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*Agriculturists as Environmentalists:  
The Challenge of Seeing Participatory IPM as  
an Environmental Innovation for Sustainable  
Adoption by Farming Communities  
in the Caribbean*

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*Abstract*

Recent definitions of Integrated Pest Management (IPM) put more emphasis on the ecological approach to pest management and the need to involve end-users in the technology development process (Joffe, 1998, Meerman, 1999). This approach brings to the fore major differences between IPM and other technical innovations that should force agriculturists to begin to look at IPM with the eyes of environmentalists. Agriculturists are trained to provide clear recommendations to farmers, based on research conducted at centralized experiment stations, and to expect changes in the shortest possible time, often without much concern for the environment. Policies and regulatory measures support this approach. The focus of this paper is to present participatory IPM as "a set of best management practices", worked out with farmers and given for a particular context and environment. A greater emphasis is placed on protection rather than production. The strategies to be adopted are therefore expected to be inconsistent with those used to promote commercial innovations, and more in line with environmental innovations. This could be challenging. Several of the issues that would confront development institutions and agriculturists if a new perspective were to be taken are discussed. Extension would need to shift from individual to community adoption, adjust expectations of short-term results, and place much more emphasis on the environment-specific Indigenous Technical Knowledge (ITK) that resides in communities. Policy-makers would need to develop a different set of policy instruments and regulatory mechanisms, research would have to be conducted on-farm, and research, extension and farmers must work together. A participatory approach must be taken. As overall objectives shift, economists so far not directly involved must now make their input. The importance of taking this approach, and its potential, are discussed from the context of the several examples of IPM initiatives in the region.

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## Introduction

The overuse of chemical pesticides in small farm vegetable-based systems in Trinidad is well documented. There are indications that similar situations exist elsewhere in the Caribbean. The consequences for the health of producers and consumers have been the focus of several programmes aimed at reducing both the levels of pesticide as well as the types used. In addition, the environment is severely affected as groundwater is contaminated by pesticide run-off and several species of beneficial insects are destroyed.

Farmers' continuous use of highly toxic chemical pesticides on a regular basis inevitably leads to pesticide resistance by insects and farmers' response is to apply even more toxic pesticides at more frequent intervals. It is reported (Lopez et al., 1995) that some 30 - 40 % of production costs are related to pest control.

The issue is by no means simple. Farmers operate in a complex production and management system, and are called to make crop protection decisions, most times immediately, in situations where they lack access to objective information.

Integrated Pest Management (IPM) programmes have been used for some time now to address this environment-crop production problem. One definition of IPM describes it as a knowledge-intensive and farmer-based ecologically and economically informed decision-making system to control pests by using a set of best management practices and, if necessary, as a last resort selective and judicious use of pesticides (adapted after USDA Agricultural Research

Service, 1993; Joffe, 1998; and Meerman, 1999). A more appropriate definition (ter Weel and Van der Wulp, 1999) describes *participatory IPM* as enhancing ecological awareness and stresses the responsibility of farmers for diagnosing pest problems and actively seeking solutions best suited to their field situations while integrating scientific and local knowledge.

Essentially, these programs promote an ecological approach to pest management and several management techniques are used in an integrated manner. The use of pest-resistant or tolerant crop varieties, biological and cultural control methods, and the application of bio-pesticides are encouraged before any resort to chemical pesticides. The major difference, however, is the involvement of the intended users in the development of the technology.

There have been efforts to introduce IPM to farmers. IPM training is included in the education programmes for small farmers and courses are conducted centrally at the Farmers' Training Centre in Trinidad and at other localized venues by district extension officers. The approach to encourage adoption is similar to the approach used for other production technologies, basically instruction driven, with emphasis on lectures with visual support.

In spite of these programmes, there is still widespread use of chemical pesticides in vegetable production systems. A recent assessment of the Cabbage Production Systems in Trinidad (CIPMNet Trinidad, 2002) showed that as many as 20 different pesticides are being used nationwide in various combinations. Some of these pesticides are classified as very dangerous

and have been banned in other countries. The report also revealed that, while there is increased use of bio-pesticides, the chemical option is still predominant. The general impression is that IPM initiatives at present have little or no impact on crop protection practices. The struggle to have greater impact continues with several initiatives in Trinidad and the wider region. For example, Trinidad is in the process of developing a national IPM policy as well as conducting a national IPM project on Ecological Crop Management.

The very definition of IPM as a "set of best management practices", and the inclusion of the concept of ecological awareness, should alert us that this innovation is different in character from other agricultural innovations. Another major difference supports this view. Agricultural innovations are usually quite clear and well-defined and their aim, having been subjected to much research on stations, is dramatic increases in production. Economic issues are very relevant in this scenario. IPM innovations, on the other hand, appear that they have "to be worked out" further, and their primary aim is protection of man and the environment. The role of the economists is going to be different in the adoption process.

