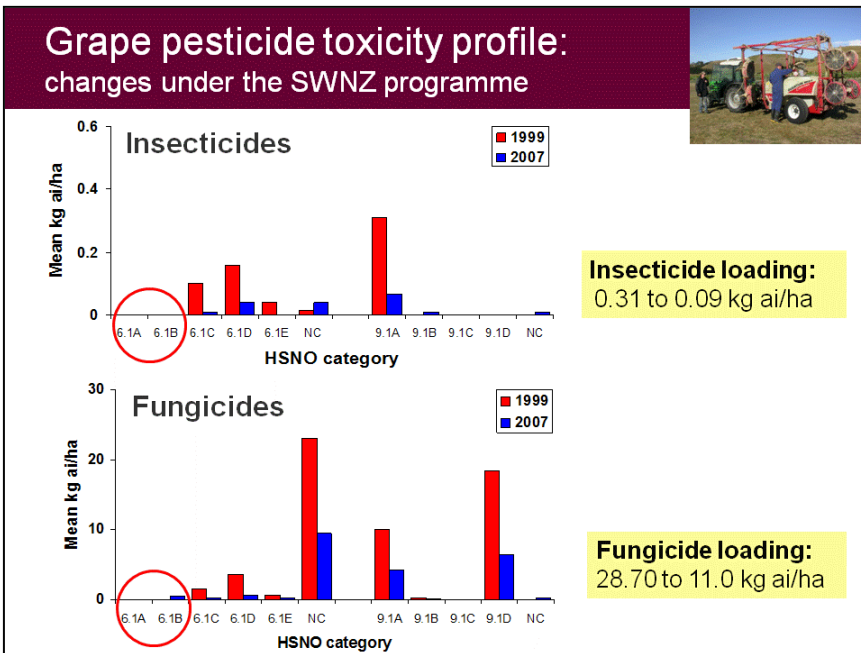
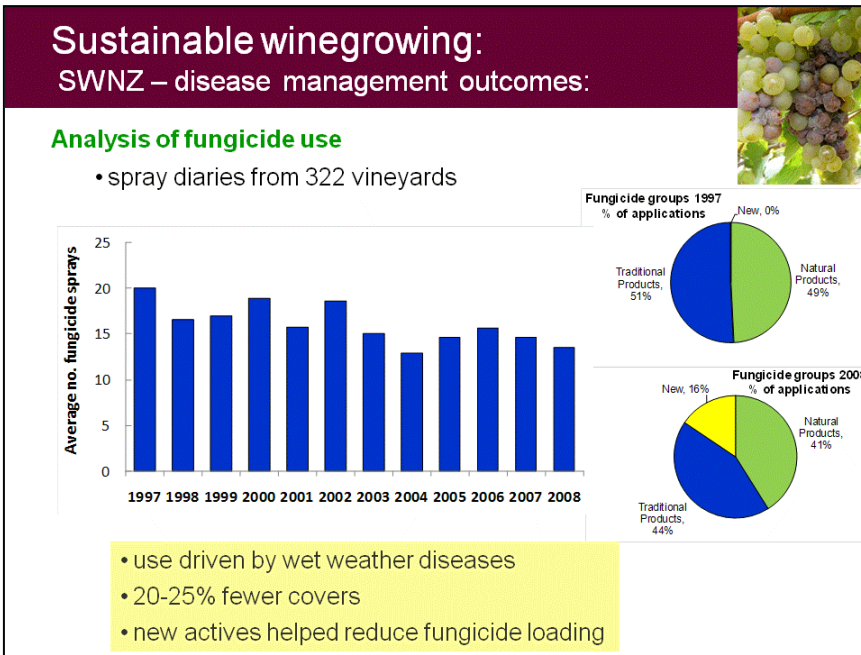




Year	OP insecticide	Selective insecticide	Total
1997	1.2	0.3	1.5
1998	1.1	0.2	1.3
1999	0.9	0.2	1.1
2000	0.6	0.5	1.1
2001	0.5	0.8	1.3
2002	0.4	1.0	1.4
2003	0.4	0.7	1.1
2004	0.1	0.7	0.8
2005	0.2	0.6	0.8
2006	0.2	0.7	0.9
2007	0.2	0.6	0.8
2008	0.2	0.6	0.8

- 43% reduction in insecticide covers





Summerfruit: SummerGreen IFP constraints in small sectors

Summerfruit IFP





- commenced in 1998
- launched as SummerGreen in 2001

Key regions

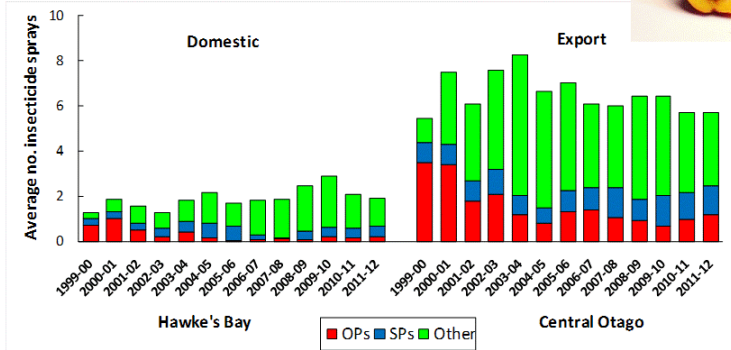
- Otago – primarily export focussed
- Hawke's Bay - focussed on the domestic market

IFP challenges

- a small sector with 5 product groups
- must meet phytosanitary export requirements
- access to new pesticides delayed by registration
- lack of residue tolerances impact on marketing plans
- sector support for research implementation
- local market issues vs export market issues

SummerGreen: insecticide issues for minor sectors:




Domestic production

- minimal insecticide use

Export production

- to achieve 'quarantine control'
- OP use - access to new actives
- compliance with residue tolerances



**Conclusions:
Sustainability and pesticide risk reduction:**



New Zealand's sustainability initiatives

- sector initiated, sector led programmes

Market drivers

- market regulations vs supermarket demands
- potential loss or regulatory cancellation of pesticides

Pest vs disease management

- diversity of pest management tactics
- maritime weather limits disease management

Issues for small export sectors

- access to new crop protection products
- delays in international residue tolerances

Biosecurity threats to sustainability

- perils of globalisation - trade and tourism
- access to appropriate products and new biocontrols

Thank you

The New Zealand Institute for Plant & Food Research Limited

Plant & Food
RESEARCH
RANGAHAU AHUMĀRA KAI




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Presentation 4
Pesticide industry: Measuring IPM: a tool for measuring uptake and identifying gaps
by Keith Jones, CropLife International




Measuring IPM: a tool for measuring uptake and identifying gaps

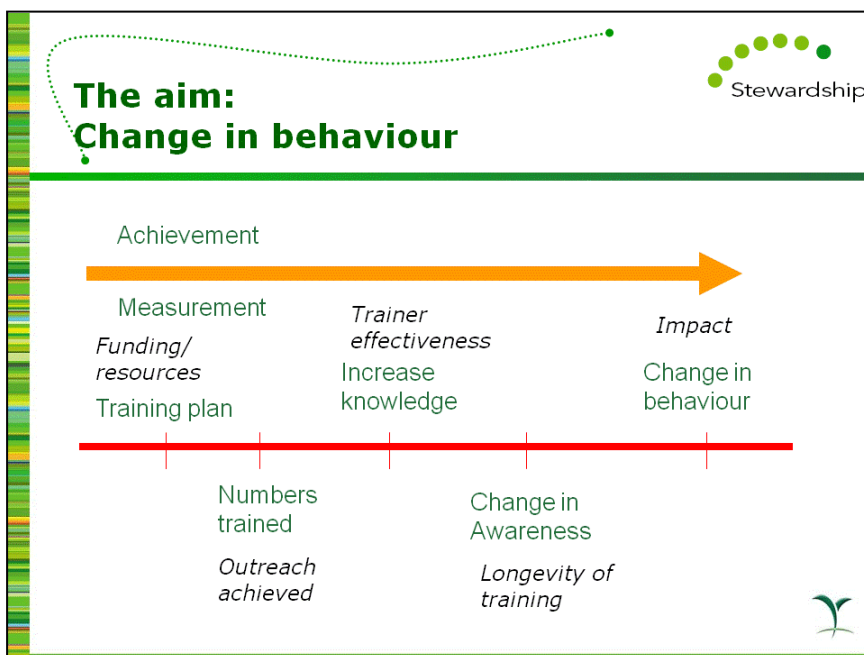
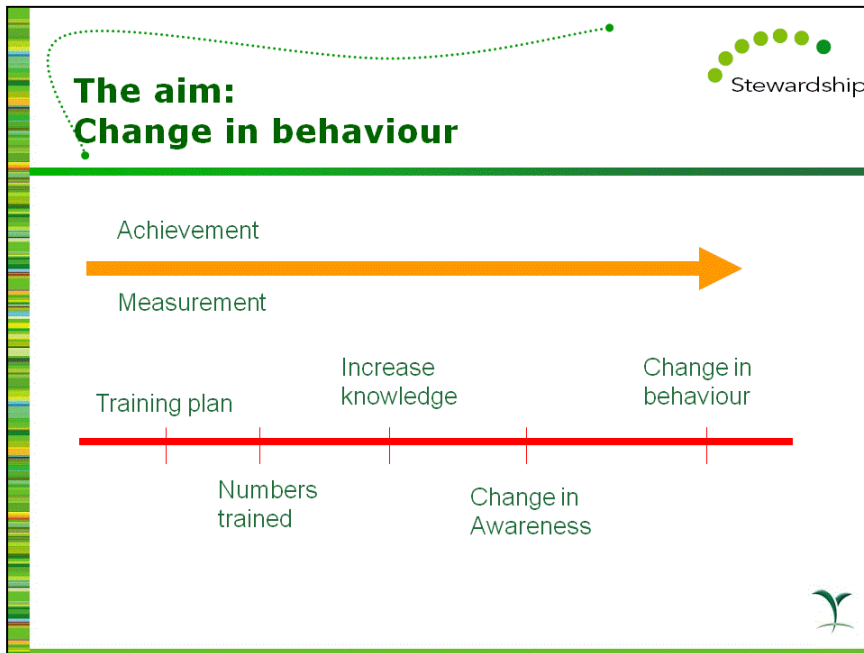
Keith Jones, Director, Stewardship & Sustainable Agriculture,
CropLife International
Martin Gibson, Stewardship Director, CropLife Asia

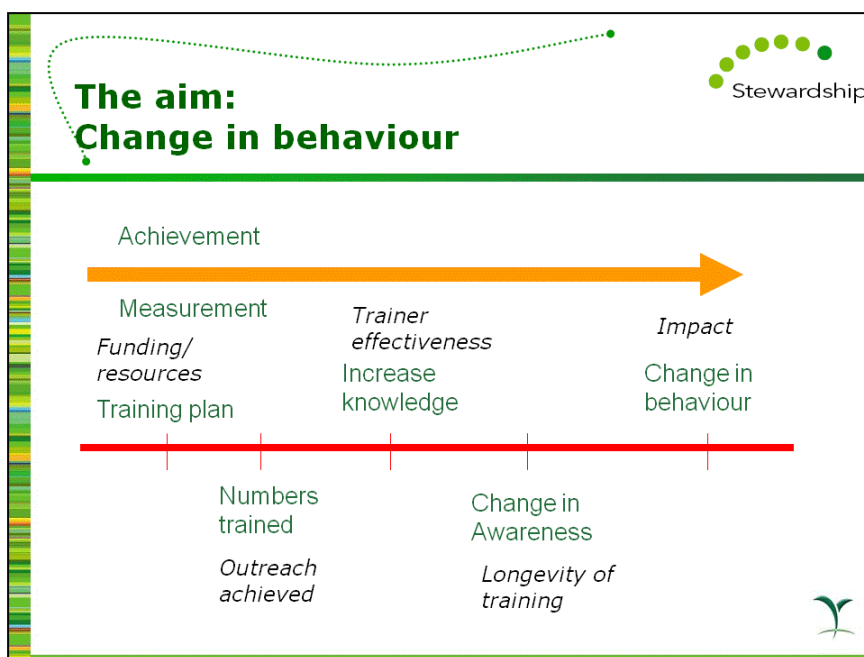


Measuring Impact



- The goal of IPM is to manage pests
- Uptake of IPM can:-
 - Increase yields
 - Reduce losses
 - Increase incomes
 - Reduce environmental impacts
 - Reduce human health risks
 - Eliminate unnecessary pesticide use
- The above are outcomes not goals!










-
- What to measure: Farm Surveys**
- Farmer status: education, family, land tenure....
 - Farm profile: crops, practices, pests...
 - Productivity & economics: yields, income/expenditure....
 - **Pest management practices**
 - **Pesticide management**
- Stewardship




How to measure: Farm level?

- National/local statistics
- Formal audits
- **Surveys: participatory, non-leading questions**
- Observation




Examples of questions


- What natural enemies do you find in your crops?
- How do you encourage natural control/preserve natural enemies?
- What dictates pest control interventions?
- Name an IPM intervention?
- What PPE do you wear when applying pesticides?
- How do you prevent pesticide resistance?




Who should measure?




- Responsible third parties



Resources?



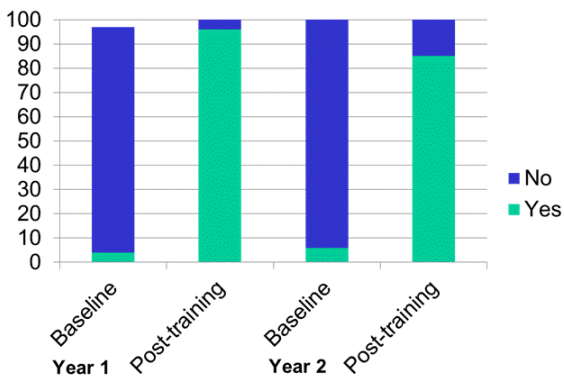

- Balance between statistically valid results and cost



Analyzing results - standard impact




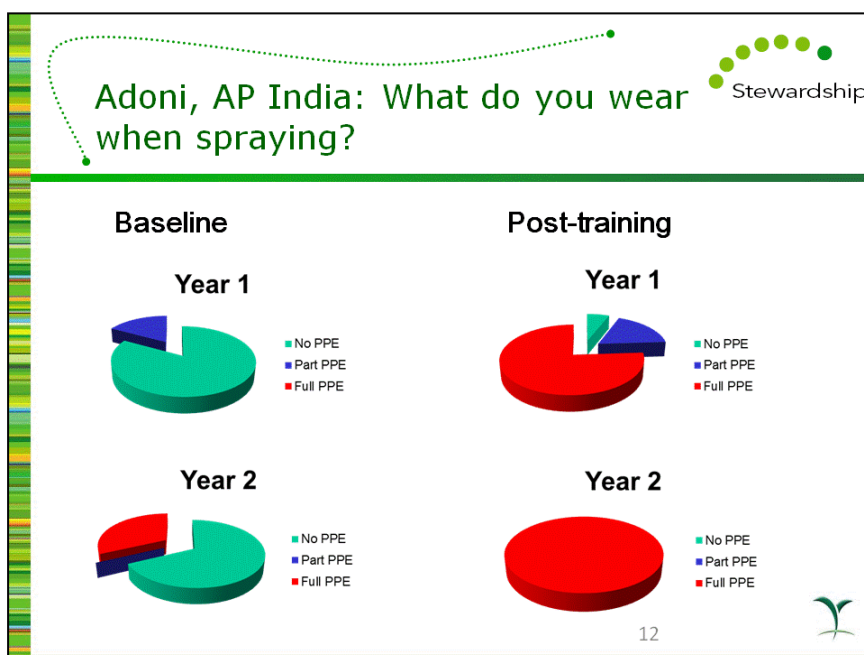
Adoni, AP India: Identification of beneficial insects



