

Rethinking Present Extension Strategies for Sustained Adoption of Environment-related Innovations by Small Farmers in the Caribbean

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Abstract

Present Extension approaches and strategies are characterized by one-way dissemination of information, generated by scientists on research stations distant from and dissimilar to farmers' fields. Their main objective is increased production on individual farms. While some success has been recorded, the sustainability of the technologies offered and their impact on the environment are being questioned. The need to preserve the environment while increasing production has forced a rethink of strategies in several areas. Current thinking of Scientist-Technology-Farmer is now being expanded to Scientist-Technology-Farmer-Environment to reflect new concerns.

This paper focuses on Integrated Pest Management (IPM) and Soil Conservation technologies offered to treat two serious threats to farming in the Caribbean region, namely the grave destruction caused by pests and diseases, and soil erosion. IPM and soil conservation, now recognized as purely agricultural innovations, are closely related to the environment. From this position, an approach different from the one used to secure adoption of other technologies is needed.

Several issues that should prompt a rethink of strategies are elaborated. These include: the targeting of innovations and the user environment, time frame for results as well as the time specificity of innovations; the need for community, not individual adoption, and determining who will bear the costs of adoption; the importance of contextual knowledge; the demand for collective activity; and the effects of insecure land tenure. Alternative strategies should include the adoption of more participatory approaches to technology development, program design, and delivery. Extension staff will need retraining and the Research and Extension interface must be reorganized and strengthened.

Introduction

The adoption of improved technology by small farmers is advanced as the major vehicle to quickly bring economic benefits to them. The purpose of extension in such a situation is to facilitate technological change at farm level to enhance the productive capacity of the farm and its operators (Garforth and Harford, 1997). Increased production in the shortest possible time is the primary objective. The dominant linear model of communication is based on the provision of clear recommendations to farmers, derived from research conducted at centralized experiment stations. Policies and regulatory measures as well as the extension approach and strategies are designed to secure quick adoption by large numbers of farmers. A clear focus is on the transfer of technology. In addition, 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 wide variety of extension methods and techniques is used, all designed to promote the technology among farmers. Instructional methods are predominant and farmers are the passive recipients of technology generated at some other location. Samy (1995) noted that Extension systems in developing countries are generally characterized by poor participation of farmers in program development.

The present model of communication is consistent with the need to promote innovations that have an overarching goal of maximizing production and profits. Usually, packages of technologies are bundled together and offered to farmers and sustained adoption at high levels is sought. Thus farmers in the Caribbean region are encouraged to use large quantities of inorganic fertilizers, pursue multiple cropping practices and frequently use highly toxic pesticides to eliminate all pests and diseases on sight. Lack of access to flat, arable land in many countries in the region means that small farmers cultivate mainly on the less fertile soils, usually on hillsides and to some extent also practise shifting cultivation. Little attention is given to the environment. The consequences of this type of approach in the medium and long term include the loss of bio-diversity, soil loss and infertility, increased “slash and burn” cultivation practices, pollution of the ground water and flooding.

In recent times, however, global concerns for the environment have come to the fore. The issue of environmental protection has been attached to the objective of increased production. Concerns about soil erosion, pollution of groundwater, loss of flora and fauna, and especially beneficial insects are routinely expressed. In addition, the need for producers to engage Good Agricultural Practices (GAP) is also an issue on the front burner of farming worldwide. These concerns relate to preserving the health of consumers, protection of the environment as well as the ability of regional farmers to access export markets.

Several of the innovations offered to small farmers have potentially serious consequences for the environment. These innovations have special characteristics which suggest that strategies to secure their adoption may have to be different from those employed for innovations which are production oriented and have little or no adverse effect on the environment. The need to preserve and protect the environment as production increases are sought demands a closer look at these characteristics and the environment for which they are intended and a reexamination of present extension strategies.

Purpose

The objective of this paper is to discuss the characteristics of some environment-related innovations targeted at small farm systems and the required modifications to traditional extension strategies to secure sustained adoption of these innovations.

