

Impacts of Implementing IPM Technologies

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Applied Economics**



**Presented in the Entomological Society 60th Annual Meeting,
Knoxville, Tennessee, November 11, 2012**

Introduction

- Systems research is a challenge for impact assessment
 - Multiple outputs, multiple goals, limited resources
 - Ex ante and ex post assessments are needed
- Impact assessment on IPM CRSP has responded to the challenge
- IPM CRSP: 6 regions, 17 countries, many crops, many goals
- Presentation will describe briefly the methods used for impact assessment on the IPM CRSP, and provide results and lessons



Measuring Impacts of IPM Interventions

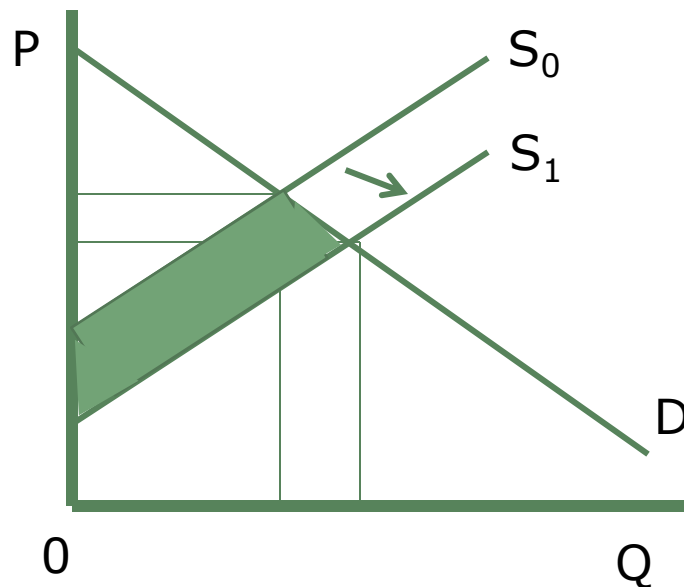
- Involves: identifying counterfactuals, measuring effects of IPM treatments, and adding up those effects over target populations
- Evaluations are multidisciplinary
 - Begin at start of the IPM program (Participatory appraisals, baseline surveys, crop-pest monitoring to prioritize research)
 - Continue as IPM practices released but not yet adopted (budget data obtained from on-farm replicated trials in main production areas with farmer practice as the control. Expert opinion used to project adoption.
 - End with ex post assessments after adoption (use cost and yield data in budgets from trials and farmer surveys for adoption data; often assess factors affecting adoption as well)

Use of Randomized Control Trials (RCTs)

- Rather than randomizing farmers in an RCT, the IPM CRSP uses the “typical farmer practice” as the control in on-farm replicated trials with cooperating farmers, but differences can be expected in farmer management
- An RCT would allow for management differences, but several drawbacks such as the **need to convince subjects to participate in trials and keep participating over time**, high cost of randomized farmers rather than plots, spillovers to untreated farmers, etc.
- RCTs could be used for testing potential of alternative diffusion approaches, with surveys potentially gathering additional cost and yield data as well
 - Detailed cost and yield data are costly to collect over a large number of participants and complicated by partial adoption of IPM

Scaling up Impact Assessments

- Market level impacts are assessed by combining budget data from on-farm trials, adoption data, and secondary data on prices, quantities, and elasticities in economic surplus analyses
 - Economic surpluses included in benefit cost analyses in spreadsheets and sensitivity analyses are conducted



Poverty Analyses

- Donors often interested in impacts on poverty
- IPM CRSP has used Foster-Greer-Thorbecke (index) approach and combined it with household surveys and economic surplus analysis (Moyo et al 2007)



Environmental Benefits

- On-farm trial data to assess IPM impacts on pesticide use or farm household survey data on pesticide used in an econometric model to relate pesticide use to IPM (Cuyno et al., 2001; Yarobe et al., 2011)
- Assessment of risks to categories of environment from pesticide use
- Change in risk valued with non-market approach such as contingent valuation (Cuyno et al., 2001)

Nutrition and Health Impacts

- Possible to use an RCT or other approach to establish change in nutrient consumption and then calculate “Disability-Adjusted Life Years” (DALYs) to assess implied health effects
- IPM CRSP has taken an alternative approach and assessed effects of additional production and income due to IPM on consumption and then on nutrients such as daily protein and calorie consumption (Mutuc 2003).



Gender Impacts

- IPM adoption can affect women in many ways, including their power, income, time allocation, and consumption among others.
- IPM impacts on total income can be measured and additional information on the shares of female production and consumption of the commodity and on technology adoption can be used to apportion benefits by gender. (Secor et al., 2012 provide an example for Honduras).