Year	Phase	No (%)	Yes (%)
Year 1	Baseline	95	5
	Post-training	2	98
Year 2	Baseline	95	5
	Post-training	15	85


11






- ### Stewardship
- ## Analyzing results – uptake matrix
- Plotting uptake of IPM and responsible use practices on a matrix
 - Visualizes current status
 - Highlights areas to be improved
 - Questions are weighted according to importance
 - Positive score for good practices, negative score for bad practices

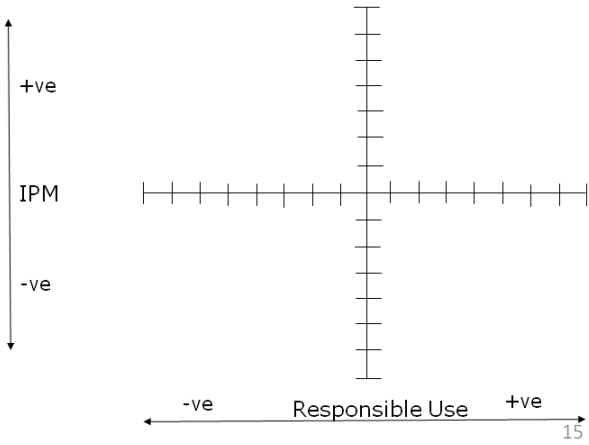

Scoring




- Maintenance of natural enemies: +2
- Intervention based on observation/predictive model: +/-3
- Use of IPM techniques: +1 per technique
- Use of PPE: +/-1 per item
-

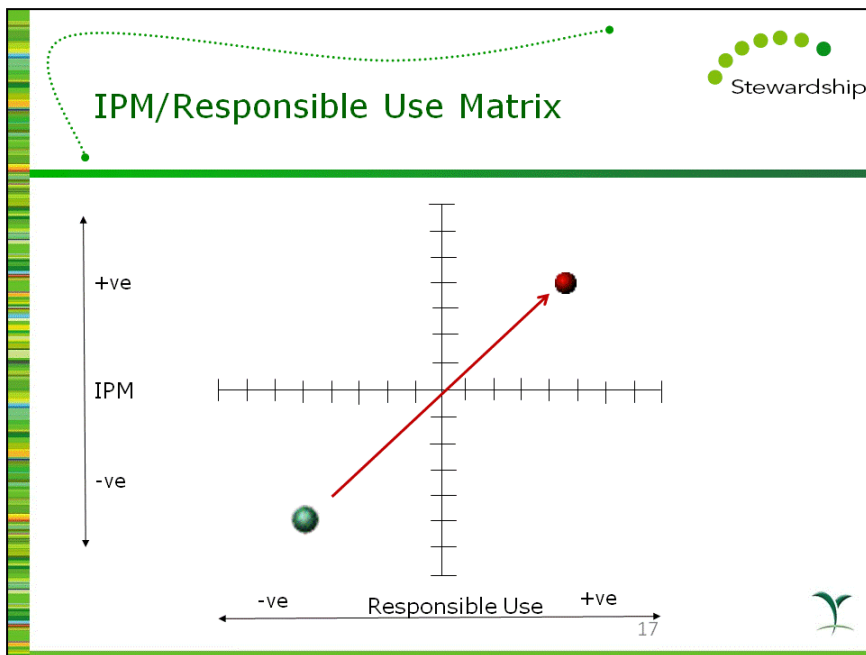
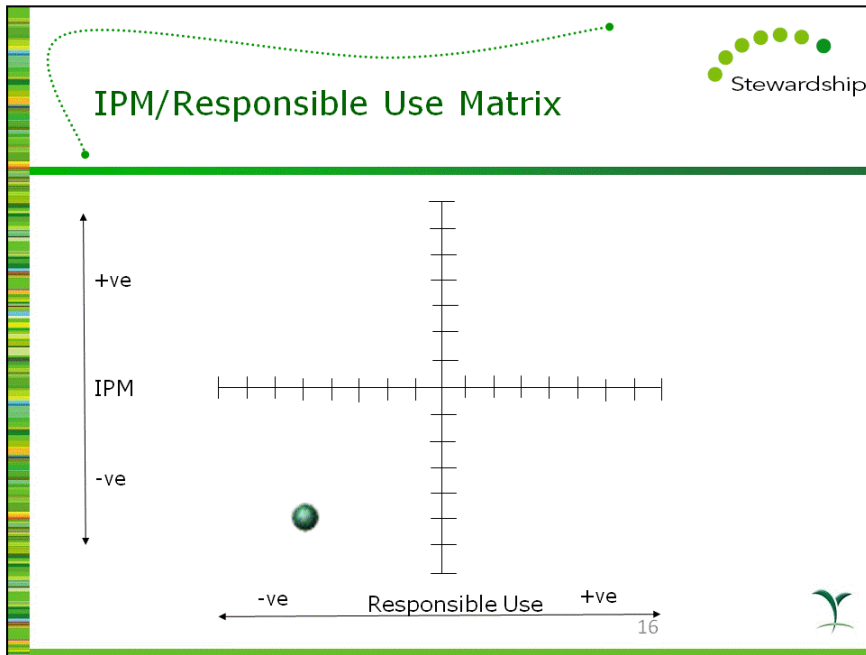


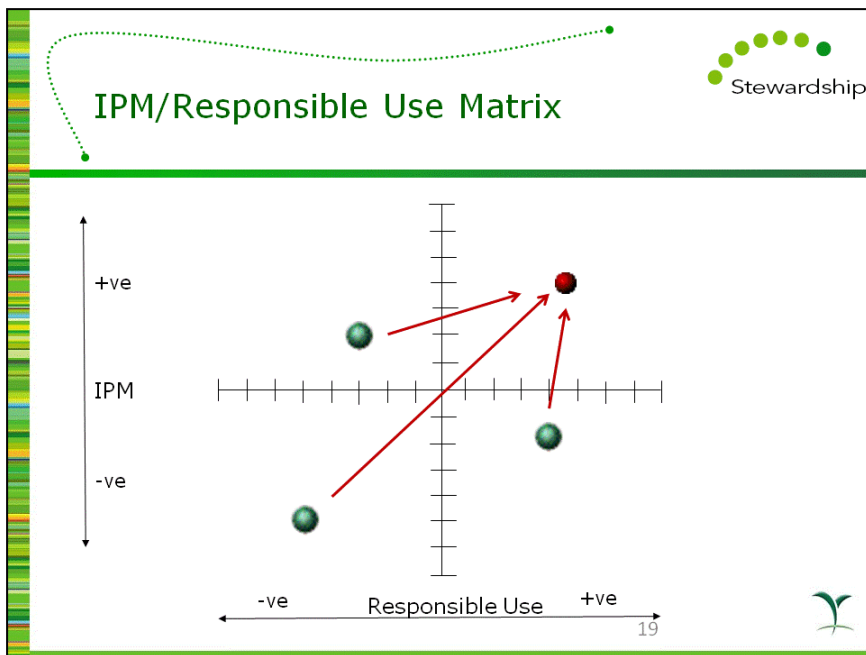
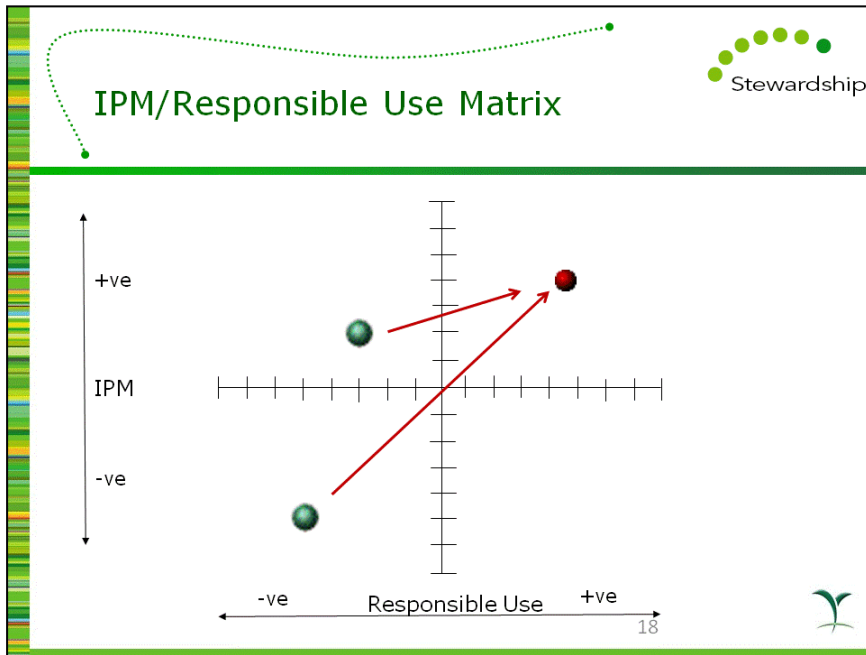
IPM/Responsible Use Matrix

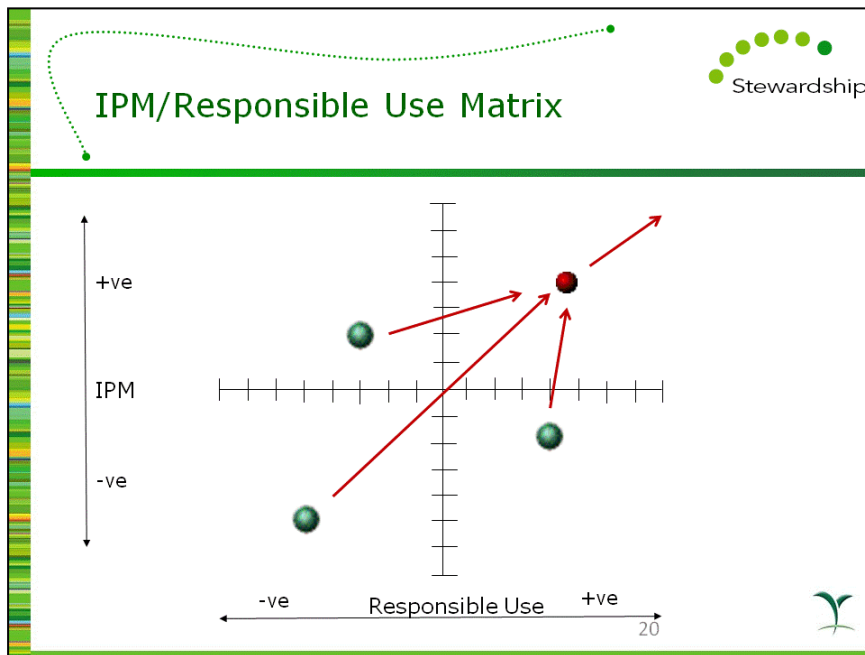


The diagram shows a coordinate system with a vertical axis labeled 'IPM' and a horizontal axis labeled 'Responsible Use'. The vertical axis has an upward arrow labeled '+ve' and a downward arrow labeled '-ve'. The horizontal axis has a leftward arrow labeled '-ve' and a rightward arrow labeled '+ve'. The origin is marked with '15'. A grid of tick marks is drawn across the axes.









- ### Who can be assessed?
- Plantations – *certification requirements*
 - Large –scale farmers – *GAP, export requirements*
 - Small-scale farmers – *improved productivity, income, safety*
-


Stewardship

Current Status

- Testing in tea plantations in India – *tool reflected real situation*

"I wish I had this available when I was undergoing certification"

- *About to test with individual farmers*




Stewardship

Thank You!



Presentation 5
US: IPM: Answering the “So what?” question
by Tom Green, IPM Institute


The IPM Institute
of North America, Inc.

Harnessing Marketplace Power to Improve Health, Environment and Economics


IPM: Answering the “So What?” Question

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www.greenshieldcertified.org
www.ipmvoice.org
www.entfnd.org

2012, 2009 US EPA Sustained Excellence in IPM Award
2009, 2008, 2005, 2004 National Champion, US EPA Pesticide Environmental Stewardship Program
2005 Children’s Environmental Health Recognition Award, US EPA Office of Children’s Health Protection



Outline



The IPM Institute of North America, Inc.

1. IPM Institute
2. IPM uptake/adoption indicators: US Land Grant University approaches since 1981.
3. National IPM Evaluation Group/Logic Models
4. USDA NRCS Conservation Effects Assessment Program
5. Use in commercial settings: ag and communities
6. Recent NGO innovations

Harnessing Marketplace Power to Improve Health, Environment and Economics

3



The IPM Institute of North America, Inc.

Harnessing marketplace power to improve health, environment and economics

Agriculture **Communities**



Good things come from Sysco



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ipm INTEGRATED PEST MANAGEMENT



GREEN SHIELD CERTIFIED
Pest control. Peace of mind.



Check Strip
BMP Strips



PARTNERSHIP for AG RESOURCE MANAGEMENT
sustainability | profitability | science



Eighth International IPM Symposium
March 2015, Salt Lake City

IPM is a continuum!



Harnessing Marketplace Power to Improve Health, Environment and Economics

I'm the real IPM baby!



Harnessing Marketplace Power to Improve Health, Environment and Economics

So, how much IPM do you do?



Proper use of monitors?






Sanitation services such as removing vegetation too close to buildings?

Rodent, wildlife – proofing; termite, carpenter ant, honey bee damage repair?



IPM Elements/Guidelines



The IPM Institute of North America, Inc.

= Lists of IPM and related practices. Also known as IPM checklists, protocols, standards, definitions.

Used to:

- Assess level of adoption/uptake.
- Identify potential practices to adopt
- Provide incentives for specific practices.
- Identify practices that suffer low adoption, to identify and address barriers.

Boutwell, J.L. and R.H. Smith. 1981. A new concept in evaluating integrated pest management programs. *Bull. Entomol. Soc. Amer.* 27(2) 117-188.

Coli, W.M. and C.S. Hollingsworth. 1996. Defining the ambiguous: Massachusetts' crop-specific IPM guidelines allow growers to understand and benefit from their pest management programs. *The Grower*, April 1996, pp. 48-49, 58.

Petzoldt, C., J. Kovach and A. Seaman. 1998. *Integrated Pest Management Elements for New York Crops*. Cornell IPM Publication #124.

Harnessing Marketplace Power to Improve Health, Environment and Economics

8



NEW YORK STATE
Integrated Pest Management
PROGRAM



Cornell University
Cooperative Extension

Elements of IPM for Fresh Market Sweet Corn in New York State

Listing the major pests lets the reader assess how closely these match up with pests at their location.

MAJOR PESTS		
Insects	Diseases	Weeds
European corn borers	common rust	brodiaeas
corn earworm	smut	annual grasses
fall armyworm	northern corn leaf blight	perennials
corn flea beetle	Stewart's wilt	
corn leaf aphid	anthracnose	
western corn rootworm	maize dwarf mosaic	
seed corn maggot	seed rot	
cornworm	holley yellow dwarf virus	
striped thrips		

Crop and geographic scope.

In this example, practices are prioritized by importance. Users earn more points for practices that are more likely to improve health, environmental or economic impacts.