The question is; Are the strategies used for other agricultural innovations which are primarily aimed at production increases appropriate in situations where innovations have a protection objective and still require further development with inputs from the end users and consideration of farm environmental circumstances?

## PURPOSE

The purpose of this paper is to present participatory IPM as an innovation that is different in character from other agricultural innovations, resembling more of an environmental innovation and thus requiring a different approach to secure meaningful long-term adoption.

## THE CASE FOR A DIFFERENT PERSPECTIVE

### *Traditional Approach for Agricultural Innovations*

At present, the top down system is the preferred approach for transfer of technology. It is generally known that there was great excitement about, and high adoption of, green revolution technologies. The adoption of new rice varieties and accompanying technologies created quite a stir and this sought to institutionalize technology transfer as standard operating procedure. Production technologies are assumed to be applicable to all farmers and the role of extension is to transfer them from the source, usually research stations, to farmers. A variety of extension methods and techniques are used, all designed to promote the technology to farmers. Instructional methods are predominant, based on the "source-sink" or "full vessel to empty vessel" principle. The diffusion aspect of the model presupposes that some farmers will adopt the technology and that this will serve as the initial action that fuels wider acceptance in the farming community. This is the so-called "trickle down effect".

Eventual declines in adoption rates, however, stimulated investigations into the reasons for low and non-adoption of

technologies. Studies focussed firstly on farmer constraints to adoption, and then examined farm-level constraints, and this was followed up by factors associated with the technology - all in an effort to understand and explain farmers' adoption behaviour.

While a wide variety of constraints have been identified, Vanclay (1992) noted several barriers to adoption that are pertinent to our study of IPM as it relates to the environment. These are the complexity of the innovation, the degree to which the technology can be broken up for adoption of its parts, its congruence with the farm and personal objectives, the economic benefits of adoption, the risks and uncertainties involved, the extent of conflicting information, cost of implementation, the capital and intellectual outlay required, flexibility of the innovation and the degree of physical and social infrastructure. Several of these barriers are later examined in some detail as they relate to environmental innovation adoption. This is in addition to others, (Taylor and Miller, 1978; Pampel and Van Es, 1977) who have long shown that the correlation for adoption of environmental innovations is different from commercial innovations. Roling (1988) noted that one of the more compelling reasons for low and non-adoption of practices is that they are not suited to the environment or social context. There is lack of fit between the technology and the farmer, his farm, his financial and family circumstances and surrounding farms.

#### *Environmental and IPM Innovations Congruency*

Participatory IPM, when defined as a set of "best management practices" which aim to

produce crops in an ecological manner, bears close resemblance to other environmental innovations. It suggests the need to take a look at IPM adoption from a different perspective, with a different lens, one that is different to the way other agricultural innovations are viewed. The adoption of soil conservation innovations provides an example in this regard, and highlights the contrasting nature of environmental and other production-oriented commercial innovations.

Environmental innovations are different from production innovations in several regards. These differences and their resemblance to participatory IPM are discussed.

*They are not broadly applicable, and are context-bound.* They are not generalized recommendations, but rather specific to a particular environmental situation and farmer circumstances. It involves management of crop profitability in ways which are suitable to local environmental conditions, and current circumstances of the intended users. Recommendations are not fixed, but rather worked out for each situation. As such, variations in recommendations are the norm.

For example, in the Watermelon production systems in Trinidad proper weed control is stressed as the major crop protection practice in the Poodai lagoon area. This is different to the method used in Vega de Oropouche area that puts the emphasis on mulching, as the main management practice. The crop is similar but the context and environment are different.

As a related point, environment innovations must also be time-specific. The set of practices will have to be in response to changing environmental situations, both biologically and socially.

*The results of adoption are not in the short term, but in the medium and long term.* The application of a new fertilizer or the modification of a previous fertilizer regime has some costs, but can improve production dramatically in a short space of time. The application of "best management practices" also has a cost attached to the farmer. Reduced hazardous pesticide usage may result in increased pest damage in the short term and loss of income. However in the long term the results, as shown, of decreased pesticide use has benefits for the environment and health of other farmers. Decreased pesticide use will in addition, conserve the natural enemy populations and when these species are established long term, the benefits are for all farms. This takes time that varies with the set of practices offered. The existence of a time lag before the farmer starts to see the benefits is part of the dynamics of the environment. This will be challenging in situations of insecure land tenancy, a characteristic of small farms in the region.

For example, the benefits derived from the use of the bio-pesticide *Metarhizium* for the control of Sugarcane froghopper over the last 5 years is now being reaped through the low incidences of the pest and the resultant reduction in volume of pesticides applied and hectares sprayed.