Theoretical Base

Our beliefs about how adults learn guide our approach to extension education for our clientele. Most of the approaches traditionally used are constructed on the theory of behaviorism. The goal of such approaches is to communicate or transfer knowledge and skills to a learner. Learning is said to have occurred when a correct response or a desired behavior is demonstrated.

This type of approach based on programmed instruction does not require any mental processing by learners. Farmers are passive recipients of information on technologies developed elsewhere, and are simply required to produce the response desired by the information provider. This approach provides a lot of new information, but does not teach learners how to learn, nor does it provide any motivation for inquiry, discovery and for learning new things on their own. Learners become and remain information dependent. Their ability to process, analyze and synthesize information is restricted. They would always want to see the information provider and want to be informed about "something new to try out" on their farms.

The approach to extension education in the Caribbean is by far and wide based on the Transfer of Technology (TOT) paradigm. Extension agents provide recommendations to farmers based on research developed at centralized experiment stations, or generated from researcher-managed trials on farmers' holdings. Farmers are required to follow these recommendations as provided. FAO (1994) noted that this approach is effective only under simplistic, predictable and controlled settings, but was unsuccessful under the complex and variable settings of rainfed systems. Chambers (1991) listed three conditions under which the TOT works. These are: where the technology can be effective in a wide range of environments; where there is a tightly regulated and predictable environment; and where the receiving environment can be readily controlled and standardized.

The dissemination of standardized recommendations to diverse environments has resulted in low adoption levels generally. Chambers (1991) stated that small resource-poor farmers have been slow or unable to adopt many of the recommendations flowing from research. Some of the reasons advanced were farmer ignorance (1950's and 1960's), farm level constraints (1970's and early 1980's) and the technology and its development process (later 1980's). Van de fliert and Braun (2000) also noted that farmers often say that the technology presented to them is not fully sustainable on their farms. If they try it out at all, farmers often adapt the technologies to suit their own particular circumstances.

In the Caribbean region, the agricultural research capacity is highly fragmented and in addition, both the number of researchers and the money spent on research are dwindling (Roseboom et al., 2001). To a limited extent, some of the larger Caribbean countries are able to support experiment stations and are able to generate technologies for farmers. Many of the smaller countries depend on work done at these institutions. Often, these institutions conduct

work in environments which may be quite different from that of the intended final users. In the Caribbean region, several variations that may impact on the extent to which technology developed elsewhere is adopted are readily discernible. These include variations in Farmer characteristics (age, education levels, ethnicity, and language) and Farm characteristics (soil structure and fertility, topography, rainfall, farm resources, and pest and diseases complexes). It is not uncommon, however, for standardized recommendations to be offered unchanged for several years and little new research results being generated.

An alternative approach, based on the theory of constructivism, holds that individuals learn by constructing meaning through interacting and interpreting their environments. It is recognized (George Mason University, 2000) that knowledge is embedded in the context in which it is used, and learners create novel and situation-specific understandings by “assembling” knowledge from diverse sources appropriate to the problem at hand. This paradigm emphasizes that learning is an active process of constructing rather than acquiring knowledge. The Top-down Transfer of technology approach and its associated extension strategies for one-way transfer of information is clearly going to be inappropriate in situations where the technology was developed elsewhere, where intended users have rich contextual knowledge, and where the innovation is for a community rather than individuals.

Constructivist approaches are based on inquiry, discovery, and situated learning. This type of learning, frequently called contextual learning, recognizes that learning is a complex process that involves much more than the behaviorist approaches that emphasize drill and practice, recall of facts, and automatic performance of specified procedures (Imel, 2000). The characteristics of contextual learning are listed (Clifford and Wilson, 2000) as: emphasizing problem solving; assisting learners in learning how to self regulate their learning, anchoring teaching in the diverse life context of the learners, and encouraging students to learn from each other. Contextual learning theory (CORD, 2001) holds that learning occurs only when learners process new information or knowledge in such a way that it makes sense to them in their own frame of reference and focuses on the multiple aspects of the learning environment.

