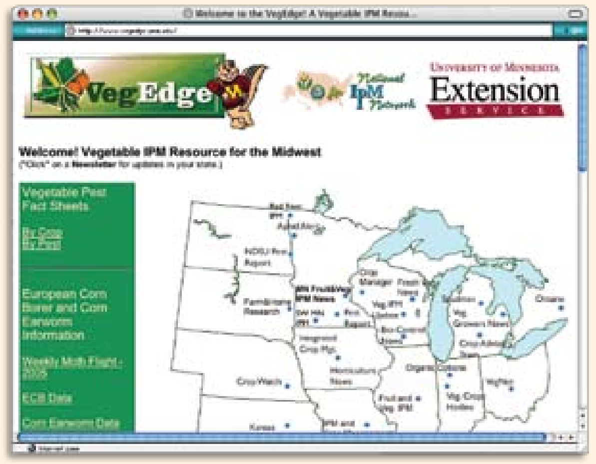
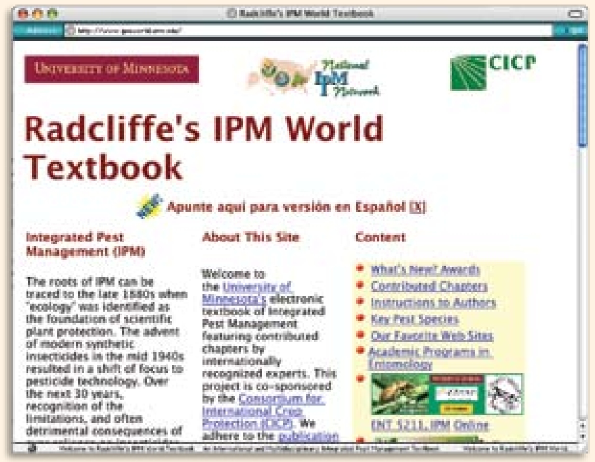
IPM Integrated Pest *Management*