*They require different policy instruments.* At present, the regulatory framework and economic policies favour chemical pesticide misuse. Tax concessions, such as exemption from stamp duty and zero rating on VAT for pesticides, are promoted to increase production by minimizing losses due to pests and diseases. IPM technologies, which also seek to reduce losses to pests and diseases without incurring human and environmental health concerns, are, however, not supported by such favourable regulatory policies. Regulating measures and subsidies required for IPM should be different from other innovations. Accordingly, an enabling policy environment favourable to the adoption of more sustainable crop protection strategies is needed. A regulatory framework that favours the search for non-chemical approaches must be adopted since there are serious concerns for the health of producers and consumers, and the environment.

The development of National IPM policies, which seeks to include integrated pest management approaches as part of its agricultural sector policies, will encourage the adoption of a favourable regulatory framework.

*Collective activity is required.* Because of the highly mobile nature of pests and diseases i.e. their easy movement among farms in some locations, one farmer adopting does not constitute sustainable adoption. The success of any actions taken on his farm is highly dependent on what is done on the other farms. This is different from other innovations that focus on individual farmers and holdings – the individualistic nature of

these innovations. Individual farmers apply the recommendations and reap the rewards. The adopted practices may or may not be adopted by surrounding farmers. It is not unusual to find adoption of a recommended practice to be quite scattered in a farming community.

For example, the release of ladybirds to control the Hibiscus Mealybug (HMB) on farms is successful only if surrounding farms do not engage in pesticide spraying. If they do not spray then the ladybirds will multiply and eventually disperse onto their own holdings to control the HMB.

The management of the Citrus Blackfly in backyard home gardens is encouraged within a community through the collective use and distribution of natural enemies.

Collective activity must be the goal, and this represents a serious departure from traditional extension practices that tend to favour individualistic action. In this regard, group interaction will be a major factor influencing decisions in a community. Issues of social cohesion and group conflict management will inevitably arise as farmers decide whether or not to adopt, and if yes, which set of practices from the milieu offered. These issues rarely arise with other innovations. The extension professional will be required to perform tasks for which he has not been trained to do.

*The costs are borne by individuals, but the benefits are for community farms.* For production innovations that require cost expenditure, the farmer is responsible for its purchase. If he chooses to apply the technology and is successful the farmer benefits. If however it is not in the farmer's economic

interest he will not adopt. For environmental technologies, measures on individual farms are costs to the owner or operator, but the results will also benefit farmers in surrounding areas. For example, soil management structures adopted on an individual farmer's holding are of benefit to surrounding farms and indeed the entire community. It is a social benefit that is seen in decreased incidences of flooding, landslips etc. Large areas are generally preserved and farming is sustained for the future. The costs of adoption were borne by individuals but there was multiple sharing of benefits. IPM practices are similar in this regard.

*Environmental adoption relies on local or indigenous knowledge of surrounding.* Site-specific knowledge plays an important role in environment-oriented innovations. This is relatively unimportant in production innovations. Local knowledge of surroundings or contextual knowledge becomes important in any situation where a "set of best management practices" is to be employed. The assumption is the "set of practices" will vary with each local situation. As such, the joint diagnosis of a situation with insiders and outsiders is important, as well as the sharing of information particular to the context and the design of any implementation strategies. Participation by all shareholders is an essential part of participatory IPM adoption. IPM technologies, by their nature, demand an amalgamation and synthesis of knowledge in a complex situation and from various sources about various topics.

Farmers hold valuable indigenous knowledge about their environment and the ecosystem within which they operate and if prescribed technologies and practices are not synchronized, then adoption is not likely to be secured or sustained in the long term. Traditionally, agricultural innovations are given with little regard to local situations. Soil fertility recommendations may be the only exception, and yet they are given for large areas.

In the production-oriented system, recommendations to control pests and diseases are pesticide-based and generalized, driven by what are available in the garden shops.

*Higher appropriation costs.* The complex management skills needed to integrate several different components in decision making suggests that higher innovative skills are needed. Also, there are high costs, particularly in the time spent in appropriating the various knowledge and decision skills. These have direct impact on the method and approach to adoption. Increased value should be placed on the communication and awareness aspects of any program before it begins. Farmers will have to agree to invest their precious time in the process if they are to reap the rewards.

*Different economics.* The shift from emphasis on production to protection is a characteristic of environmental innovations and requires a shift in economic thinking. One major issue needs to be re-examined; the real economic costs of production are masked by subsidies on pesticides in the production-oriented system and less

pesticides are used in the protection-oriented system.

#### NEW LENS NEEDED

The lens through which we look at IPM adoption will make a huge difference to our approaches, methods and techniques.