Strategies based on this type of learning focus on the learner in the learning situation and utilize discussions among farmers, researchers, and extensionists to determine what is appropriate for a given situation. Such strategies center on meaningful participation of all the stakeholders. The technology environment, which includes the farmer and the context for adoption is an important facet of the technology adoption process which cannot be ignored and approaches that involve the intended users of technology on all stages of technology development is posited as being essential for the sustained adoption of technologies.

The modification of present strategies to meet new global concerns will mean that those who facilitate the use of technology will have to be more people and context oriented. The inclusion of intended users in all aspects of technology development and use must be given more attention by organizations responsible for extension. A concerted move toward participatory approaches is needed. Such approaches (Toness, 2001) involve farmers in the process of research and development, is both interactive and empowering, and emphasizes participatory learning processes and sustainable development. It has been suggested (FAO, 1994) that any shift in approach will require professional, institutional, and policy-related changes, a strengthened human resource, and the removal of attitudinal and behavioral barriers.

Scope of Discussion

The reasons for suggesting a rethink of the extension strategies are based on some general issues raised and discussed by Vanclay and Lawrence (1994). Although this discussion represents an elaboration and an addition to the previous discussion, it will be restricted to Integrated Pest Management (IPM) and Soil conservation technologies that are offered to solve two main threats to small farming in the Caribbean.

Issues that Suggest a Rethink

Innovations that have both production and protection functions are different from innovations designed solely for production increases in several regards. Some of the issues that should concern extension would be:

Applicability of innovations

Production-oriented innovations are usually quite general and given for use by farmers with little specificity, i.e., they have broad applicability, for example, fertilizer and pesticide recommendations which are given to produce a specific crop. Differences are based mainly on the crop type and beyond this the recommendations are assumed to be broadly appropriate for all farmers in a country. While this may be appropriate in larger countries, the situation in small island developing states is quite different. Moreover, the small size of Caribbean countries may suggest relatively homogenous farm and farmer circumstances. However, within a small country there can be wide variations in topography, soil types, and fertility, as well as pest and diseases complexes. Farm systems and ecosystems could vary from one valley to the next, separated by only a few kilometers. Integrated Pest Management (IPM) recommendations cannot be rigid in farm systems that are characterized by dissimilarity over relatively small areas. As an environment-related innovation, it cannot be a generalized recommendation, but rather specific to identified environmental situations and farmer circumstances. Such an innovation would need to be finalized with farmers as farm situations may vary widely, especially the level of farm resources and the education level of farmers. These two factors are important as IPM is a knowledge-intensive technology and soil conservation is resource intensive and differences in these two important attributes could possibly influence sustainable adoption.

User environment

Production oriented recommendations are often developed on experiment stations in very controlled environments and they are then offered for use in conditions which are highly variable. It is quite likely that both the physical and biological environments of the technology development process were different from that of the intended users. For example, soil conservation measures may be developed on larger, resource rich holdings which may be quite different from the resource-limited situation of intended final users.

Environment innovations stress the management of enterprises in ways that are suitable to local environmental conditions and current circumstances of the intended users. As such, recommendations are not fixed, but rather worked out for each situation. Variations

in recommendations should be more the norm than the exception. For example, in the Watermelon production systems in Trinidad, proper weed control practices are stressed as the major crop protection strategy in the Poodai lagoon area. This is different to the method used in the Vega de Oropouche area where farmers put the emphasis on mulching as the main management practice. The crop is similar but the environment is different. The user must play a part in the adaptation process for sustained use.

Contextual knowledge

The knowledge of scientists is generally predominant in the development of technologies and recommendations are given with little regard to local knowledge. Farmers, however, hold valuable indigenous knowledge about their environment and the ecosystem within which they operate and if prescribed technologies are not synchronized with this knowledge, then adoptions are not likely to be secured or sustained in the long term. This site-specific knowledge plays an important role in environment-oriented innovations but is relatively unimportant in production innovations. Local knowledge of surroundings, or contextual knowledge derived from the experiences of farming for a long time in the area becomes important in any situation where the environment is a crucial factor to be considered. 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. Final practices may well vary according to the existing knowledge set in each local situation.