A. Site Preparation	Priority	Points	Acres/Goal	Achieved
1) Review weed map/list of fields to choose appropriate weed control strategies. See the Weed Assessment List available for use in auditing this element.	M	5	50%	2.5
2) Crop Rotation: Plant only in fields where sweet or field corn has not been grown in the previous year to avoid corn root worm, anthracnose, smut, and northern corn leaf blight.				
a. Fields harvested before Aug. 15:	L	2	25%	
b. Fields harvested after Aug. 15:	H	10	75%	
3) Soil test at least every three years; fertilize accordingly to recommendations.	H	10	100%	
B. Planting				
1) Use tolerant or resistant varieties whenever possible for controlling common rust, smut, and Stewart's wilt, NCLB, maize dwarf mosaic, holley yellow dwarf	M	5	25%	
2) Seed treatment. Use fungicide treated seed or biological seed treatment for control of root and seed rots.	H	10	100%	

In this case, users can receive five points for implementing this element on 50% of their acreage.

The user enters points scored, e.g., this practice was completed on 25% of the producer's total acreage.

Points allow developers to signal priority or level of difficulty, and users the flexibility to pick and choose practices that fit their operation.



Nutrient management practices are included. Although not typically considered an IPM practice, nutrient management addresses water quality concerns and can also impact pest populations, e.g., excessive nitrogen can sometimes flare aphid populations.


Guide to IPM Elements and Guidelines

9

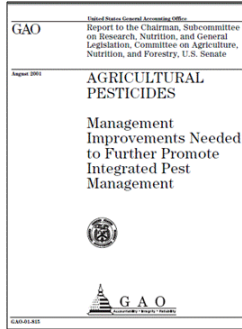
Available LGU Elements/Guidelines

<ul style="list-style-type: none"> Alfalfa (New York) Alfalfa (Ohio) Apple (Massachusetts) Apple (Ohio) Apples (New York) Asparagus (New York) Banana (Hawaii) Beets (New Jersey) Beets (New York) Blueberries (New York) Blueberry, Highbush (Massachusetts) Brussels Sprouts (New York) Cabbage (New Jersey) Cabbage (New York) Cabbage (Ohio) Carrot (Ohio) Carrots (New Jersey) Carrots (New York) Cauliflower (New Jersey) Cauliflower (New York) Cherry (Ohio) Christmas Trees (North Carolina) Christmas Trees (Virginia) Cole Crops (Massachusetts) Corn, Field (New York) Corn, Field (Ohio) Corn, Sweet (Ohio) Cranberry (Massachusetts) Cucumber (New York) Cucumber (Pickles) (Ohio) Cucumbers (New Jersey) Dry Beans (New York) Grapes (New York) Greenhouses (New York) 	<ul style="list-style-type: none"> Honey Bees (Delaware) Honey Bees (Maryland) Honey Bees (New Jersey) Honey Bees (North Carolina) Honey Bees (Pennsylvania) Honey Bees (South Carolina) Honey Bees (Virginia) Honey Bees (West Virginia) Lettuce (New York) Lettuce (Ohio) Macadamia Nut (Hawaii) Melon (New York) Melons (New Jersey) Onions (New York) Peach (Ohio) Pear (Ohio) Peas (New Jersey) Peas (New York) Pepper (Massachusetts) Pepper (Ohio) Peppers (New Jersey) Peppers (New York) Pineapple (Hawaii) Plum (Ohio) Poinsettia (Massachusetts) Potato (Massachusetts) Potato (Ohio) Potatoes (New York) Pumpkin (Massachusetts) Pumpkin (New York) Pumpkin (Ohio) Pumpkins (New Jersey) Radish (Ohio) Raspberries (New York) 	<ul style="list-style-type: none"> Raspberry (Massachusetts) Residential Turfgrass (Ohio) Snap Bean (Ohio) Snap Beans (New Jersey) Snap Beans (New York) Soybean (Ohio) Squash (Massachusetts) Squash (Ohio) Strawberries (New York) Strawberry (Massachusetts) Sugarcane (Hawaii) Summer Squash (New Jersey) Summer Squash (New York) Sweet Cherries (New York) Sweet corn (Massachusetts) Sweet corn (New Jersey) Sweet Corn, Fresh Market (New York) Sweet Corn, Processing (New York) Tomato, Field (Massachusetts) Tomato, Greenhouse (Massachusetts) Tomato, Processing (Ohio) Tomatoes (New Jersey) Tomatoes, Fresh Market (New York) Tomatoes, Greenhouse (New York) Wheat (Ohio) Wine Grapes (Massachusetts) Wine Grapes (North Carolina) Wine Grapes (Virginia) Winter Squash (New Jersey) Winter Squash (New York)
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<http://www.ipmcenters.org/ipmelements/index.cfm>



2001: US GAO Report



www.gao.gov/new.items/d01815.pdf

“USDA estimates that IPM has been implemented on about 70% of crop acreage, but **USDA has not focused IPM on meaningful outcomes.**”

“Implementation of biologically-based IPM practices is limited.”

“IPM has resulted in some environmental and economic benefits, but **use of the riskiest pesticides remains substantial.**”

USDA response:

While reducing pesticide use in agriculture was one goal articulated in the 1993 initiative, it is widely recognized that IPM offers many positive economic, human health, and environmental benefits in addition to those that might accrue from simply reducing pounds of pesticides used.

And...



NATIONAL ROAD MAP FOR INTEGRATED PEST MANAGEMENT May 17, 2004

#1 Integrated Pest Management, or IPM, is a long-standing, science-based, decision-making process that identifies and reduces risks from pests and pest management related strategies. It coordinates the use of pest biology, environmental information, and available technology to prevent unacceptable levels of pest damage by the most economical means, while posing the least possible risk to people, property, resources, and the environment. IPM provides an effective strategy for managing pests in all arenas from developed agricultural, residential, and public areas to wild lands. IPM serves as an umbrella to provide an effective, all encompassing, low-risk approach to protect resources and people from pests.

<http://www.ipmcenters.org/ipmroadmap.pdf>

<http://www.ipm.gov/LogicModels/index.cfm>

#2

IPM Planning and Evaluation

What defines a successful integrated pest management (IPM) program? How can we develop programs that will achieve our IPM goals? And how do we assess the true worth of an IPM program? These questions can be answered by careful planning and by conducting a program evaluation. This website includes resources that can help you plan an IPM program that you will be able to evaluate, so that you can determine its value.

What is the relationship between planning and evaluation?

This site contains 14 detailed examples of planning and evaluation models (also called logic models) to illustrate the relationships among desired:

- Targeted audience
- Short-Term impacts—changes in knowledge
- Intermediate-Term impacts—changes in behavior
- Long-Term impacts—changes in condition

Example includes possible measures that can help you know how well you have achieved each short-, intermediate-, and long-term impact.

Examples below provide examples of impacts and possible measures in different interest areas.

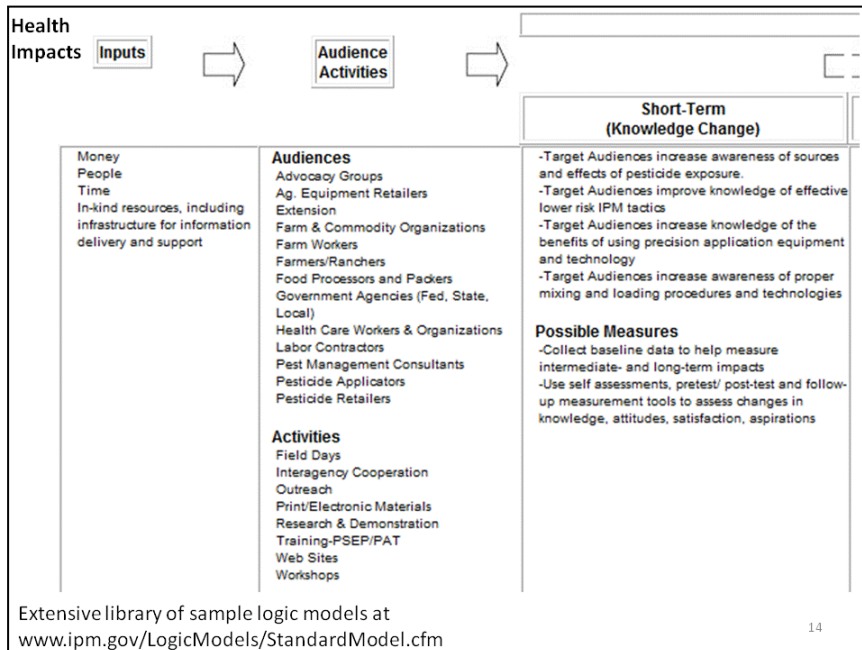
Production Agriculture	Residential and Public Areas		Natural Resources and Recreation
	Indoor pesticide use	Outdoor pesticide use	
<ul style="list-style-type: none"> Environmental impacts <ul style="list-style-type: none"> Water quality Soil quality Health impacts Economic impacts 	<ul style="list-style-type: none"> Health impacts <ul style="list-style-type: none"> Indoor air quality Food Economic impacts 	<ul style="list-style-type: none"> Environmental impacts <ul style="list-style-type: none"> Water quality Soil quality Health impacts Economic impacts 	<ul style="list-style-type: none"> Environmental impacts <ul style="list-style-type: none"> Water quality Soil quality Health impacts Economic impacts

Zooming in...



Production Agriculture	Residential and Public Areas		Natural Resources and Recreational Lands
	Indoor pesticide use	Outdoor pesticide use	
<ul style="list-style-type: none"> Environmental impacts <ul style="list-style-type: none"> Non-target organisms Transgenics Health impacts Economic impacts 	<ul style="list-style-type: none"> Health impacts <ul style="list-style-type: none"> Non-school Buildings Schools Economic impacts 	<ul style="list-style-type: none"> Environmental impacts Health impacts Economic impacts 	<ul style="list-style-type: none"> Environmental impacts <ul style="list-style-type: none"> Water quality Non-target organisms Rights of Way/Water Health impacts Economic impacts

National IPM Evaluation Group: US EPA, USDA, USDA Regional IPM Centers, Land-Grant Universities, others participating



Health Impacts (continued)	Intermediate Term Behavior Change	Long-Term (Condition Change)
	<ul style="list-style-type: none"> -Target Audiences reduce use of highly toxic pesticides -Target Audiences increase use of reduced risk IPM tactics (e.g. cultural, biological, physical controls, etc.) -Target Audiences increase adoption of lower risk application technology (e.g., direct injection sprayers) -Target Audiences increase adoption of PPE, pre-rinsing pesticide clothing -Target Audiences reduce use of highly toxic pesticides -Target Audiences increase use of reduced risk IPM tactics (e.g. cultural, biological, physical controls, etc.) -Target Audiences increase adoption of lower risk application technology (e.g., direct injection sprayers) -Target Audiences increase knowledge of the benefits of using precision application equipment and technology -Target Audiences increase use of proper storage and mixing/loading procedures and technologies -Target Audiences build better storage and mixing/loading facilities <p>Possible Measures</p> <ul style="list-style-type: none"> -Measure increased adoption and implementation of IPM -Measure change in use of higher risk pesticides -Document change in use of lower risk application technology (e.g., direct injection sprayers) -Document changes in use of PPE, etc. -Measure increased adoption and implementation of IPM 	<p>Reduce farmer, farm worker and farm family exposure to and risk from pesticides</p> <p>Possible Measures</p> <ul style="list-style-type: none"> -Measure change in number of cases and severity of worker exposure incidents -Measure change in number of pesticide poisonings -Measure and maintain baseline cholinesterase levels in workers -Measure change in pesticide use from precision ag. equipment <p>www.ipm.gov/LogicModels/StandardModel.cfm</p>

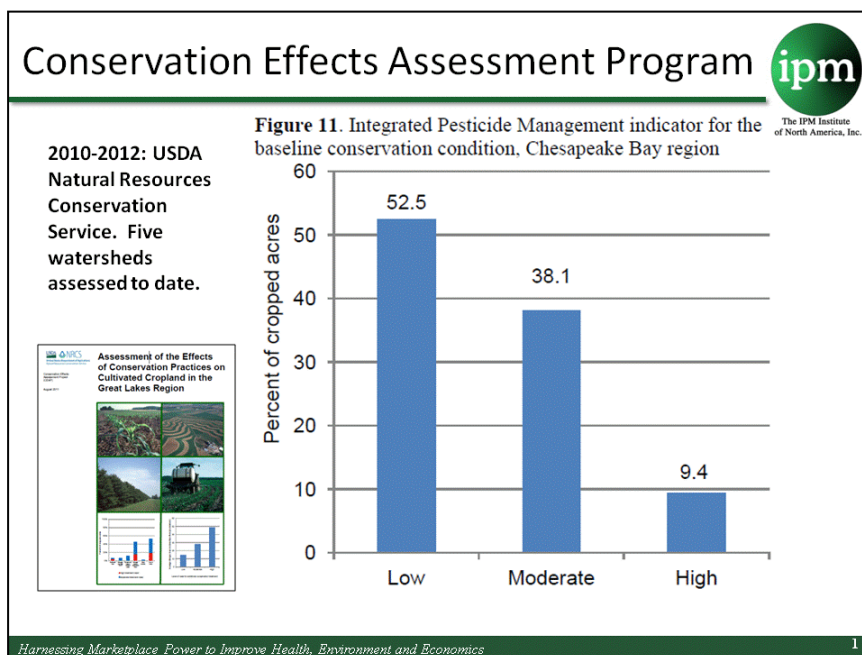

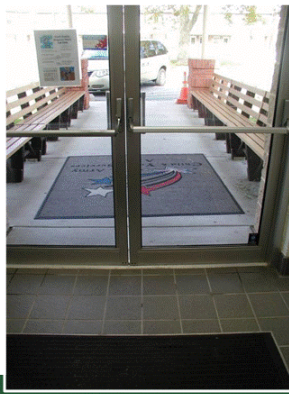



Table 10. Summary of survey responses to pest management questions, Chesapeake Bay region

Survey question*	Number samples with "yes" response	Percent of cropped acres
Prevention		
Pesticides with different action rotated or tank mixed to prevent resistance	252	33
Plow down crop residues	133	20
Chop, spray, mow, plow, burn field edges, etc.	264	33
Clean field implements after use	272	35
Remove crop residue from field	72	10
Water management used to manage pests (irrigated samples only)	12	1
Avoidance		
Rotate crops to manage pests	531	66
Use minimum till or no-till to manage pests	482	56
Choose crop variety that is resistant to pests	299	34
Planting locations selected to avoid pests	109	12
Plant/harvest dates adjusted to manage pests	53	6
Monitoring		
Scouting practice: general observations while performing routine tasks	278	36
Scouting practice: deliberate scouting	366	44
--Established scouting practice used	156	19
--Scouting due to pest development model	62	8
--Scouting due to pest advisory warning	99	9
Scouting done by: (only highest of the 4 scores is used)		
--Scouting by operator	221	27
--Scouting by employee	2	<1
--Scouting by chemical dealer	86	10
--Scouting by crop consultant or commercial scout	63	7
Scouting records kept to track pests?	140	17
Scouting data compared to published thresholds?	221	26
Diagnostic lab identified pest?	58	6
Weather a factor in timing of pest management practice	250	31

