Introduction
The use of chemical pesticides by Ontario farmers increased dramatically during the 1950s to mid 1980s. The increased usage during crop production - pesticide use increased 24% between 1973 and 1983 (measured in kg of active ingredient) – allowed producers to introduce new production technologies, enhance their productivity, improve product quality, and reduce the use of more expensive inputs. However, the concerns over the effects of pesticide use in agriculture led to several policy initiatives in Ontario, including the initiation of a program, Food Systems 2002, to fund research into reducing pesticide use by 50% in Ontario agriculture by the year 2002.

Food Systems 2002
Since its inception, the Food Systems 2002 program has allocated approximately C$2 million annually to research efforts to reduce risks from pesticides (funding went to over 200 projects). The initiatives of Food Systems 2002 attempted to enhance pest control options through research into integrated pest management techniques designed to reduce pesticide use. According to the 1998 Survey of Pesticide Use in Ontario, total pesticide active ingredient applied has been reduced by 41.0% since 1983 (next pesticide use survey is in 2003) (Hunter and McGee, 1999). It is difficult to determine if the changes in pesticide use are a result of Food Systems 2002 or a result of agronomic shifts determined by market forces, new varieties, prices, or other influential factors. However, what has been shown is that there are many factors that can influence pesticide use, one of which is research.

On-farm benefits
Our research investigated the on-farm net benefits of 10 projects funded under the Food Systems 2002 research efforts to reduce risks from pesticides. The net present values of farm-level net returns were calculated for each of the selected projects. Three major findings were obtained:

- less than half of these applied research projects were adopted at the farm level.
- while there were few successful projects in terms of adoption, the net returns to producers from the successful projects was greater than the research costs of all funded projects. The net farm-level returns were $6.16 for each dollar spent on research. These returns to research for pesticide reduction are in the range of estimated returns for other general research projects within agriculture.
- the adoption rate of the successful projects tended to be immediate followed by a linear decline rather than the typically assumed pattern of slow then rapid then slow adoption.

Outlook
Research funding agencies should be aware that not all projects will generate high producer-level returns but that the few winners often pay for the whole program. There do need to be criteria to assess the probability of success for pesticide reduction; one factor positively associated with success is an emphasis on cost reduction technology such as scouting devices. While the motivation behind pesticide reduction research is the desire to reduce associated environmental risk, this objective cannot be achieved without adoption of the technology at the farm level.

References

For further information on the Ontario Food Systems 2002 program see http://www.gov.on.ca/OMAFRA/english/research/archives/researchfund/fs2toc.html or email Cher Brethour on cher@georgemorris.org