Agriculture and the environment are intricately linked, yet they are overseen by different agencies in many Caribbean countries. Even when they reside within the same Ministry or Government agency, responsibilities are often assigned to different departments.

IPM strategies reside within the domain of Agricultural Science. As such, extension may follow standard methods and approaches without question to secure its adoption by the farming community. Practitioners, whose functions are not integrated, may not see clearly that it bears a lot of resemblance to the environment. Even if they see some cloudy relationship, their ingrained training will dictate that they pursue strategies for adoption in the traditional manner.

The present lens used has helped to shape a techno-science conscience geared to promote production innovations. Technologies aimed at protection of man and the environment requires the nurturing of a social conscience.

The motive for offering technologies to farmers comes into focus. Increases in production to feed a food deficit world was the motivation for the green revolution technologies. The development of IPM, however, was in response to threats to man and the environment and is offered primarily

for protection. Although production and protection share space, they are at different focal lengths. What is needed are lens that can keep each objective in full view. It may sound impossible, but is a challenge for all stakeholders including economists.

#### **IMPLICATIONS AND SUGGESTIONS FOR CHANGE**

##### *Approach to Development*

The top down approach, and its associated one way transfer of information, is clearly going to be inappropriate in situations where intended users have rich knowledge and the innovation is for a community rather than individuals. The "source-sink" relationship will become clogged and messy early.

Consider the tree. Parts are dependent on each other. The leaves provide food for other parts including the roots, and the roots provide nutrients for leaves to manufacture food for the survival of the entire plant. Vessels in the plant are essential conduits to maintain the process of back and forth. Rather than a source and a sink, a better perspective would be a "source-source" relationship. This arrangement would enlist farmers, extension and researchers in appropriate forms of arrangements that facilitate sharing of knowledge. The amalgamation of science-based knowledge and community knowledge to fashion a set of best management practices would more likely be adopted given the appropriateness to the context and the sense of ownership that goes with it.

The present approach to development must be modified and reorganized to facilitate adoption of IPM technologies. A

shift away from the top down approach and the provision of a set of instructions to a more participatory approach where all knowledge is valued and all stakeholders contribute to solving a particular situation is more appropriate.

##### *Institutional Rearrangements*

For success, institutions will have to be reorganized to be able to deliver a steady stream of relevant pest management information and to support its development in the field with farmers.

Arrangements must be put in place to facilitate research, extension and farmers coming together as collaborators in the research and development process. This will require retraining of staff that, for long years, has not been accustomed to treating farmers as their partners in a process. Constructive collaboration will have to be the guiding principle of operation.

##### *Role of Extension*

The role of extensionists must change from being simply a vessel that provides unidirectional transfer of information, to one that facilitates movement back and forth. While this suggestion has been made many times in the past, the reality is that it has never been addressed, and it is "business as usual" for technology dissemination.

In addition, new roles as facilitators of learning rather than providers of information from research stations need to be developed. Facilitation skills, to draw out and synthesize the rich experiences of farmers, are needed more than instructional skills. The function of extension has to change to be one of knowledge integration rather than



transfer. It must see its role as providing farmers with the ability to influence biological systems positively in their environment which would certainly promote sustainable agriculture.

Extension would also need to shift centres of learning from sanitized classrooms in centralized locations, school classrooms and from under farmer's houses to the centre of farmers' fields. It is here that farmers are most comfortable and knowledge abounds. Farmers are very articulate in their own surroundings, excellent with their hands, always ready to demonstrate or draw something. This type of approach facilitates experiential learning. Farmers are put in a disadvantaged position when brought into a classroom type situation and lots of experiences are suppressed.

Training in group dynamics, especially facilitation skills would be as important as the science behind the innovation. Facilitators are needed to create the right learning environment to promote experiential learning. Positive attitude among facilitators are needed to draw out these experiences.

#### *Other Programmes*

The use of inorganic fertilizers is increasingly coming under scrutiny for the effects they have on the environment, especially groundwater. A similar approach may be needed to address these concerns.

The need for producers to engage Good Agricultural Practices (GAP) is also an issue on the front burner of farming worldwide. These concern the health of consumers and in that regard may require similar approach and actions as IPM.

#### **CONCLUSION**

IPM, now recognized as an agricultural innovation, seems to share a lot of similarities with environmental innovations. From this position, an alternative approach to secure sustained adoption by farming communities would have to be adopted. Different institutional arrangements must be made, new policy support measures, and collaborative forms of working arrangements for research, extension and farmers are needed. The approach that should be taken may become clearer if those concerned with IPM adoption by farmers take a moment and look at the innovation with a new perspective. We need to look with eyes, not blurred by our previous agriculture experiences, but rather ones that envision us to look far and wide in different domains and directions and to think and strategize differently.

It is a challenge I am sure we can overcome successfully over time.

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