IPM STAR for Schools

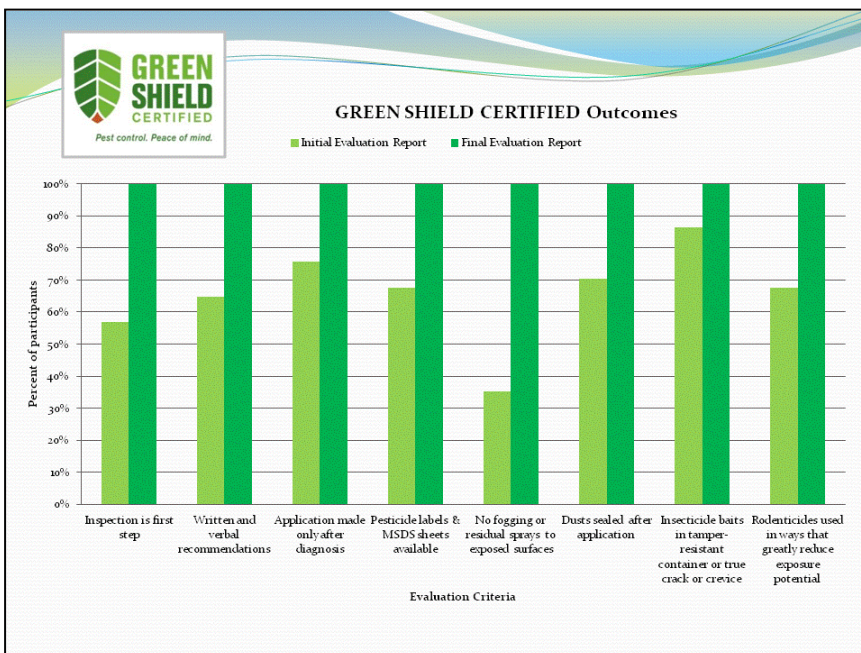
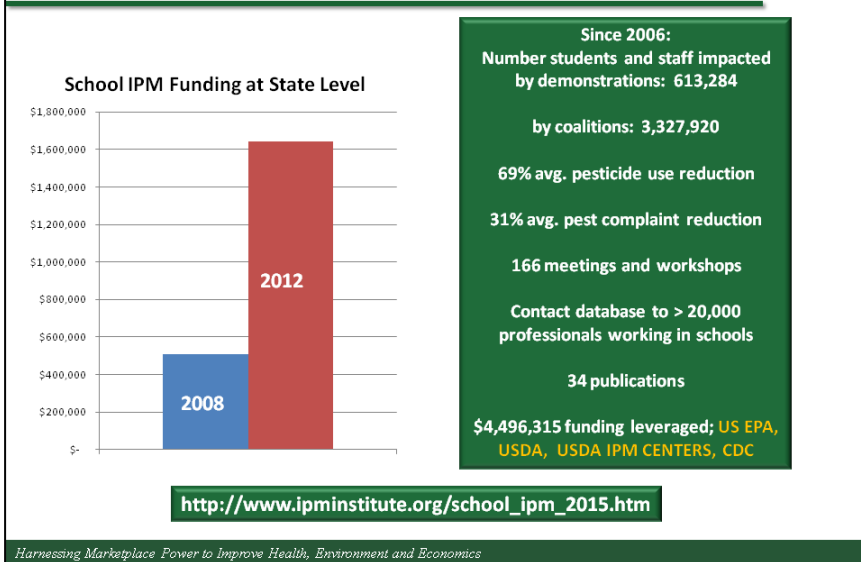
- Monitoring
- Sanitation
- Exclusion
- Pesticide use/storage
- **38% were out of compliance with own policy or legal requirements for applicator qualifications, posting, MSDS/labels, etc.**
- **38% had unmanaged pest problems**
- **21% had outdated/unregistered pesticides on the shelf**
- **More than 60 school systems and 2 million kids impacted to date. US EPA and USDA funded development.**

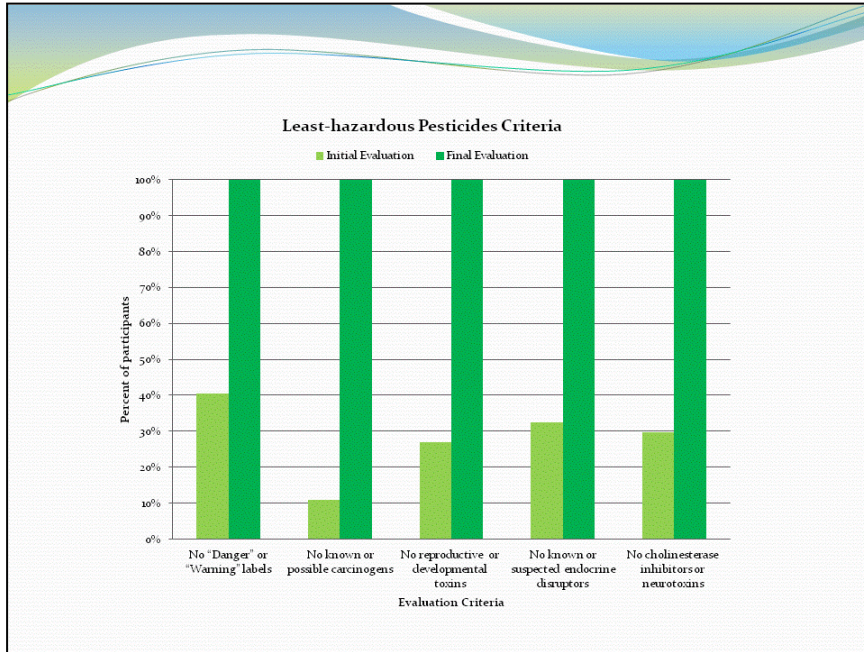





Harnessing Marketplace Power to Improve Health, Environment and Economics

National School IPM Effort, >240 Partners





Corporate Sustainability Initiatives

Sysco Sustainable/Integrated Pest Management Initiative
Environmental Impact Report Summary for the 2010 Processing Season

Key Metrics:

Metric	2010	2009
IPM Usage	100%	0%
IPM Training	100%	0%
IPM Audits	100%	0%
IPM Compliance	100%	0%
IPM Reporting	100%	0%
IPM Documentation	100%	0%
IPM Communication	100%	0%
IPM Collaboration	100%	0%
IPM Innovation	100%	0%
IPM Leadership	100%	0%
IPM Commitment	100%	0%
IPM Accountability	100%	0%
IPM Transparency	100%	0%
IPM Integrity	100%	0%
IPM Respect	100%	0%
IPM Responsibility	100%	0%
IPM Sustainability	100%	0%
IPM Performance	100%	0%
IPM Excellence	100%	0%
IPM Innovation	100%	0%
IPM Leadership	100%	0%
IPM Commitment	100%	0%
IPM Accountability	100%	0%
IPM Transparency	100%	0%
IPM Integrity	100%	0%
IPM Respect	100%	0%
IPM Responsibility	100%	0%
IPM Sustainability	100%	0%
IPM Performance	100%	0%
IPM Excellence	100%	0%

Annual IPM Survey Results

Year:

Country:

IPM Level	Score
Basic	98.24%
Steward	68.97%
Expert	66.74%
Master	41.79%
Index	2.92
# Farms	446

Mean Scores

IPM Level	Mean Score (%)
Basic	98.24%
Steward	68.97%
Expert	66.74%
Master	41.79%

Harnessing Marketplace Power to Improve Health, Environment and Economics

Walmart IPM Pilot

46 distribution centers on green program:

- 16,916 fewer gallons of preventive pesticide applications
- 8421 gallons of pesticide for fogging eliminated in entire network
- 3.1 tons of rodenticide eliminated
- 3234 fewer exterior devices
- 2880 fewer interior devices
- PVC eliminates the replacement of 3.5 devices a month for a total of 2,058 devices (1.71 tons of landfill waste).



Harnessing Marketplace Power to Improve Health, Environment and Economics

IPM Eco-labels

Eight sustainable agriculture programs requiring IPM of participants reported 40.4 million certified US acres and 375.7 million worldwide in 2011.

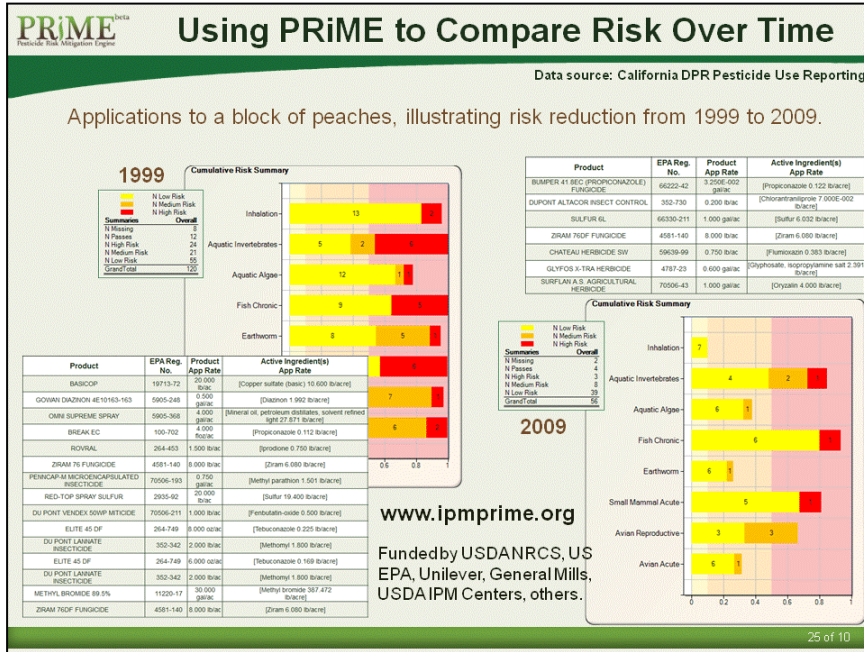
- [Food Alliance](#)
- [Rainforest Alliance](#),
- [Forest Stewardship Council](#)
- [Protected Harvest](#)
- [Northeast Eco Apple](#)
- [Central Coast Vineyard Team](#)
- [Low Input Viticulture and Enology \(LIVE\)](#)
- [Salmon Safe](#)

eco apples
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Meats, dairy, fruits and vegetables, wine and cut flowers. www.ipminstitute.org/links.htm

Harnessing Marketplace Power to Improve Health, Environment and Economics



Thank you!



Funders: Great Lakes Protection Fund
US EPA, USDA, USDA NIFA Regional IPM Centers
Sysco, McDonald's, ConAgra/Lamb Weston, Simplot, McCain Foods, Unilever, General Mills
Additional clients, members and supporters

Collaborators: American Farmland Trust, BCS, Carleton University, National School IPM Working Group, NRCS and IPM Working Group, NRDC, Oregon State University, Pesticide Research Institute, Red Tomato, University of Wisconsin

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Matthew Doyle Olson, M.A., Project Coordinator
Laura Geller, Project Assistant
Samson Gimui, M.S., Systems Engineer
Leigh Presley, Project Assistant
Wade Pronschinske, M.A., Technical Manager
Rebecca Ressler, Project Coordinator
Jodi Schmitz, Project Assistant
Caitlin Seifert, Project Coordinator
Peter Werts, Project Coordinator

Presentation 6

BioPesticide industry: How the biocontrol industry contribute to and view IPM indicators
by David Cary, IBMA

How the biocontrol industry contribute to and view IPM indicators

David Cary, Executive Director, IBMA



History of IPM and lack of adoption

- ▶ In existence since mid 20th century
- ▶ Many growers practice it without knowing it
 - Oh yeah, I monitor, I rotate crops, I don't plant till after first, I don't use that spray anymore as I get other problems
- ▶ Often practised as a consequence
 - Resistance
 - Secondary pest flare
 - Legislation removing products
 - Invasive pest species
- ▶ Low market engagement
 - Not an area of focus by the consumer until recently

November 2012



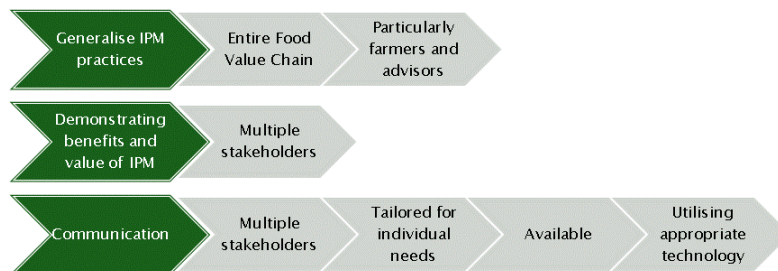
What has led to a more rapid introduction?

- ▶ Plant Care concepts based on a better integration of all involved tools such as biological, resistant plants and agronomical techniques
- ▶ The extremely fast discovery and development of new electronic tools (internet, satellites communication, information technologies etc...) .
- ▶ The growing concern of consumers about the health risks attached to pesticides residues
- ▶ The commitment of the fresh product retailers (supermarkets), NGO's and the food industry in the promotion of new sustainable, biologically based IPM programs (GlobalGap IPM Tool Box- 2010)
- ▶ The progress in industry of the discovery, development and lower cost production of biocontrol agents

November 2012



IBMA view on the aim of IPM indicators



November 2012



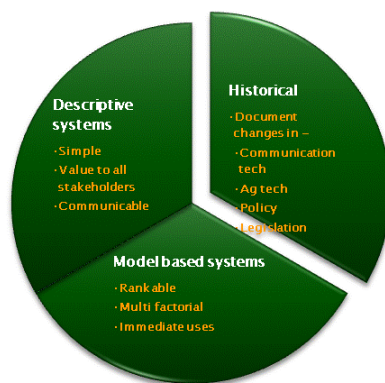
Desirable attributes of IPM indicators

- ▶ Simple
- ▶ Facilitate ranking
- ▶ Multi factorial
- ▶ Immediately valuable
- ▶ Low Cost
- ▶ Good compliance
- ▶ Valuable to all stakeholders
- ▶ Communicable

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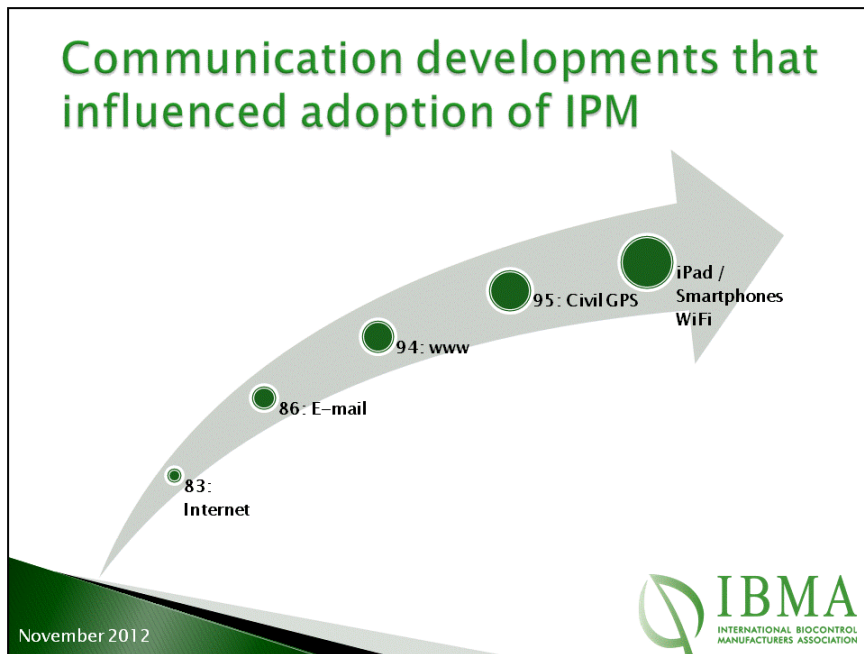


IBMA view on types of IPM indicators



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The indicators have to have value to the stakeholder

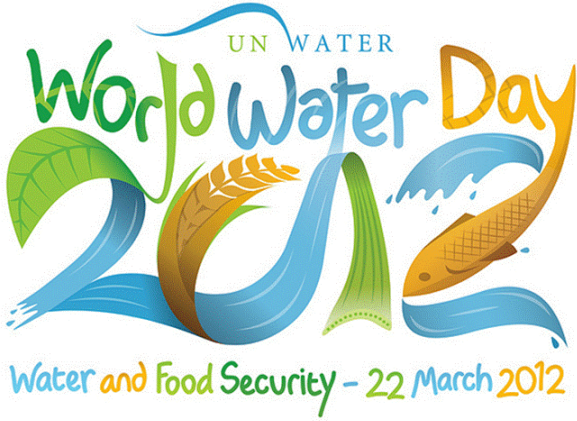
- ▶ Range of indicators
- ▶ Simple to understand and see trends
- ▶ Comparable
- ▶ Usable in OECD and non-OECD countries alike

- ▶ What does the phrase “We have seen a 5% year on year increase in water quality mean?”

