

Chapter 5: Summary and Conclusions

I. 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 methodology used to accomplish the analysis. A summary of the major results will be described. The second part of the chapter will discuss policy implications of the research and propose recommendations for further research both on the IPM systems and the effects of policies on IPM adoption.

II. Summary

The two objectives of this study were: to evaluate the economic incentives for farmers in Ebony Park to adopt the IPM systems being developed by the IPM-CRSP scientists; and to analyze the impacts of various government policies on the economic incentives for IPM adoption.

A mathematical programming model of a representative farm in Ebony Park was used to achieve the first objective. The representative farm could choose among seven different crops: hot pepper, corn, pumpkin, sweet potato, callaloo, cassava and sugar cane. The farmer could grow all of these crops using conventional practices and, in addition, could grow the hot pepper, sweet potato and cassava using the IPM techniques. The farm was limited in the availability of the owner's labor and land. The farmer could purchase all necessary inputs including: financial capital, seeds, machinery services for land preparation, fertilizers, pesticides, water for irrigation and hired labor. The farmer's objective function was to maximize the returns to the fixed

resources. The farmer was restricted in the per crop acreage for each crop as a reflection of the risk averse behavior displayed by the farmers interviewed.

The representative farm model was then run incorporating each of the seven different policies that were discussed in Chapter 2. The Jamaican government is moving to liberalize the economy by reducing government intervention and lower trade barriers. The policies chosen for this study were either a direct (elimination of the water subsidy) or indirect (appreciation of the real exchange rate) result of the economic liberalization. The policy changes were evaluated with respect to the farmer's decision whether to adopt the IPM systems or to continue to use the conventional production methods. The increased net returns obtained with IPM were also evaluated under the policy scenarios and compared to the baseline.

The policies included in the model were: farmers completing farm level inspections of their crops before shipping them to the preclearance station; the elimination of the \$JM11.39 water subsidy to farmers; the elimination of the 22.51% credit subsidy for farmers borrowing financial capital; a 25% reduction in the real interest rate; the elimination of the duty concession for farm vehicles causing the price of mechanical imports to rise by 20%; a 11.25% reduction in the Common External Tariff causing the price of all imports to rise by 5%; and a 5% appreciation in the real exchange rate.

The results of the model showed four major conclusions. First, the model illustrated the profitability of the IPM systems for hot pepper, sweet potato and callaloo relative to the conventional systems. The IPM systems were more profitable with and without the inclusion of risk constraints. Without the risk constraints, the farmer specialized in IPM hot pepper production. Under the risk-constrained scenarios, the farmer diversified his production mix and the IPM systems continued to be more

profitable than the conventional production methods. The IPM systems increased the usage of owner and hired labor and raised the returns to fixed resources.

The second conclusion is that, within the framework of risk constraints and preclearance (farm level inspections of exportable harvest), the IPM systems continued to be more profitable than the conventional practices. The farm level inspections will require more of the farmer's labor than the present system of simply selling the exportable harvest to the exporter but will allow the farmer to receive higher export prices. The inspections of a farmer's harvest for soil, disease or pests will result in higher returns to fixed resources even when the farmer is using the IPM systems. The increased labor requirements of both the IPM and the preclearance inspections did not prove to be a barrier to the implementation of the production practices. In fact, preclearance increased the returns to IPM adoption therefore, the Jamaican government can promote both the farm level inspections and IPM simultaneously

Third, farmers receive subsidies on the water bought from the National Irrigation Commission and on the interest rate charged on the financial capital borrowed. The elimination of any of these subsidies did not greatly affect the profitability of the IPM systems compared with the profitability of the conventional production. The elimination of these subsidies either slightly reduced or did not affect the returns to adoption. If the Jamaican government, in moving towards a more liberalized economy, removes the water or the credit subsidy, the results suggest that the farmers will continue to have approximately an equal level of economic incentives to adopt the IPM technologies.

The final major result addresses the trade liberalization of Jamaica. With a lower real interest rate, the elimination of the duty concession, a lowering of the Common External Tariff (CET) or an appreciation of the real exchange rate, the IPM systems are more profitable than the conventional technologies. Jamaica is working towards a more open economy with the rest of the world and the Uruguay Round negotiations will lower the

barriers to trade currently in place over the next seven years. The trade liberalization will not erect additional barriers to the IPM technologies and farmers will continue to have economic incentives to adopt IPM.

III. Recommendations

The conclusions of this research suggest five recommendations. First, extension should educate farmers regarding the potential profitability of IPM. The results show that the IPM systems raise the quantity of total labor used in the production process. In addition, chemical usage is lowered and water usage is increased. The profitability of IPM is not sensitive to changes in labor requirements, increased yields or decreased chemical quantities. However, the profitability is lowered significantly when all three areas are below the estimated value.

With the current research, farmers have economic incentives, in the form of higher returns to fixed resources, from adopting the IPM practices. While the IPM systems for hot pepper, sweet potato and callaloo are not complete at this time, the economic benefits of the alternative technologies are likely to remain even with further research. Farmers should be educated about IPM even while research continues to refine the IPM packages.

The second recommendation regards effects of the liberalization of the Jamaican economy on IPM adoption. The government has been taking steps in the last ten years to reduce interventions in the domestic and trade economies. Sales of government land, privatization of utility companies, and participation in the Uruguay Round negotiations are some of the steps that Jamaica has taken to move towards a more open economy. Policy steps designed to liberalize the domestic economy, such as eliminating the water or credit subsidy, will not require offsetting policies supporting the adoption of IPM by farmers in Clarendon.

The trade liberalization policies, such as lowering the CET, should not be slowed or ceased because of fears of erecting barriers to IPM adoption. A movement of the Jamaican economy towards a more open economy will not lower the increases in returns to fixed resources from the IPM systems. Farmers will continue to see economic incentives in using the IPM technologies.

The third recommendation is for further research into the effects of water availability on IPM adoption. Alternative non-irrigation production practices were not evaluated in this study. Lack of available could potentially affect the profitability of the IPM systems. Data on the percentage of farmers having inadequate access to irrigation water would help to establish the importance of available irrigation water to IPM adoption. If the number of farmers with inadequate access to water is sufficiently large, an evaluation of the returns to IPM when irrigation water is limited is recommended and would involve agronomic trials as well as socio-economic research.

The fourth recommendation is for further studies into the socio-economic aspects of IPM adoption. Further analysis of potential barriers to adoption of IPM could suggest a general policy reform enhancing the adoption of the alternative technologies. In particular, research is needed on potential barriers to adoption by female-headed households. Female Jamaican farmers could have different access to resources than male Jamaican farmers potentially altering the profitability of IPM.

Fifth, further analysis is recommended on the potential to combine IPM education with education concerning preclearance to stimulate farmer adoption of both practices simultaneously. Extension efforts aimed at educating farmers to the benefits of preclearance could be coordinated with methods for encouraging IPM and lead to increased rates of adoption of IPM.

If Jamaica wants to continue to support IPM, then it must make a firm commitment to small acreage farmers and the agricultural sector. In order for IPM to

become a viable option for farmers, the government must support the research, development and extension of alternative IPM systems. Perhaps most importantly, the government must support the notion that agricultural production must support environmental protection and public health.

This study has shown that IPM is a viable and more profitable production practice than conventional methods using only chemicals for pest control on hot pepper, sweet potato and callaloo. Changes in economic policies do not affect the profitability of IPM when compared to conventional practices for hot pepper, sweet potato and callaloo. Efforts to promote IPM will likely result in more efficient production and greater economic rewards for the farmers and for the country as a whole.