

## Chapter 5: Summary & Conclusions

### **5.1: Introduction**

The purpose of this chapter is to summarize the thesis research and suggest research and policy recommendations for further analysis. The first section of the chapter will discuss the objectives of the research and the framework and the set of procedures used to accomplish the analysis. A summary of the major results from the case studies will be described. The second part of the chapter will discuss policy implications of the research and propose recommendations for further research.

## 5.2: Summary of Methods and Findings

This study formulated a framework for assessing the economic impact of IPM strategies in the countries it operates. The economic feasibility of specific pest management practices was examined using economic surplus methods. Sub-objectives of this study were:

- (i) To use the framework to estimate the benefits of a set of IPM CRSP activities in Bangladesh's eggplant production system, and in Uganda's Bean/maize production system, and
- (ii) To assess the potential spillover of economic impacts of selected IPM practices within Bangladesh and Uganda.

To accomplish the objectives, a framework for assessing and monitoring the economic impact of IPM-CRSP activities was developed. This framework was given in five logical steps to simplify the assessment process. An economic surplus method was used to accomplish the first objective. Market and experiment data were collected and expert questionnaires were designed to elicit information on the potential profitability of these IPM practices.

In such a complex area as the development of IPM technologies, it is essential to have a sound conceptual and analytical framework to use as the basis for evaluation and assessment of research activities. This has been absent from past research within the IPM CRSP. This study has attempted to fill this gap, basing the framework on the view that realization of tangible benefits to farmers is the primary incentive to adopt a technology and that this information has

value primarily as an input to decision making and priority setting of resource allocation. The framework has revealed a number of important insights, which should influence the choice of methodologies for any given research evaluation. Economic Analysis using DREAM was used to incorporate the market data, technical data, and economic assumptions to calculate technology benefits. Net present values (NPV) and Internal Rates of Return (IRR) were used as measurement tools to quantify and summarize economic surplus gains from adoption of IPM technologies.

The research findings indicate that the IPM practices investigated will give a substantial amount of benefits discounted over thirty years to both consumers and producers. Furthermore, the GIS-based spatial analysis implies that agro-ecological zones with higher crop production, population density, and larger farm sizes will have a strong potential for IPM adoption and likely spillover of benefits within their respective countries.

### **5.3: Conclusions & Policy Implications**

It was projected in this study that IPM CRSP activities in Bangladesh and Uganda will have significant economic impacts on the overall economies of the respective countries. It was also projected from the findings that these technologies do spill over agro ecological regions.

The goal of this study was to develop a framework to assist the IPM CRSP program in setting research priorities across agro climatic zones and research activities. This kind of structured framework provides scientists with a better

understanding of the environment for technology development. The classification of agro climatic zones allows researchers to examine potential spillovers to other research centers in the region. The zoning scheme also helps identify areas associated with key biophysical parameters for beans and maize production. The nature of economic impact assessment necessitates periodic revisions and updates of production budgets, price information, experiment data, and adoption profiles. The researcher suggests that the analysis presented in this study be treated as a framework of analyzing more specific data and situations in the future. Once the framework is set in motion, the results can become the basis for prioritizing IPM CRSP research themes.

This study has shown that IPM CRSP-induced pest management practices in Bangladesh and Uganda are viable and more profitable production practices than conventional farmer practices. A fundamental variable driving the economic surplus model – one that is very clear in the results – is that the impact of IPM technologies depends on successful adoption of the technologies by the farmers (Mills, 1997). The results also highlight that fact that gains from research are bounded by farmers' adoption decision. This has an important implication for institutional policy: efforts to promote the adoption of these technologies will likely result in more efficient production and greater economic rewards for the farmers and for the country as a whole.

#### 5.4: Limitations of the study

The advantage of formulating a framework for assessing economic impacts of IPM CRSP activities is that program evaluators would be able to perform the task in a simplified and structured manner given the availability and quality of data. In this study, we have tried to apply the framework to evaluate the impacts of specific IPM strategies in Bangladesh and Uganda. However, difficulties had arisen in collecting and acquiring researcher-based estimates of potential adoption levels and cost and yield changes. These difficulties were primarily due to the format of the interviews with the researchers. Because of financial constraints, the researcher was not able to conduct the interviews in person. Instead the questionnaires were sent to Bangladesh and Uganda where researchers were asked to respond without being allowed to ask questions. Consequently, researchers might have subjectively overestimated expected yield increases from research leading to inflated surplus gains. These difficulties may be reflected on the results of the analysis.

Furthermore, there was little information on price elasticities of demand and supply for some of the commodities. Elasticity estimates from outdated studies and from other regions of similar market structure were used in many cases. However, it has been shown that these estimates are less sensitive to these parameters than to other critical parameters such as adoption rates and expected cost and yield changes.

As a result, the contribution of this study is on the development of the framework than the results of the applications of it. Note that the core aim of the study was to formulate a strategic framework to assess impacts of IPM activities to any given locality. The specific assessments made in this study are given as case studies to test the framework.

### **5.5: Directions for further research**

This study could lead us to numerous directions where further research can be made to strengthen the current framework. Two main directions however stand out that need pressing attention that can have a lasting impact on usability of this framework. There are discussed below in more detail.

#### **Gender Issues**

A growing literature documents the significant differences between women and men's experiences with adoption of IPM technologies. Whilst the sections on factors of adoption have already some reference to gender issues, important gender-related IPM adoption factors warrant special attention. Women are often disproportionately represented among the farmers in both Bangladesh and Uganda, and they frequently approach pest management differently from men. It is sometimes suggested that IPM should become more 'feminized', due to (i) an increase in the proportion of poorly resourced female-headed households and (ii) women respond to new technology more positively than men. Therefore, important policy implications can be obtained if the impact assessment process embodies the gender factor in order to determine how

benefits are distributed across gender lines. The current framework can be enriched by incorporating distributional (equity) issues into the economic surplus model.

### **Cross-border technology spillover**

This study mainly covered the potential technology spillover across agro ecological zones within a country. The past literature clearly indicates that there is a significant potential of spillover across national borderlines. The procedures to perform cross-border spillover are very similar to inter-regional spillover. The major difference is that the former requires trade data of the nations involved. The inclusion of trade and spillover issues across political boundaries to the current framework will give new insights into future adoption patterns to regions beyond primary sites. This in turn will assist IPM CRSP globalize its research agendas.

Furthermore, a Geographic Information System was used in this study to introduce the spatial nature of IPM research and to complement the economic analysis. The use of it however was static in that it only provided a geographical (spatial) guideline to identify and prioritize research themes within a given country. As GIS technology is expanding by the minute, a more vigorous and dynamic approach should be taken to fully realize the potential of adding a spatial dimension to conventional socio-economics analysis. This study could be used as a benchmark for the integration of dynamic GIS into the impact assessment process.