November 2012


IBMA
INTERNATIONAL BIOCONTROL
MANUFACTURERS ASSOCIATION

To the scientist



UN WATER
World Water Day
Water and Food Security - 22 March 2012

November 2012



To the farmer



November 2012



To the economist



November 2012



To the fisherman



November 2012



Role of Biocontrol Industry

- ▶ Owners of scientific expertise
 - Share expertise and make it available
 - Co-operate more with bodies to use data
- ▶ Owners of biocontrol sales data
 - Share the data in a way that is mutually beneficial to all stakeholders but provides value to contributors
- ▶ Promoters of IPM practices
 - Provide access to toolboxes and working systems
 - Train stakeholders
 - Develop systems with regional / local tweaks
- ▶ IBMA will fully engage in developing, promoting, co-operating and using indicators of IPM

November 2012



Areas of concern

- ▶ **Parallel development of indicators needs to be avoided**
 - Co-ordination with other bodies is essential
- ▶ **Existing information should be incorporated where feasible**
 - This ensures more immediate use can be made of data
- ▶ **Not all measures need to be compared directly**
 - A matrix of combined systems can allow comparison and ranking

November 2012





Thank you, let's use all the tools in the toolbox in IPM systems, show we are using them and that there are benefits for all by using appropriate indicators!

November 2012



Presentation 7

Australia: Exploring the potential IPM indicators for Australia

by Bronwyn Walsh, Department of Fisheries and Agriculture Western Australia



Exploring potential IPM indicators for Australia

A case study from agricultural crops

Bronwyn Walsh, Nancy A. Schellhorn and Sandra McDougall

CSIRO ECOSYSTEM SCIENCES & SUSTAINABLE AGRICULTURE FLAGSHIP
www.csiro.au

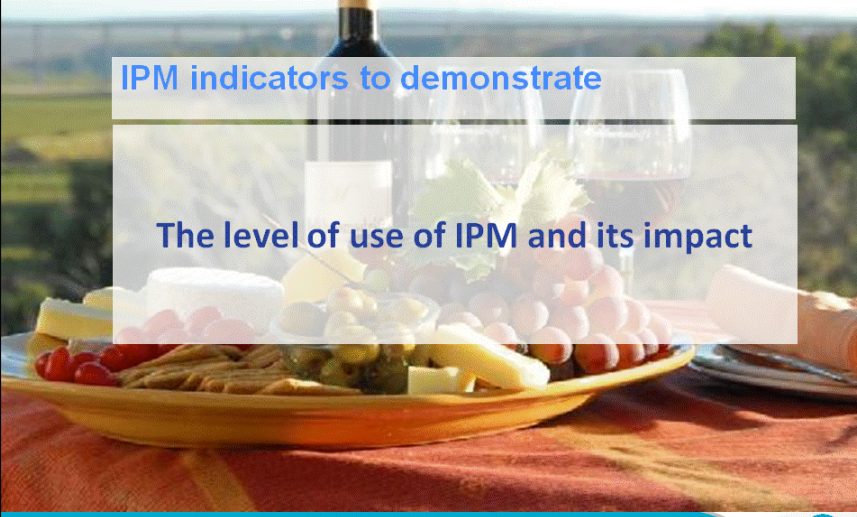
Department of Agriculture and Food
GOVERNMENT OF WESTERN AUSTRALIA

NSW GOVERNMENT
Department of Primary Industries

CSIRO

OECD, IPM Indicators Workshop,
NZ, November 2012

Vision for Australian IPM indicators



IPM indicators to demonstrate

The level of use of IPM and its impact

2 | Exploring potential IPM indicators for Australia | Bronwyn Walsh

CSIRO

Characteristics of indicators

1. **Linked to a Goal(s)**
2. **Clear Definitions: pest, IPM, impact, implementation**
3. **Integrated levels of measurement**
4. **Agreed measures and methodologies amongst stakeholders**

Definitions

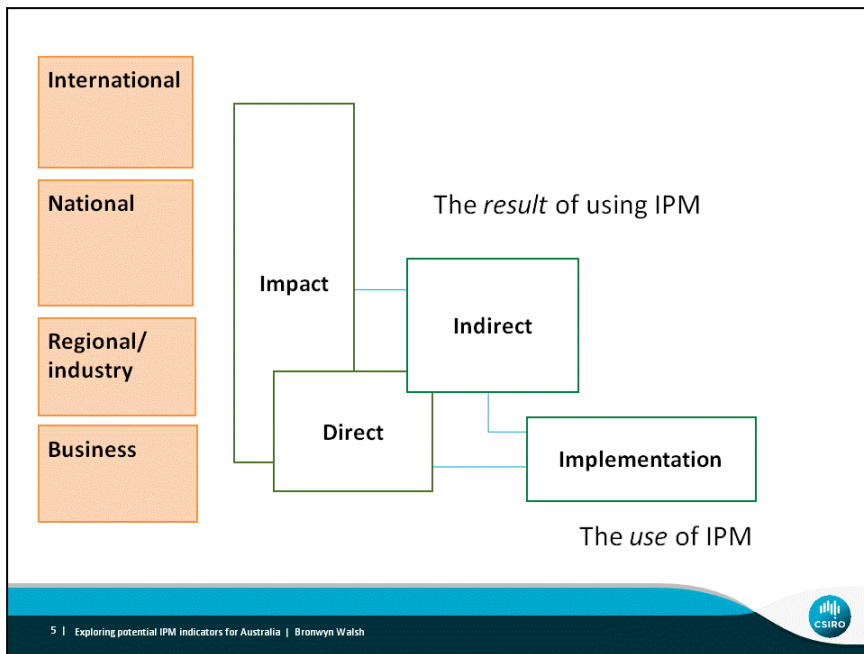
Pest: invertebrates, pathogens and weeds

IPM:

A system approach to pest management – the integrated use of tools for pest management within economic sustainability

These definitions imply the measure should be show

- That more than one practice is being used
- That pests are managed
- That it is cost effective



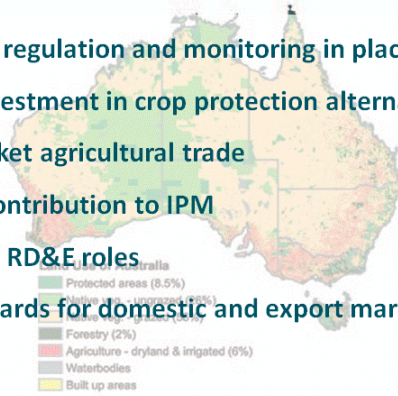
Potential indicators

Indicator Theme
Reduced pesticide use
Profitability
Other management practices
Environmental
Health
Towards change of practice

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Context

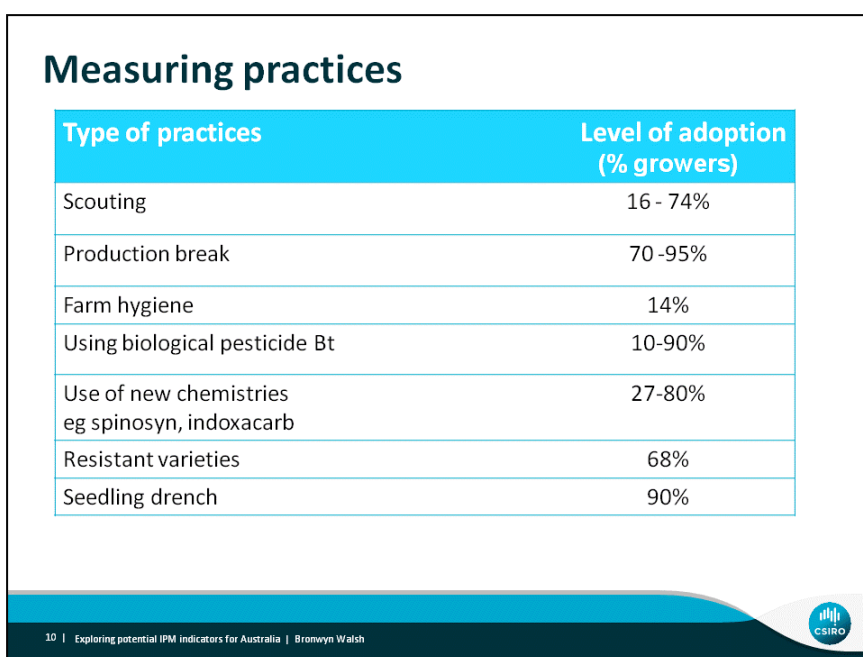
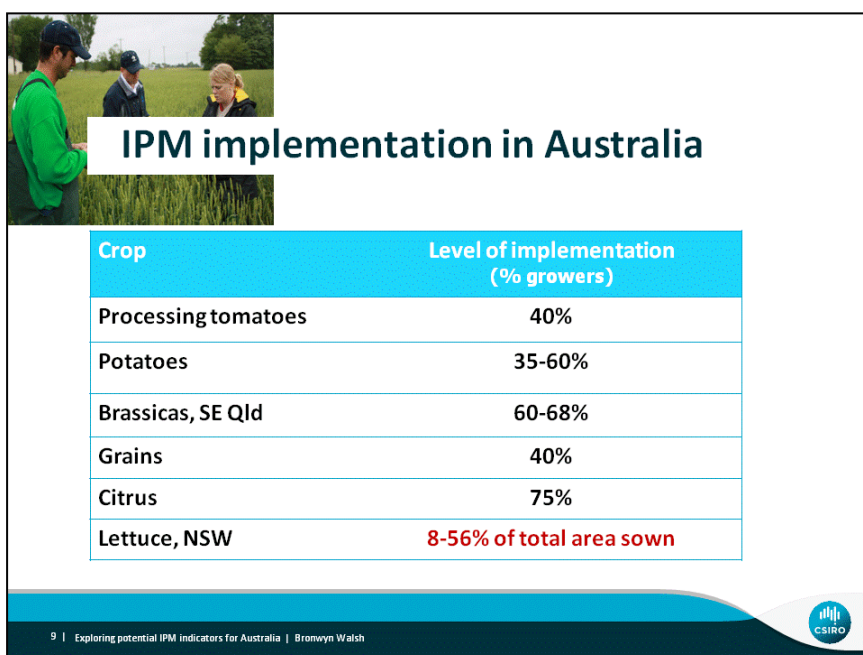
- Pesticide regulation and monitoring in place
- RD&E investment in crop protection alternatives to pesticides
- Free market agricultural trade
- Shared contribution to IPM
- Changing RD&E roles
- QA standards for domestic and export market

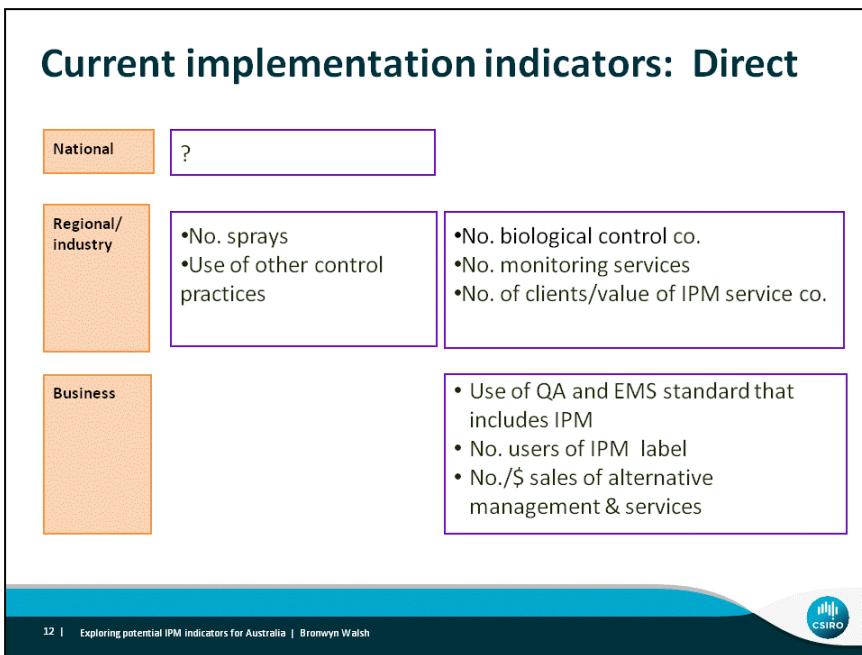
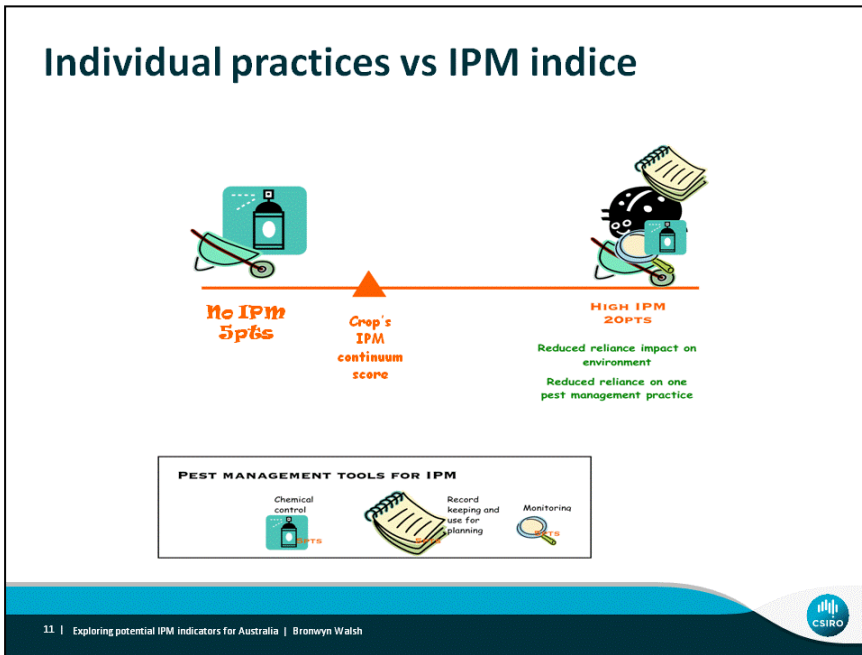


Goals of IPM implementation in Australia

In 1996 the processing tomato industry set a target of 100% adoption of IPM techniques by 2001







Current implementation indicators: Indirect

National	<ul style="list-style-type: none"> No. Sprays Vol. of pesticide Type of spray Sales of pesticides No. Pesticide registered 	<ul style="list-style-type: none"> Amount of R&D being conducted & IPM in research priorities (\$, # people)
Regional/ industry		<ul style="list-style-type: none"> Reduction rate of resistance development No. pest outbreaks Biodiversity in soil or crop Existence of IPM guidelines No. enquiries about IPM No. website hits No. incident reports No. staff being trained Level of staff retention No. using QA & EMS standards
Business	<ul style="list-style-type: none"> Level of awareness No. pest id workshops 	

Goals of impact of IPM in Australia

- Reduced **pesticide** use

In 1991 the Australian Apple and Pear Growers Association made an agreement to reduce pesticide use by 50% by 1996 and 75% by the year 2000.