Additional IPM References, Online



www.vegedge.umn.edu



www.ipmworld.umn.edu

www.pesp.org

www.ncipmc.org/index.cfm

ACKNOWLEDGEMENTS

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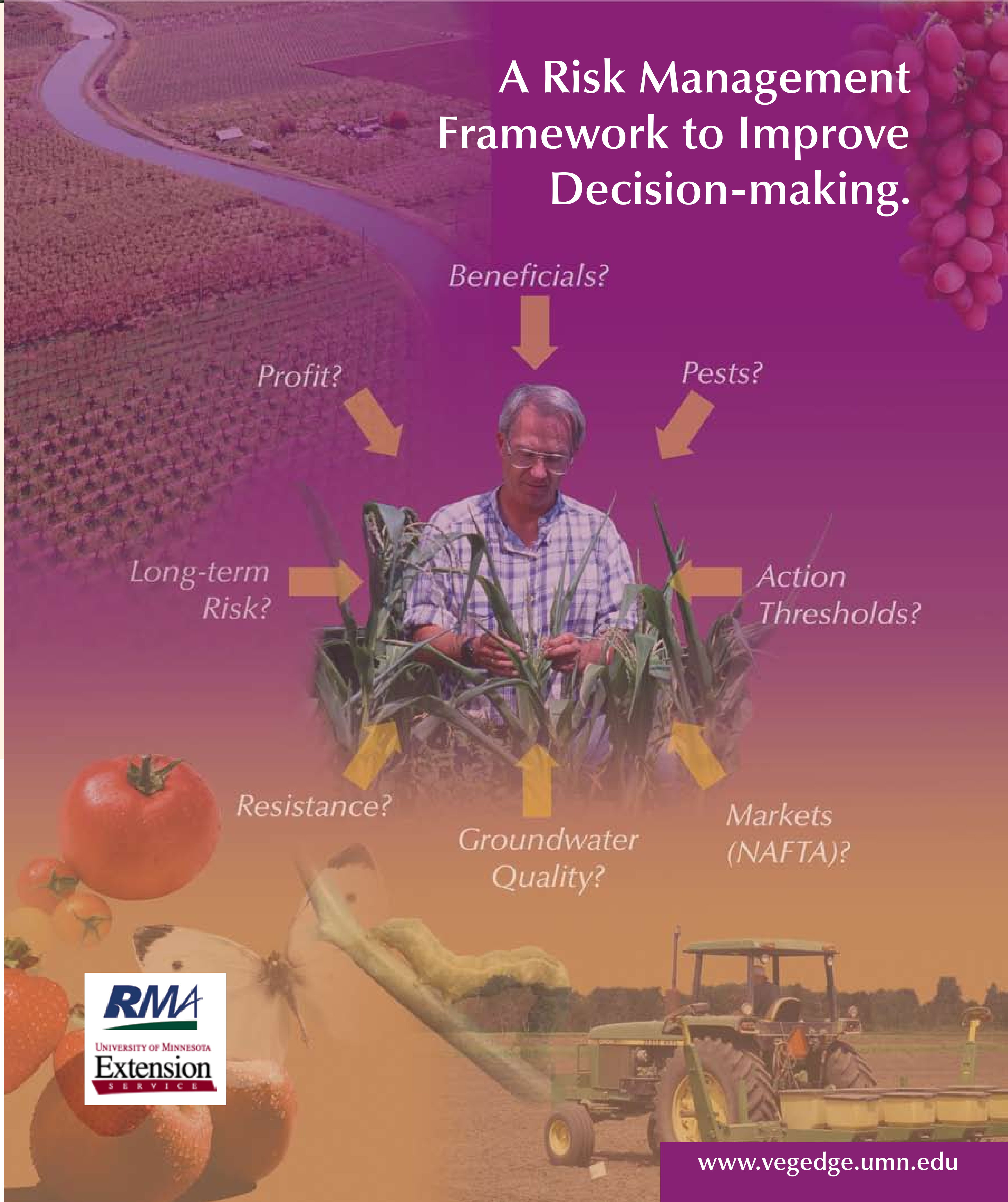
Photos courtesy of USDA ARS, USDA NRCS and University of Minnesota.

IPM Integrated Pest *Management*

A Risk Management Framework to Improve Decision-making.



RMA
University of Minnesota Extension Service

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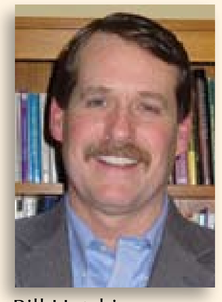
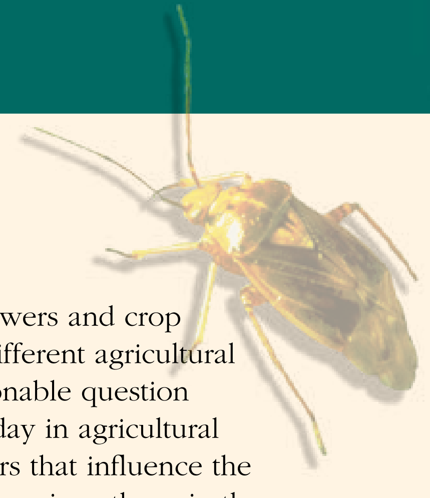
IPM
Integrated Pest *Management*

Is IPM Too Risky?



Bill Hutchison



This question reflects a concern that I have heard from growers and crop consultants throughout my career, while working with many different agricultural commodities. As illustrated by the cover page, it is also a reasonable question given the uncertainty that many growers face each year, each day in agricultural production. As with all agricultural crops, there are many factors that influence the variability in pest pressure, final yields or produce quality. In my view, those in the agricultural business must contend with a diversity of uncertainties and risk that many other businesses often avoid.

Our answer to the risk question, as illustrated throughout this publication, is that *Integrated Pest Management (IPM)* should be viewed as a *decision-making process* that provides an excellent framework for increasing value, as well as reducing the uncertainty, associated with economic, environmental or health risks. In recent years, more work has been done to present the Value of IPM in terms that producers, consultants and those working in IPM policy can use to measure and improve the implementation of IPM programs. In this publication, sponsored by the USDA Risk Management Agency (RMA), we have highlighted several key concepts regarding Risk Management as it relates to IPM, and provide a case-study of the Risk Perceptions of a fresh-market grower audience in Minnesota. We have also summarized several case-studies illustrating the Value of IPM by comparing the economic returns and reduced risk (variability) in economic returns for selected high-value horticultural crops.