Results of IPM CRSP Impact Assessments

Country and Authors	Crop	Type of IPM Practice(s)	Assessment Method(s) ¹	Total Economic Benefits (Millions)	Other Benefits (Poverty, Nutrition, Environment, Gender)
Bangladesh Rakshit, et al, 2011	Cucurbits	Pheromone traps	ES (partial EA, partial EP)	\$3-6	
Albania, Daku, 2002	Olives	Olives	ES (partial EA, partial EP)	\$39-52	
Mali, Nouhoheflin et al, 2010	Tomato	Cultural	ES (partial EA, partial EP)	\$21-24	
Uganda, Debass, 2000	Beans, maize	Cultural	ES (EA)	\$36-302	
Bangladesh, Debass, 2000	Eggplant, cabbage	Cultural	ES (EA)	\$26-29	
Ecuador, Baez, et al., 2004	Plantain	Cultural	ES, EM (partial EA, partial EP)	\$59-63	
Philippines, Mamaril and Norton, 2006	Rice	Resistant variety (GMO)	ES (partial EA, partial EP)	\$136-276	

Results continued

Country and Authors	Crop	Type of IPM Practice(s)	Assessment Method(s) ¹	Total Economic Benefits (Millions)	Other Benefits (Poverty, Nutrition, Environment, Gender)
Ecuador, Barrera, et.al., 2002	Potatoes	Resistant variety	ES (EP)	\$108	
India, Selvaraj, 2012 (preliminary)	Mulberry, papaya, cassava	Classical biocontrol	ES (EP)	\$104 (first year)	
Uganda, Moyo et al, 2007	Peanuts	Virus resistant variety	ES, EM, FGT (partial EA, partial EP)	\$33-36	.5% to 5% poverty reduction in peanut region
Honduras, Sparger et al, 2011	Eggplant, onion, tomato, pepper	Cultural	ES (partial EA, partial EP)	\$17	\$5 million to the poor
Philippines, Cuyno et al, 2001	Onion	Cultural	CV (partial EA, partial EP)		\$150,000 in environmental benefits to six villages
Philippines, Yarobe et al, 2011	Onion	Cultural	EM (EP)		Participants reduced pesticide use by \$174/ha

Results continued

Country and Authors	Crop	Type of IPM Practice(s)	Assessment Method(s) ¹	Net Economic Benefits (Millions)	Other Benefits (Poverty, Nutrition, Environment, Gender)
Philippines, Mutuc, 2003	Eggplant	Cultural	FM (EP)		Increase of .09-.6 kilocalories/person/day in Nueva Ecija
Bangladesh, Liang, 2006	Rice	Varietal	EM (partial EA, partial EP)		1% increase in HYV adoption = .07-.08% increase in calorie and protein intake of poor
Honduras, Secor, et al., 2012	Maize, onion, tomato, pepper	Cultural, biocontrol	ES, GA (EA)	\$70	Several improvements in gender indicators
Bangladesh, Harris, 2011	Vegetables	Multiple	LP (EA)		\$90 million from increased diffusion
India, Mishra, 2003	Eggplant	Resistant variety (GMO)	ES (EA)	\$279-773	

1. ES = economic surplus; EM = econometric; FGT = Foster, Greer, Thorbecke poverty index; GA = gender analysis; CV = contingent valuation; LP = Linear Programming; FM = Frisch method for calculating demand elasticities; EA = ex ante analysis; EP = ex post analysis

Lessons for IPM Impact Assessments

- Impact assessment should be a continuum from ex ante priority setting, to partial-ex-ante-partial-ex-post impact assessment, to eventual ex post impact evaluation.
 - Budget data from experiments important for ex post analyses
- Multiple simultaneous and staggered technology interventions with IPM research require careful planning of experiments and impact assessments
 - Test practices individually and then in packages
 - PAs and surveys
- Multiple goals implies multiple impact methods

Lessons for IPM Impact Assessments

- Scaling up micro-level assessments requires (1) attention to agro-climatic zones and socioeconomic characteristics of target groups when placing on-farm experiments, and (2) market-level models that include micro-level cost, yield, and adoption survey data and add market parameters and regional and national data.
 - Basic economic surplus analysis helpful for scaling up.
- Econometric approaches practical for evaluating adoption of multiple IPM practices using data from farmer surveys.
 - Randomized Control Trials better for adoption studies than for cost and yield assessment at the experimental stage, because treatments can be assigned randomly and a choice not to participate is fine.

Conclusions

- IPM CRSP has had a significant economic impact and its cost has been paid for several times over by just the limited set of practices evaluated thus far (evaluation requires resources)
- Multiple practices aimed at multiple goals requires close collaboration between social and biological scientists
- Graduate student training is also a key output from impact assessment on IPM CRSP



Acknowledgement

This presentation was made possible through support provided by the Agriculture Office within the Bureau for Economic Growth, Agriculture, and Trade (EGAT) of the U.S. Agency for International Development, under the terms of the Integrated Pest Management Collaborative Research Support Program (IPM CRSP) (Award No. EPP-A-00-04-00016-00). The opinions expressed herein are those of the author and do not necessarily reflect the views of the U.S. Agency for International Development.



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