Achievements:
85% reduction pesticides in cotton
75% reduction in pesticide use in citrus

Current indicators of impact of IPM: Direct

National	<ul style="list-style-type: none"> Biodiversity data Water quality testing results No. health reports of pesticide related illness 	<ul style="list-style-type: none"> No. IPM service companies Profitability of IPM service companies Sales of alternative management and services Use of QA standards that include pest management Profit margin for IPM produced food
Regional/ industry		
Business		

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Current impact of IPM indicators: Indirect

National	<ul style="list-style-type: none"> # Pesticide registrations (preventative) No. MRL violations 	<ul style="list-style-type: none"> Marketable yield Profit margin for IPM produced food No. certified in safe pesticide use practices No. pesticide incident reports
Regional/ industry	<ul style="list-style-type: none"> Dietary intake survey results Drinking water testing results 	
Business	<ul style="list-style-type: none"> Sales of pesticides No. sprays Costs of pesticides Costs of alternative practices 	

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Who collects data

Private

- Farmers
- Wholesalers/supply chain members
- Independent consultants - evaluation R&D impact, monitoring crops
- Pesticide companies
- Resellers
- R&D companies
- Industry owned (9)



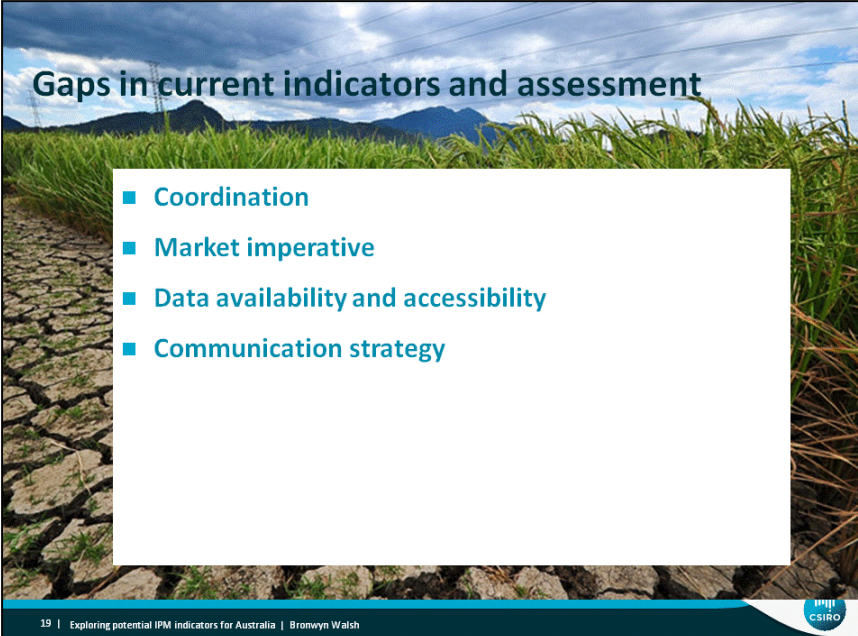
Public

- Australian bureau statistics
- Statutory body – APVMA
- R&D corporations (6)

Why collecting data

To show


- Return on investment in R&D on IPM
- Effectiveness of practices in managing pests for decision making for next season
- IPM works to manage pests
- IPM is cost effective
- IPM reduces pesticide use
- Business performance relative to particular product lines
- Compliance with government, marketplace requirement
- Level of pesticide use nationally



Gaps in current indicators and assessment

- Coordination
- Market imperative
- Data availability and accessibility
- Communication strategy

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Way forward

Build on what we have to build a plan for measuring IPM impact & implementation

1. Establish a goal
2. Link a set of indicators to the goal
3. Coordinate measurement through the levels.
4. Agree on measures and methodologies amongst stakeholders
5. Integrate into data collection tools
6. Integrate into stakeholder responsibilities and resourcing

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Acknowledgements

- CSIRO commonwealth Scientific and Industrial Research Organisation
- Department of Agriculture Fisheries and Food
- State government agriculture departments incl. DAFWA, NSW DPI
- Horticulture, Cotton and Grains funding R&D corporations
- Scholefield and Robinson
- Industry associations

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Agriculture and Food

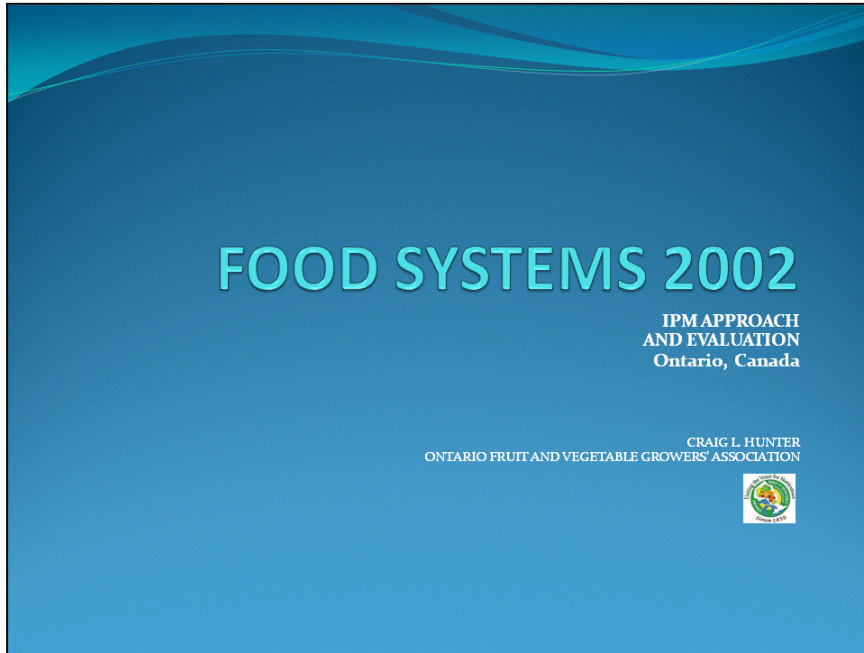


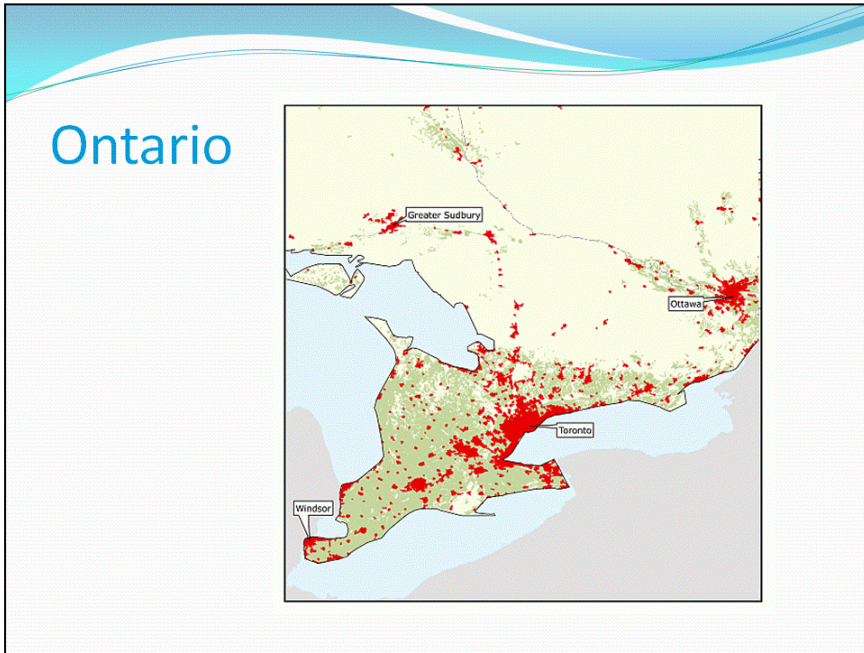
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Primary Industries



Presentation 8
Grower association from Canada: Food Systems 2002, IPM Approach and Evaluation, Ontario
Canada
by Craig Hunter, Ontario Fruit and Vegetable Growers' Association





Outline

- Food Systems 2002 Program
- Measurement Parameters
- Program Analyses Using Four Different Approaches
- Discussion of Results

Food Systems 2002

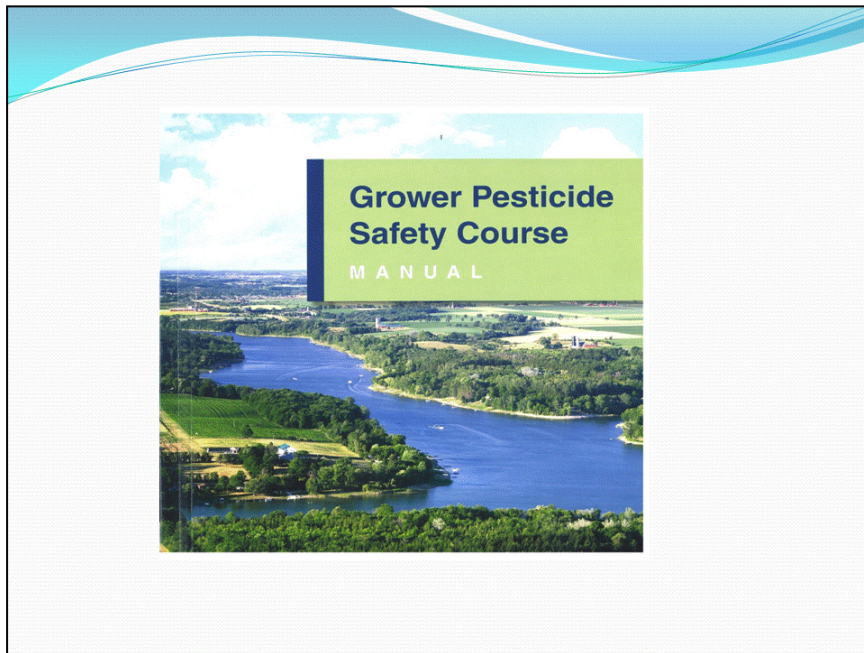
- The program was announced as a political promise- To achieve a 50% reduction in Pesticide Use in 15 years
- It was based on a 3-pronged approach: Research, Education, and Field Delivery of IPM programs
- Sufficient funding was provided to accomplish all factors over the 15 years
- Program development had already started for IPM on some crops based on available monitoring techniques, new sprayer technology and evaluations, the grower pesticide education program was under development, and a first class research infrastructure was in place

IPM Program Uptake

- Growers were very quick to adopt these programs
- IPM became the new 'normal' for pest control on crops where program delivery was available
- Sprayer assessment/calibration was mandatory before program participation by a grower, so sprayer application efficiency improved substantially
- Over 22 crops had IPM programs developed and delivered in the field

Grower Pesticide Certification

- The Grower Certification Program had already been under development, as was a vendor program
- Grower organizations insisted it be made law in 1991, to the surprise of the government!
- Over 25,000 were initially trained – course must be taken every 5 years with mandatory exam, and a 75% pass grade
- Specialized courses were developed for sectors like orchards, greenhouse, field crops etc.
- Courses to train assistant seasonal farm workers by a grower-trainer came later
- Oral training in many languages is also available
- First such courses in Canada



- ## Publications
- Many publications were created during the program
 - These include specific ones for each IPM program, like apple, peach, turf, greenhouse etc.
 - Results from 143 solicited research projects were published, as well as in-house projects
 - Results of Pesticide Use Surveys were published every 5 years
 - The sprayer assessment guide was updated
 - Results of FS 2002 program assessments were also released each 5 years and after the project ended





Program Assessments

- The initial rapid program announcement and development resulted in having no prior agreed-upon measurement for 'success' or 'failure'
- Later it was decided to use the existing Pesticide Use Survey to measure pesticide 'reduction'
- After the second such survey, (1993) further 'risk' analysis was done from the survey results using the 'EIQ' (Environmental Impact Quotient) recently developed by Joe Kovach et al. from Cornell U.
- When the program was complete, further evaluations were conducted using 2 additional approaches

Results

- Pesticide use has been measured in Ontario every 5 years since 1973 by grower survey
- The FS 2002 results were base-lined on the 1983 Survey numbers, being the last survey before the program started in 1987
- Pesticide use had risen by 46% from 1973 to 1983, (and may have continued to rise from '83 to '87)
- Use declined overall from 1983 to 2003 by 49.5%
- Herbicides had been 68% of the total in 1983, and were 82% in 2003, mainly due to rapid increase in glyphosate use
- Pesticide use changed for many reasons in most crop sectors

Results

- Generally, IPM programs led to reduction of use, improved efficacy of use, or avoided expected and probable use increases, due to delaying or avoiding pesticide resistance, and rapid response to new and invasive pests with accurate controls instead of panic spraying
- Changes occurred in the choices of pesticides used, timing and frequency of use, and as a result, crop quality and yields generally increased while use was static or reduced
- Pesticide use per dollar of crop value declined by 35 %, in spite of crop values also declining by 22.4% over the same time
- Pesticide costs also rose substantially during that period

Program Analyses

- In addition to the use results, the data was further subjected to the Environmental Impact Quotient (EIQ) after the 1993, 1998, and 2003 surveys
- EIQ measures various factors related to each active ingredient and its use, including applicator effects, picker effects, farm worker effects, shopper effects, water effect, consumer effect, and effects on birds, bees, beneficials, and ecological effects.
- Results from all years showed parallel and greater risk reduction than the pesticide reductions achieved

NEW *directions*
IN AGRI-FOOD & RURAL RESEARCH

Research Project SR9128: Survey of Pesticide Use and
Evaluation of the Changes in Pesticide Risk on
Agricultural Crops in Ontario

EVALUATION OF THE CHANGES IN
PESTICIDE RISK

G.J. Gallivan, H. Berges and B. McGee

Program Analyses

- Following the program completion in 2002, a full analysis was called for, and in addition to the **EIQ** and Pesticide Use numbers, 2 further approaches were utilized: The Environmental Hazard Index (EHI)- Wm. Pease et al. , and the Priority Substances List (PSL) score- Diane Koniecki et al.
- The EHI measured oral tox., cancer risk, RfD for the ADI, avian tox., invertebrate tox., fish tox., bio-concentration potential, solubility, soil half-life, and adsorption

Program Analyses

- The PSL approach measured: acute tox., chronic tox., teratogenicity, carcinogenicity, mutagenicity, aquatic effects, avian effects, soil half life, and accumulation
- The data for each active ingredient were sought out from various sources. As the Actives changed in each 5 year period, some data was not available, but 200+/- active ingredients were included in each approach

Program Analyses

- The results of all three approaches were remarkably similar, in spite of the differences in the factors that were measured by each approach.
- The EIQ approach showed a 52% reduction in risk
- The EHI approach showed 60.6% reduction
- The PSL approach showed 59.1% reduction
- Risk reduction was also measured by : per Kg of pesticide use, per hectare, and impact of the highest 24 pesticides used (See Table)