Although the IPM examples summarized in this publication focus on insect pests of horticultural crops, many of the risk management principles apply to other pests, field crops, and other systems as well. Similar studies are underway to illustrate the benefits of IPM for reducing environmental risks, but the purpose of this publication is limited to the benefits of reducing economic risk. In terms of economic risk, one of the goals of IPM is to reduce the variability in net returns, and when possible, increases the expected value of net returns (or profit). We believe that the IPM case studies summarized here, entitled *"IPM and the bottom line,"* provide examples that you, or producers and crop consultants in your region may find useful.

I hope that you agree, and that you will find this publication useful for enhancing the value of IPM for your business, or to share as an educational tool with growers and crop consultant's in your region.

Sincerely,

W.D. Hutchison

William D. (Bill) Hutchison
Professor & Extension Entomologist
Department of Entomology
University of Minnesota

> *"The biggest thing I learned from this project [cabbage] is the importance of scouting and timing of applications. Any time you can get by with one spray (1999), it saves the grower a lot of money. It also shows the importance of regular scouting; we usually just scout to determine the first spray, and then go on a calendar-based schedule after that. But regular scouting will probably save us more money in the long-term."*
>
> — Gary Pahl, Pahl's Farms, Inc.
> Apple Valley, Minnesota (1999)

Suggested Citation:
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IPM, Uncertainty and Risk Concepts

Early development and use of Integrated Pest Management (IPM) concepts and programs has been attributed to several entomologists and scientists working in the U.S., Australia, and other countries, dating at least to the 1950's. Among the many scientists involved with promoting the IPM concept in the U.S., Dr. Ray Smith, with the University of California, clearly played a significant role and is often referred to as the "Father of IPM." Since the 1950's, over 75 definitions for IPM have been proposed. For the purposes of this publication, we have elected to use a definition recently developed by the USDA, as part of the USDA's "IPM Roadmap." This definition reflects considerable input by growers and IPM stakeholders throughout the U.S., and explicitly reflects the decision-making and risk management features of IPM. We also clarify the differences between uncertainty, risk, and decision-making.

Integrated Pest Management: "IPM is a long-standing, science-based, decision-making process that identifies and *reduces risks from pests and pest management related strategies*." In addition, "…it [ipm] 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 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." (IPM Roadmap, May 17, 2004)

Uncertainty: The possibility of outcomes that are difficult to quantify for predictive purposes (e.g., yield loss from a new invasive pest, or the effect of an agbioterrorism attack on crop prices).

Risk: Uncertainty that can be estimated by measuring key outcomes over time, and summarizing the data as a probability distribution (e.g., profit/net returns from crop production, timing or intensity of weather events, commodity prices).

Probability Distribution: Set of all possible outcomes and their probabilities (e.g., the net revenue probability distribution defines the complete range of all possible net revenue outcomes and the probability that each will occur).

Risk Perceptions: Beliefs or perceptions concerning the probability distribution of a desired outcome (e.g., profit/net returns from crop production, reduced nitrate leaching).

Risk Preferences/Attitudes: Given a known set of outcomes and their probabilities (based on information [data] or previous experience), how one responds to this risk. Different methods exist to classify and measure an individual's risk perceptions and attitudes, but people are typically characterized as Risk takers, risk averse or risk neutral. Given the choice between a certain outcome and risky outcome with an average (mean) of the same value, a **risk taker** would choose the risky outcome to have the chance to earn more than expected; the **risk averse** person would choose the certain outcome to avoid the risk of earning less than expected; and the **risk neutral** person would be indifferent between the certain and risky outcomes.

Decision-making & Management: The process of selecting the best choice to achieve goals using available resources (people, goods, services) within pertinent constraints, given the available data [distributions], risk perceptions, and risk preferences of the individual. In the context of IPM, goals often include economic, environmental, health, and societal improvement. Constraints often include time, regulatory factors, and finances.