For IPM, participation by all shareholders is an essential part of its adoption simply because this technology, by its nature, demands a synthesis of knowledge in a complex situation and from various sources about various topics.

Consequently, extension agents must pay more attention to local or indigenous knowledge in the communities. This would represent a shift from the emphasis on scientist knowledge at the research station.

Time specificity

Production oriented recommendations are generally fixed for long periods of time. Usually, no "time of use" is specified. Crop protection advice varies on the onset of a new pest or disease outbreak. Soil conservation recommendations rarely vary. For environment-related innovations, the set of practices will have to respond to any changes in environmental situations, both biologically and socially. Strategies will have to be constantly modified. Pest and disease situations change seasonally and farmers are required to respond with shifting strategies. In such situations, fixed recommendations are of little value. Farmers empowered to work out crop and soil conservation strategies would be able to respond to shifting agro-ecosystems appropriately. Rather than simply following instructions, if farmers understood principles and basic experimental procedures, they would be better positioned to adapt technologies to meet ecosystem changes.

Results of adoption are not in the short term, but in the medium and long term.

Unlike the application of a new fertilizer or the modification of a previous fertilizer regime which can improve production dramatically in a short space of time, alternative pest management strategies or soil conservation structures have results in the medium to long term range. The challenge to extension is to have farmers understand and be prepared for this by engaging in other activities to maintain income in the interim. Improving farmers' knowledge on economic farm planning will become a priority.

In addition, the application of some IPM management recommendations 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 decreased pesticide use has benefits both for the environment and the health of 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. There usually exists a time lag before the farmer starts to see the benefits of an intervention. The benefits derived from the use of the bio-pesticide *Metarhizium* for the control of Sugarcane froghopper over the last five years is now being reaped through the low incidences of the pest and the resultant reduction in volume of pesticides applied and hectares sprayed.

Land tenure

This will be challenging for extension. Many small farmers in the region have moved beyond subsistence-orientation to being actively involved in marketing their produce. These farmers usually farm on lands left over from the large export-oriented estates. They occupy marginal lands which are not very fertile, are often on hillsides and are characterized by insecure land tenancy arrangements. The adoption of management practices and structures which incur costs and which have delayed results will not be a priority. They will most likely not be around for medium to long term benefits of adopting IPM and soil conservation technologies. For example, pineapple farmers in one region of Trinidad were practising a system of clearing old abandoned estates, farming the steep lands for a few years, and then moving on to other lands when serious erosion began to take its toll.

Collective activity required

Production-oriented innovations focus on individual farmers adopting a particular technology and reaping the rewards— the individualistic nature of these innovations. The adopted practices may or may not be adopted by surrounding farmers and it is not unusual to find adoption of a recommended practice to be quite scattered in a farming community.

For both IPM and Soil conservation technologies, however, the success of any actions taken on one farm is highly dependent on what is done on the other farms. In this regard, group interaction will be a major factor influencing decisions in a community. Community work will have to be the focus of extension. Extension agents will have to be equipped with the necessary skills, for example, group facilitation, cohesion building, team work, etc. These skills are presently not in their toolboxes or if present, are not used to any extent. A greater participation by the clients is needed.

For example, with IPM, the highly mobile nature of pests and diseases facilitate their easy movement among farms in some locations. One farmer adopting does not constitute sustainable adoption, a critical number must adopt. The release of Australian Ladybird beetles to control a serious crop pest, the Hibiscus Mealybug (HMB) on farms is successful only if surrounding farms do not engage in pesticide application. If they do not spray harmful pesticides, then the ladybirds will multiply and eventually disperse onto their own holdings to control the HMB.

Collective activity must be the goal, and this represents a serious departure from traditional extension practices that tend to favor work with individuals. 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 roles and tasks for which he or she has not been trained.