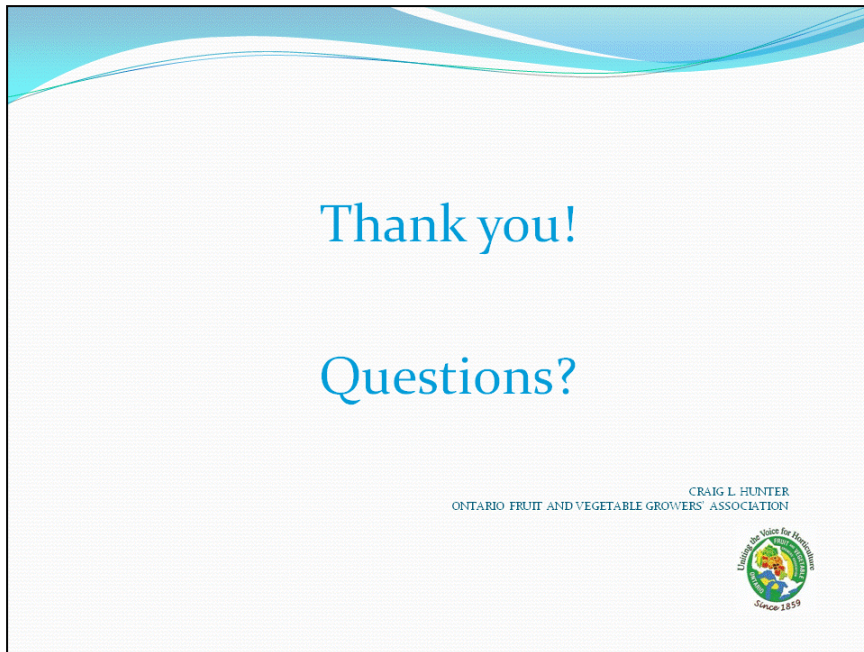
RESULTS			
Pesticide Use Reduction → 1983 - 2003 = 49.5%			
PESTICIDE RISK REDUCTION			
1983 = 100%	EIQ	EHI	PSL
Risk Reduction Overall	52%	60.6%	59.1%
Risk per kg of pesticide used 2003/1983	95.1	78.1	81.1
Risk per Ha of crop	43.8	47.5	44.1
% Risk from highest used 24 pesticides (1983/2003)	17/10	18/7	17/13

Discussion

- In spite of having no pre-determined measurement system, the program achieved much success by each measurement parameter used
- The uptake of IPM as THE approach to pest control was and continues to be widespread
- The legacy of program development, publications, grower education, research collaboration, and in field IPM delivery are invaluable
- In spite of much rear-mirror criticism about whether the 'reduction' means the same thing to different people, growers were well satisfied

Discussion

- Since the ending of the official program, in-field support for IPM has decreased
- Research support has also diminished
- Over 100 new pesticides, many 'reduced risk', have been registered and introduced- many older products, of higher risk, have been eliminated since 2003
- The 2008 Pesticide Use Survey showed an increase in overall use, but EIQ/EHI/PSL analyses were not done
- Growers still embrace IPM, scouting programs and use recommendations, and Pesticide Education and mandatory Certification continue


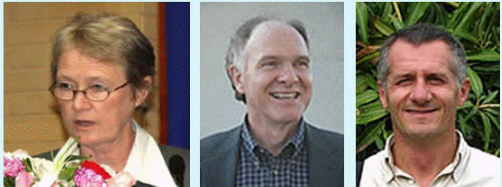


Presentation 9
IOBC: Guidelines for Integrated Production and Endorsement' performance indicators
by Barbara Barratt, Global IOBC


13th OECD Seminar on Risk Reduction: Indicators for Integrated Pest Management : Queenstown 26-27th November 2012

IOBC-WPRS IP Commission
'Guidelines for Integrated Production and Endorsement'
performance indicators

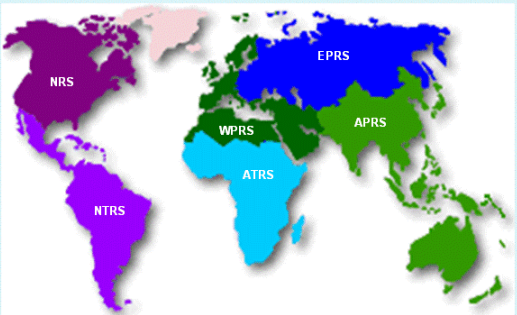
Barbara I.P. Barratt – President of Global IOBC
Franz Bigler – President of IOBC-WPRS
Carlo Malavolta – Convenor of IOBC-WPRS IP Commission



Outline



- IOBC mission and objectives
- IP and IPM
- SESAME – a measure of adoption and 'radar' of performance



IOBC Regional Sections

2

IOBC mission and objectives



- IOBC is a non-profit, scientific organization of individual and institutional members working on biological control, Integrated Pest Management (IPM) and Integrated Production (IP)
- IOBC provides independent, professional advice to policy makers, governments, advisory services researchers and farmers
- IOBC raises public awareness of the economic and social importance of biological control, IPM and IP


3

IOBC mission and objectives



- IOBC promotes R&D and technology transfer in biological control and IPM in all productive systems by means of:
 - global and regional working groups on specific crops or themes
 - commissions on major issues
 - organising conferences, meetings and symposia
 - facilitating training in biocontrol and IPM

4




Definitions

- IP (Integrated Production) is sustainable agriculture based on the use of natural resources and regulating mechanisms to reduce agrochemical use**
 - mitigation measures selected and balanced to safeguard the protection of the environment and the health of workers and consumers**
 - emphasis on holistic systems involving the entire farm as the basic unit; the central role of agro-ecosystems, balanced nutrient cycles, animal welfare**

- IPM (Integrated Pest Management) is the part of IP focusing on weed, pest and disease management.**

5




IOBC
OILB

WPRS / SROP

INTEGRATED PEST MANAGEMENT

Design and application of feasible and effective strategies




International Organisation for Biological and Integrated Control of Noxious Animals and Plants
 Organisation Internationale de Lutte Biologique et Intégrée contre les Animaux et les Plantes Nuisibles
 West Palearctic Regional Section / Section Régionale Ouest Paléarctique

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2.2 Perennial crops: grapevines.....	14
2.3 Olives.....	16
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2.5 Annual crops: arable crops.....	22
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6



IOBC
OILB

WPRS / SROP

INTEGRATED PEST MANAGEMENT

Design and application of
feasible and effective strategies




International Organisation for Biological and Integrated Control of Noxious Animals and Plants
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7

SESAME



- **IOBC Inspection Protocol and its software consists of:**
 - a checklist for farmer self-evaluation and scoring against standards
 - an expanded checklist with more detail for each checkpoint developed for inspectors from certifying bodies
 - software creates a visual display (“radar”) of the farm performance in the major control areas
 - can also be compiled from a group of farms to show the performance of the group
 - transparent and communicable
 - identifies areas for improvement

- **The software was specifically designed for and exclusively for the use of IOBC endorsed growers’ organisations**

8

30.11.05
Name of Organisation:

Checklist (Farm inspection protocol) 2006

of IOBC Standard for Integrated Production

All crops and crop specific aspects for Grapes (vinification)

Sesame

1. Index of major inspected areas

Major control aspects	Control areas	IOBC Guideline II Chapter no.
Farm management aspects	Farm records, self-inspection, training	1
	Traceability	1
Agronomic and environmental aspects	Biodiversity, ecological infrastructures	2
	Site selection	3
	Site management	4
	Varieties, rootstock, cultivation systems	5
	Plant nutrition, fertilizer usage	6
	Irrigation	7
	Crop Protection	8
	Waste disposal and recycling	8.7
Food safety aspects	Harvesting	9
	Postharvest (Produce Handling)	10
Social aspects	Worker health, safety, welfare	12
	ILO Charta: Minimal wages, child work	
Ethical aspects	Animal welfare	11.2

9

1011/2008

Checklist (Farm inspection protocol) 2006

of IOBC Standard for Integrated Production

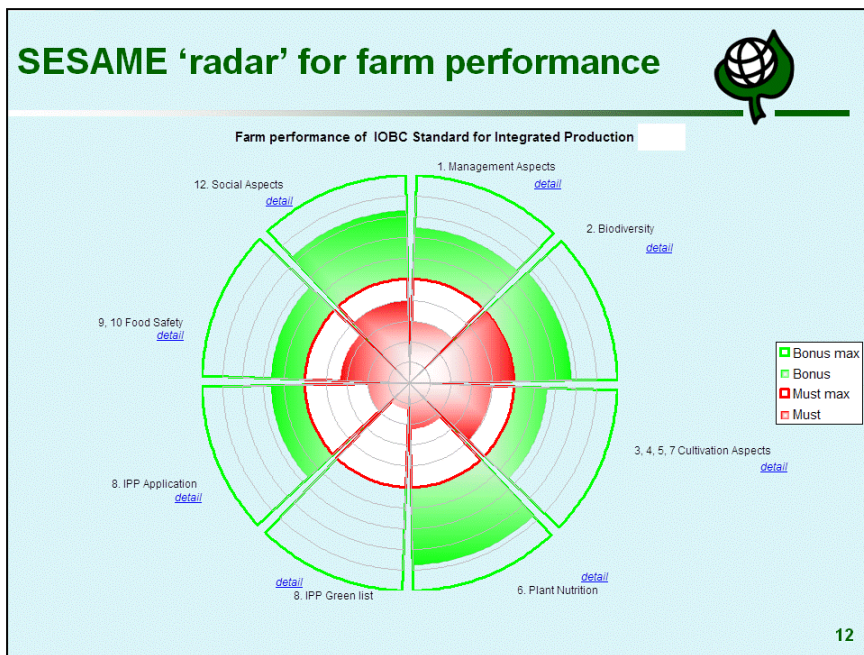
3. Control points to be verified by inspection body

		Must	Bonus
1. Farm records, self-inspection, training and traceability	1	0 (not allowed)	+1 +2 +3
1.1 Records complete, available at inspection and kept for 3 years			
1.2 Self-evaluation (internal audit) made, documented and available at inspection			
1.3 Corrective action taken based on results of inspection			
1.4 Participation in annual training courses approved by organisation			
1.5 Traceability for products at farm level			
2. Biodiversity, ecological infrastructures			
2.1 At least 5% of farm surface identified and managed as ecological infrastructures			
2.2 At least 2 ecological options for active enhancement of biodiversity fulfilled			
Read more: IOBC list of options for Ecological infrastructures			
2.3 Adequate buffer zones between crop areas and sensitive off-crop areas established			
3. Site selection			
3.1 Every field suitable for sustainable production and clearly identifiable			
3.2 In new cultivation sites an adequate risk assessment made, documented and corrective plan established			
4. Site management			
4.1 Annual crops: Crop rotation requirements fulfilled			
4.2 Perennial crops: Alleyway/intertree strip management fulfills specified requirements			
4.3 Soil fertility and protection by adequate measures			
4.4 Chemical fumigatory/disinfection prohibited			
5. Varieties, rootstock, sowing/planting aspects			
5.1 Adequate choice of cultivars			
5.2 Adequate quality and health status			
5.3 Use of GMOs according to guidelines			
5.4 Cultivation: crop specific requirements observed			
6. Plant nutrition and fertilizer use			
6.1 Soil analyses data adequate, not older than prescribed interval			
6.2 Fertilization plan based on rules established for each crop (and entire crop rotation)			
6.3 Measures to reduce nutrient loss are followed			
6.4 Nitrogen supply and timing applied according to fertilization plan			
6.5 Other major nutrients (especially P and K) applied according to fertilization plan			
6.6 Storage conditions and handling of fertilizers fulfill basic requirements of GAP			
6.7 Restrictions of using human sewage sludge strictly observed			
6.8 Organic materials with only technically lowest possible load of heavy metals			
7. Irrigation			
7.1 Water requirements of crops adequately taken into account and irrigation plan established for each plot			
7.2 Irrigation methods used are adequate			

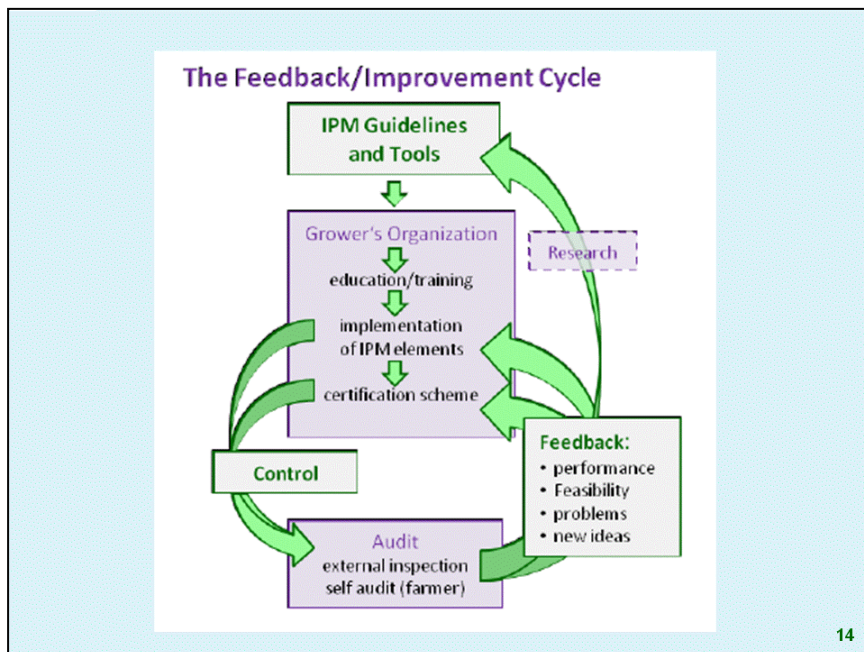
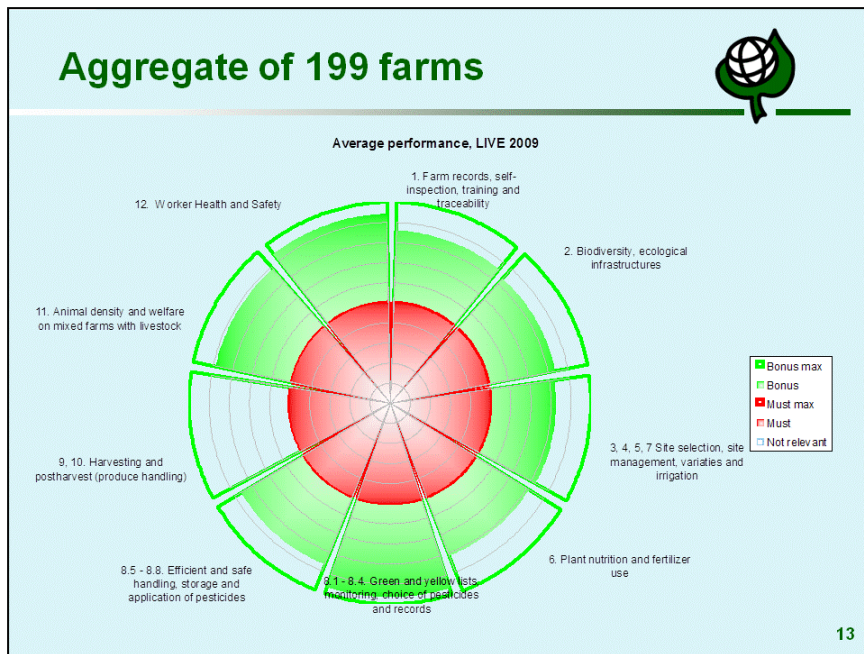
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7. Irrigation		
7.1	Water requirements of crops adequately taken into account and irrigation plan established for each plot	
7.2	Irrigation methods used are adequate	
7.3	Water quality is adequate	
7.4	Water supply is optimised	
8. Integrated plant (crop) protection		
Green and yellow lists, monitoring, choice of pesticides and records		
8.1	Application of the Green list	
8.2	The pests have been recorded properly and tolerance level for each key pest is known	
8.3	Pesticides used are exclusively those listed in the green and yellow list of the organisation and restrictions observed	
8.4	Records of pesticide applications are complete	
8.5	Preharvest intervals of pesticide applications and MRL values respected, residue analyses made	
Efficient and safe handling, storage and application of pesticides		
8.6	Pesticide storage conditions and handling are adequate and fulfilling GAP standards	
8.7	The spray equipment is properly chosen and maintained	
8.8	The disposal of surplus mix, obsolete pesticides and empty containers fulfills GAP requirements	
9. Harvesting		
9.1	Hygiene measures of workers are documented, meet standards and are applied	
9.2	Hygiene measures of packaging are documented, meet standards and are applied	
10. Postharvest (Produce Handling)		
10.1	Hygiene measures are documented, meet standards and are applied	
10.2	Postharvest washing procedures are documented, meet standards and are applied	
10.3	Postharvest treatments are specified and documented	
10.4	On farm facilities for produce handling and/or storage meet standards	
12. Worker health and safety		
12.1	Responsibilities are defined, instructions given and training in risk jobs carried out	
12.2	Accident procedures (First aid boxes etc.) and protective clothing/equipment meet standards and are applied	
Worker welfare and basic rights		
12.3	On-site living quarters habitable, basic services and facilities are adequate	
12.4	Specified items of the ILO Convention are fulfilled (especially prohibition of child and forced labor, provision of wages above existence level)	
11. Animal density and welfare on mixed farms with livestock		
11.1	Livestock density does not exceed 2.0 LU/ha or delivery contracts for excess manure exist where density is higher	
11.2	Animal welfare on mixed farms observe the rules described section 11.2 of IOBC guideline II (2004)	
CROPS only		
Total score possible		
Total score achieved		
% achieved (minimum target for bonus points XX%)		
CROPS + LIVESTOCK		
Total score possible		
Total score achieved		
% achieved (minimum target for bonus points XX%)		