Further Reading in Agricultural Risk Management:

Hardaker, J.B., R.B.M. Huirne, J.R. Anderson and G. Lien. 2004. Coping with Risk in Agriculture. CABI Publishing. 2nd Edition. Cambridge, MA
National Ag Risk Education Library. 2002. USDA-CSREES Web site: www.agrisk.umn.edu/
USDA-RMA, Introduction to Risk Management. www.rma.usda.gov/pubs/1997/irm_intr.html

IPM Integrated Pest *Management*

Purpose

- Few IPM programs evaluate grower or client risk perceptions.
- Many studies assume growers are risk averse in most situations.

Methods

- In February, 2005, Minnesota growers completed a written survey to assess their risk perceptions (n=32 useable surveys).
- Study resulted in 32 useable surveys.

Further Reading:

Bacic, I. L. Z., A.K. Bregt and D. G. Rositer. 2005. A participatory approach for integrating risk assessment into rural decision-making: A case study in Santa Catarina, Brazil. Agric. Systems (in press).

Patrick, G. (1992). Managing risk in agriculture. NCR-406, Coop. Ext. Serv., Purdue University, W. Lafayette, IN.

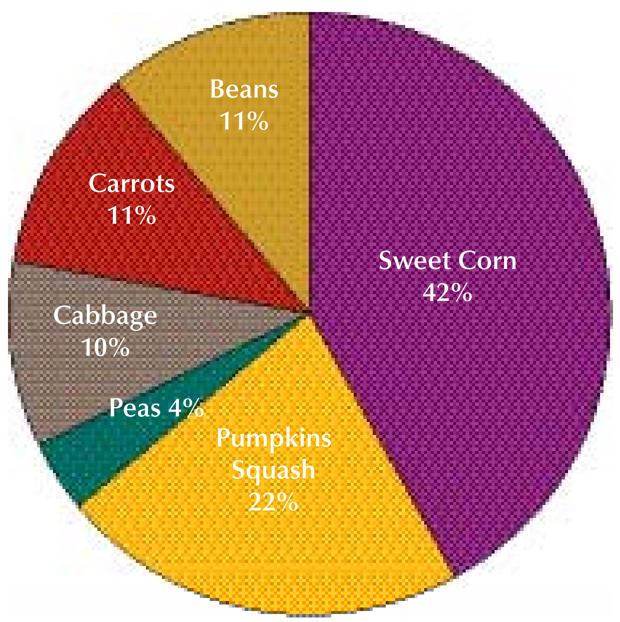
Hardaker, J. B., R. B. M. Huirne; J.R. Anderson and G. Lien. 2004. Coping with Risk in Agriculture. 2nd Edition. Cambridge, MA.

Understanding Client Peceptions about Risk and IPM

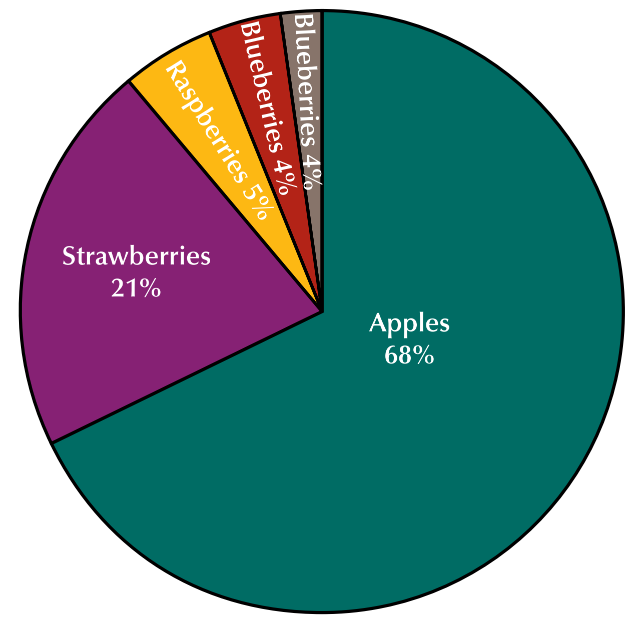
Minnesota Case Study: Fruit and Vegetable Growers