Individual costs, but community benefits.

For production innovations that require cost expenditures, the farmer is responsible for its purchase. If, however, it is not in the farmer's economic interest, he will not adopt. For environment-related technologies, measures on individual farms are costs to the owner or operator, but the results will also benefit farmers in surrounding areas. For example, the construction of soil conservation measures on farms higher up the hillside incurs costs to the individual farmers, but the benefits are for the all farms on the hillsides and the flat lands below. It is a social benefit that is seen in decreased incidences of flooding, landslides, etc. Large areas are generally preserved and farming is sustained for the future. IPM practices are similar in this regard, for example the establishment of trap crops, insect repellent crops, and other eco-friendly practices are costs to the farm owner, but the surrounding farms benefit.

Implications

Any rethinking of present approaches and strategies will have several implications for the way in which extension is organized and conducted by governments and NGO's in the region. There is a changing role for Extension. It is to provide farmers with the ability to influence biological systems positively in their environment. This would certainly promote sustainable agriculture. However, some reorganization is necessary.

General Approach

Present extension strategies would have to be modified and reorganized to facilitate the sustained and increased adoption of IPM and soil conservation technologies. The need to ensure preservation of the environment while seeking increased production is now a serious concern. A shift from a non participatory approach to one that involves the end users in all stages of the technology development process may be more appropriate. An approach that incorporates all stakeholders, especially the farmers, is more appropriate in these circumstances. Such a participatory approach empowers farmers to become better decision-makers and they are more likely to demonstrate continued use of the technology.

Role of Extensionists

The role of extensionists would have to be changed from being simply a vessel that provides unidirectional transfer of information, to one that facilitates movement back and forth. Facilitation skills to draw out and synthesize the rich experiences of farmers are needed more than instructional skills. New roles as facilitators of learning rather than providers of information from research stations need to be developed. The function of extension will also have to change to be one of knowledge integration rather than transfer.

It would be very useful for Extension to shift centers of learning from classrooms in centralized locations, and even from under farmers' 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 to assist explanations. Farmers are put in a disadvantaged position when brought into a classroom situation where lots of experiences are suppressed. The emphasis on behaviorism must give some way to constructivism, and top-down instruction to participatory learning methods.

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. A positive attitude among facilitators is needed to draw out these experiences.

Institutional level

Agriculture and the environment are intricately linked, yet they are overseen by different agencies in many 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. Inter-agency coordination is necessary.

Emerging concerns

The use of large quantities of inorganic fertilizers is coming under scrutiny due to the effects on the environment, especially groundwater. Additionally, the demand that producers engage in Good Agricultural Practices (GAP) is also an issue on the front burner for Caribbean agriculturists. Consumers' and farmers' health and the environment are threatened by improper farming practices. These two issues are similar to those raised for IPM and soil conservation and a similar approach may be needed.

Conclusion

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, innovations are for communities rather than individuals and further adaptation is needed. An alternative participatory approach may be better in such situations. This approach would entail involving farmers, extensionists, and researchers in appropriate forms of arrangements that facilitate sharing of knowledge. The amalgamation of science-based knowledge and community knowledge can fashion a set of best management practices which is more likely to be adopted given the appropriateness to the context and the sense of ownership that goes with it.

The goals for agriculture have changed from a single focus of production increases to include environment protection at the same time. The imposition of purely technical solutions developed without client involvement will present a challenge to adoption of environment innovations. Farmers are experts in their own environment and this must be recognized and factored into a modified approach to extension. Again, a participatory approach that fully involves farmers in all its phases may be more suitable.

The Extension and Education strategies must be suitably remolded in keeping with any new approach. Staff re-training will be required as well as institutional adjustments to support the new initiatives. Collaborative forms of working arrangements for researchers, extension personnel, and farmers are needed and should be institutionalized.

Finally, it is recognized that the participatory approach still drives fear into the hearts of some workers. However, such fears could be lessened if those concerned with the adoption of these innovations by farmers take a moment and look at them 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.

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