11



12



Summary

- SESAME approach could be applied specifically for IPM measures
- Provides consistent and comparable measures of farm or farm-group performance against standards
- Flexibility to be modified as new solutions to problems available through science
- IOBC (esp. WPRS) has now developed considerable expertise in developing standards for IP/IPM which can be used as indicators of adoption and improvement/compliance etc.
- IOBC has global networks, wide-ranging WGs with expertise spanning all aspects of biological control and IPM
- IOBC would like to contribute by nominating a representative for the OECD Steering Group on Risk Reduction

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IOBC Global Executive 2012

President	Barbara Barratt (NZ)
Secretary General	Russell Messing (Hawaii)
Vice President	Joop van Lenteren (Netherlands)
Vice President	Jiangqing Ding (China)
Treasurer	Josep A. Jacas (Spain)
Past President	Jacques Brodeur (Canada)




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Presentation 10

Germany: An approach to use the environmental risk indicator SYNOPSIS for the assessment of IPM “performance” on regional level

by Silke Dachbrodt-Saaydeh, Julius Kühn Institute (JKI)




An approach to use the environmental risk indicator SYNOPSIS for the assessment of IPM ,performance` on regional level

Silke Dachbrodt-Saaydeh, Jörn Strassemeyer and Volkmar Gutsche

JKI - Federal Research Centre For Cultivated Plants,
Kleinmachnow, Germany

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Approach

Use existing risk indicators to analyze the impact of IPM uptake on the environment

Within the German NAP the risk indicator SYNOPSIS is used on different spatial levels

field/farm level → regional level SYNOPSIS-GIS → national level SYNOPSIS-TREND






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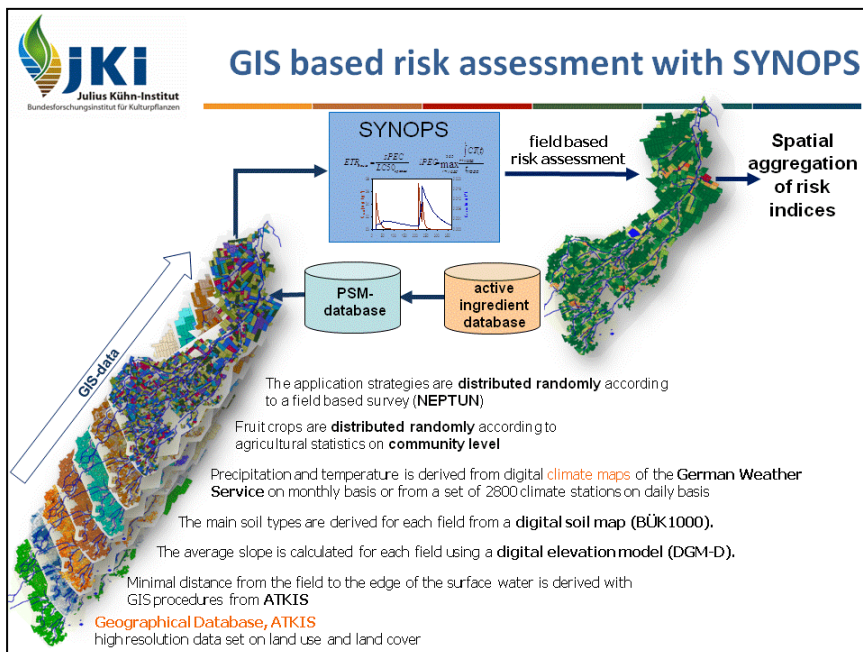
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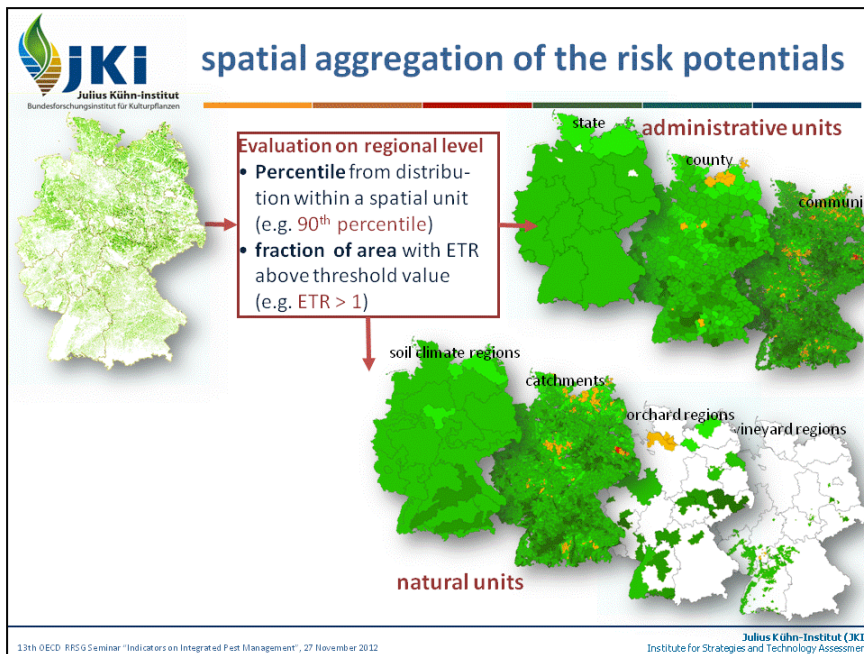
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Approach

	purpose	environmental data	pesticide use data	Assessment of IPM impact
 SYNOPSIS-TREND	<ul style="list-style-type: none"> tracking of the risk trends risks for pesticide groups on national level 	<ul style="list-style-type: none"> realistic worst case scenario 	<ul style="list-style-type: none"> sales data or aggregated use data (no realistic application) 	<ul style="list-style-type: none"> Difficult, since active ingredients are analyzed separately Mitigation measures are not considered
 SYNOPSIS-GIS	<ul style="list-style-type: none"> Identification of hotspots Regional analysis of risk 	<ul style="list-style-type: none"> Field based input for soil, climate and crop data from GIS databases 	<ul style="list-style-type: none"> Real application scenarios from field based surveys (random distribution) 	<ul style="list-style-type: none"> Possible, since application strategies on field level are evaluated mitigation measures can be considered
 SYNOPSIS-WEB	<ul style="list-style-type: none"> Comparison of pesticide use strategies under certain environmental conditions 	<ul style="list-style-type: none"> Field based input for soil, climate and crop data from real field data or GIS databases 	<ul style="list-style-type: none"> Real application scenarios from demonstration farms, station experiments of single farmers 	<ul style="list-style-type: none"> Possible, since application strategies on field level are evaluated mitigation measures can be considered

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Impact of IPM uptake on regional level


With the GIS-based assessment approach the following evaluations are possible in relation to impact of IPM uptake on regional level

Evaluate the Impact of current IPM production.
Possible if the pesticide use surveys differentiate between IPM and conventional production.

Evaluate the impact of new and future IPM strategies compared to the current pesticide use.
Impact of new strategies can be analysed by replacing a certain fraction of the currently surveyed strategies with the future strategies. **Example 1**

Evaluate the impact of new and future IPM strategies compared to a conventional base line strategy.
Certain distribution scenarios with fixed percentages of IPM strategies and base line strategies are assumed. No field based pesticide use surveys are necessary. **Example 2**

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aquatic risk on landscape level

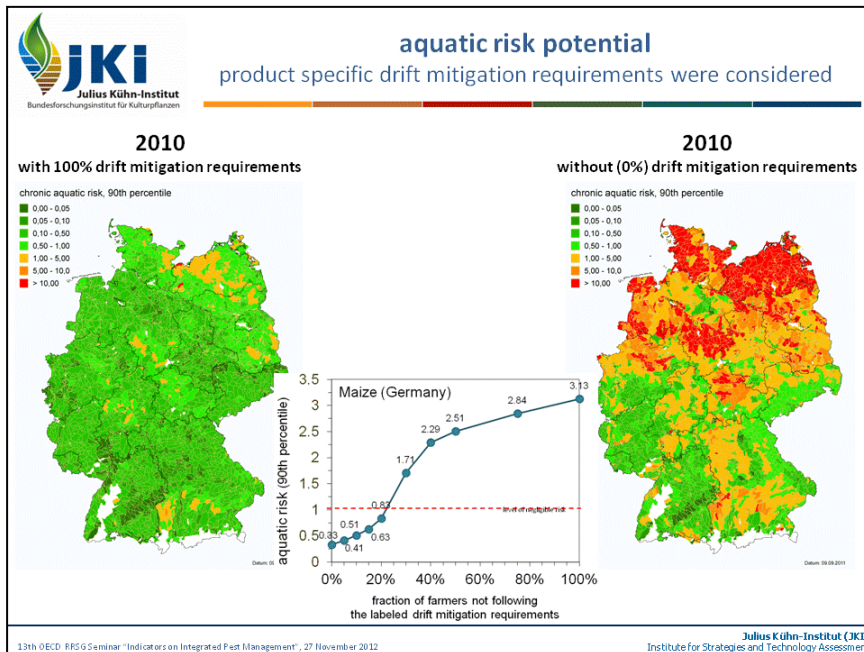
risk based on current pesticide use of reference farms


- Region: **Germany**
- Crop: **Maize**
- Spatial unit of aggregation: **Catchment**
- Pesticide applications from reference farms in the year 2010
- random distribution of the application calendars (n= 84)

Scenario 1: No (0%) farmer follow the product specific drift mitigation requirements

Scenario 2: All (100%) farmers follow the product specific drift mitigation requirements

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Evaluate the impact of new and future IPM strategies compared to the current pesticide use

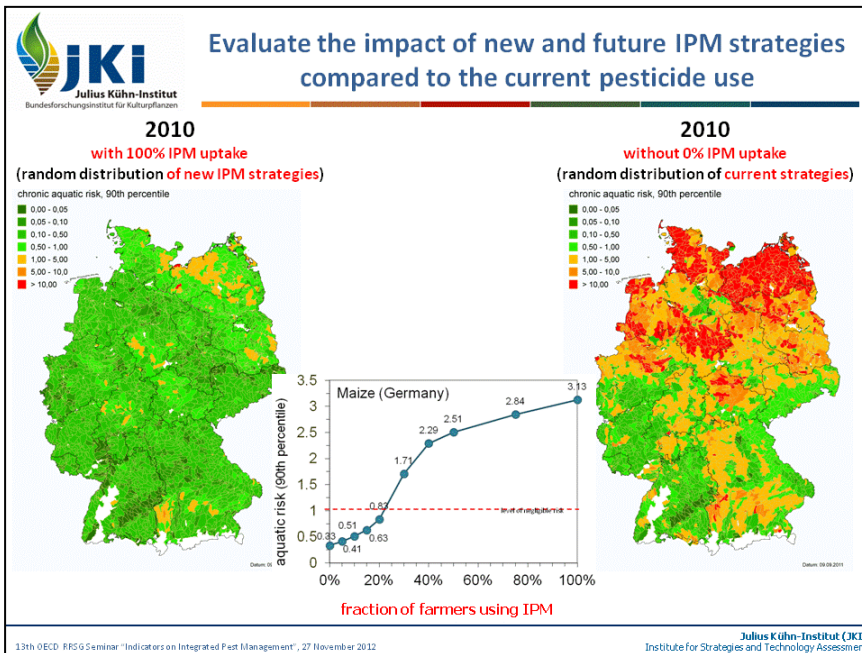
- Region: **Germany**
- Crop: **Maize**
- Spatial unit of aggregation: **Catchment**
- Pesticide applications from reference farms in the year 2010
- random distribution of the application calendars (n= 84)


Scenario 1: **No (0%) IPM**
 current pesticide use,
 e.g. from reference farms

Scenario 2: **All (100%) IPM**
 set of new IPM strategies distributed randomly
 e.g. from demonstration farms

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Evaluate the impact of new and future IPM strategies compared to a conventional base line strategy


- Region: **Lake Constance-GER**
- Crop: **Apple**
- Spatial unit of aggregation: **Orchard region**
- The 100% base lines scenarios represents conventional production.
- A mixture of available scenarios depending on the **availability** and **acceptance** of the IPM systems is more realistic .
- random distribution of the defined systems according to the following scenarios:

Scenario 1 in 0-2 years: **70% BS, 20% IPM-1 and 10% IPM-2**

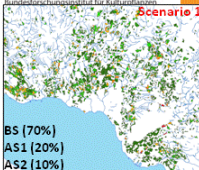
Scenario 2 in 2-5 years: **50% BS, 30% IPM-1 and 20% IPM-2**

Scenario 3 in 5-10 years: **20% BS, 50% IPM-1 and 30% IPM-2**

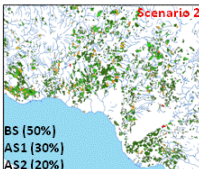
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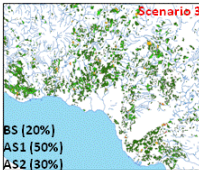
Evaluate the impact of new and future IPM strategies compared to a conventional base line strategy



Scenario 1
BS (70%)
AS1 (20%)
AS2 (10%)

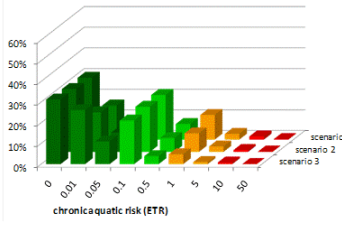


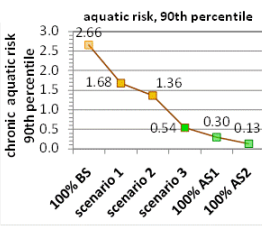
Scenario 2
BS (50%)
AS1 (30%)
AS2 (20%)



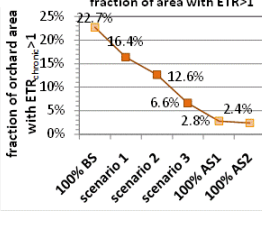
Scenario 3
BS (20%)
AS1 (50%)
AS2 (30%)

frequency distribution of risk indices





aquatic risk, 90th percentile



fraction of area with ETR>1

	Reduction compared to BS	
	aquatic risk, 90th percentile	fraction of area with ETR>1
Scenario 1	-36.98%	-27.78%
Scenario 2	-48.69%	-44.43%
Scenario 3	-79.69%	-70.81%



**Thank you
for your attention!**

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