Grower Profile

Vegetables 1,185 acres



Fruits 470 acres



Demographics

- Education: BS/BA/MS degrees (59%)
- Average Age (52 years)
- Average Farming Experience (19.7 years)
- Average Farm Size (79 acres)
- Use some crop insureance (47%)

Conclusion:

Clearly, more research is necessary to better understand the risk preferences of IPM audiences. However, including this information in the design of IPM programs should be useful for understanding the degree to which IPM is implemented, or suggest new methods for communicating the value of IPM.

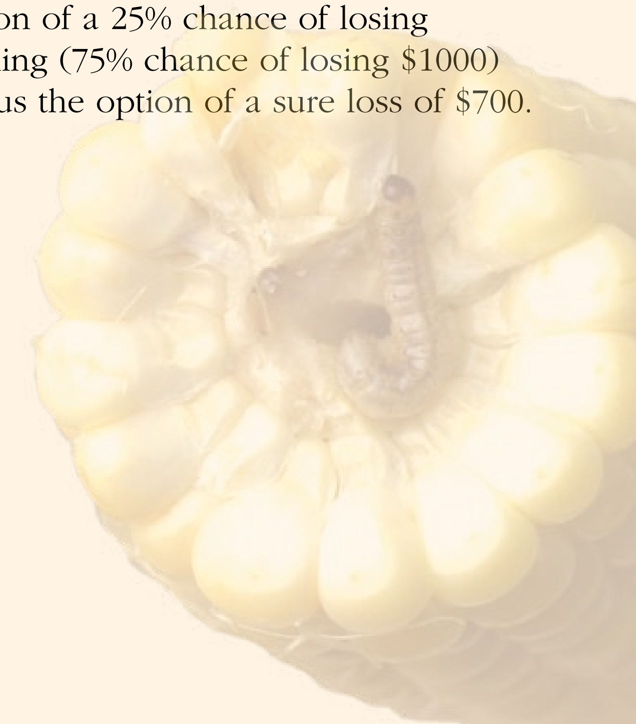
RESULTS

Risk Preference based on self-assessment

- For "Day-to-day living", 37.5% viewed themselves as risk takers; 22% were risk averse
- For "Agric. decision-making", 44% were risk takers; only 15.6 were risk averse
- For "IPM decision-making", 40% were risk takers; only 17.7% were risk-averse

Risk Preference based on response to a gamble (trade-off)

- Unlike the self-assessment, where most growers were risk takers, the response to loss/gain trade-offs varied.
- Given the uncertainty of a monetary gain, 84% preferred the choice of a lower, yet sure gain ($700) verses a 75% chance of a $1000 gain, and a 25% chance of zero dollars
- Given the possibility of a monetary loss, the majority of growers were considered risk takers; e.g. 77% preferred the option of a 25% chance of losing nothing (75% chance of losing $1000) versus the option of a sure loss of $700.



Measuring the Economic Value and Risk of IPM

Whether you are considering a new crop, or a new investment opportunity, it is always useful to evaluate past performance. Although past performance is no guarantee of future returns, data from previous field trial research is invaluable for assessing the potential impact on a farm enterprise. In addition to the enclosed case study, *"IPM and the bottom line--Cabbage,"* we summarized the results of the 4-year Minnesota study showing the Increased Value (Net returns) and Reduced Risk (Standard Deviation, SD) for IPM. IPM results, compared with a conventional grower program (minimal pest scouting) are presented for each year **(Fig. 1)**, as Cumulative Total Net Returns **(Fig. 2)** and Cumulative Total Risk **(Fig. 3)**.

The IPM program relied on frequent pest monitoring (1-2 times/wk), the use of "reduced-risk" insecticides to conserve beneficial insects, and timely applications when needed (see also *"IPM and the bottom line—Cabbage,")* to provide more consistent economic returns. Although economic returns for IPM may be lower in any specific year (e.g., 2000), return for this year, and over the 4 years was much greater than that of the Conventional system **(Figs. 1-2)**. Of equal importance, the risk of economic returns (variability measured by the standard deviation) was also much less for IPM vs. the Conventional grower system **(Fig. 3)**.

The following IPM case studies, subtitled *"IPM and the bottom line,"* provide additional ways of measuring and communicating the economic value and risk of IPM for several horticultural crops.

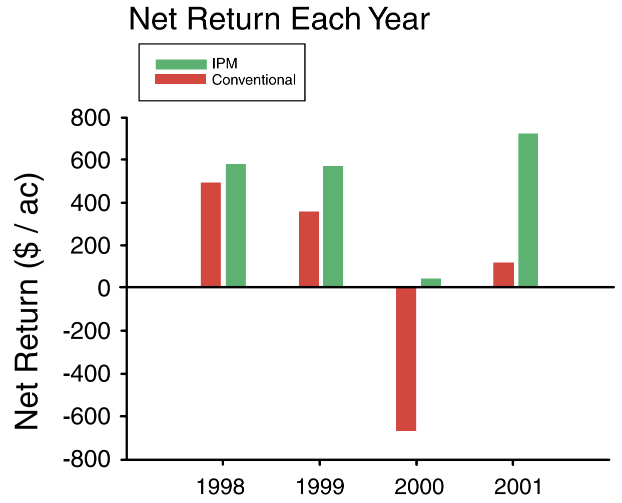


Fig. 1. Average net returns for Cabbage IPM and Conventional Grower program, showing increased returns each year for IPM, with a significant grower program loss in 2000.

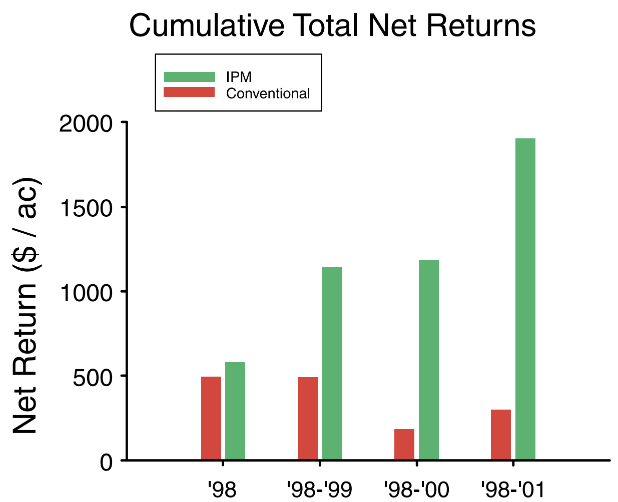


Fig. 2. Average cumulative total net returns, over 4-year period, for Cabbage IPM and Conventional Grower program, showing the benefit of investing in an IPM approach over time.

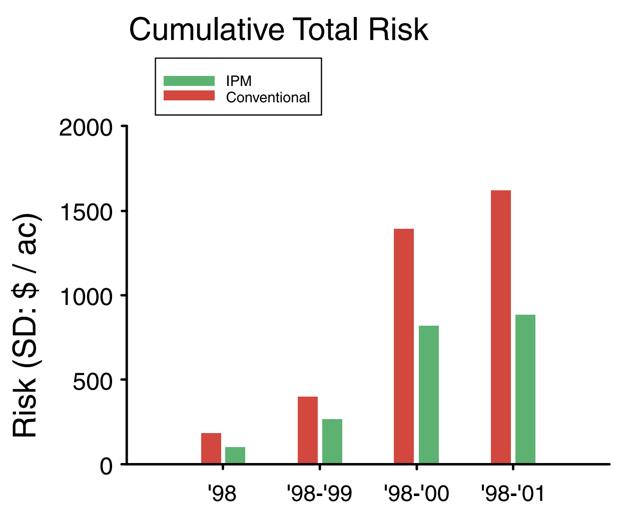


Fig. 3. Average cumulative risk (standard deviation) of net returns, over 4-year period, for Cabbage IPM and Conventional Grower program, showing cumulative risk of IPM is only about ½ of the Conventional grower program.

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