THE ROLE OF EXTENSION IN THE TRANSFER AND ADOPTION OF AGRICULTURAL TECHNOLOGIES

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Abstract

Using appropriate, research-based, agricultural technologies to promote food security is a major priority for many developing nations. Since farmers differ in their socioeconomic backgrounds, academic levels, learning needs and problems, these technologies must be communicated to them using proven extension education principles and appropriate teaching methods. Seven principles and five technology characteristics related to the transfer and adoption of a new innovation are discussed, and examples given of what could happen when they are observed or violated. To be successful in technology transfer, extension personnel must understand farmers' learning needs, problems, priorities, and opportunities as well as the psychological, process, semantic, physical, and economic barriers to adoption.

Introduction

To alleviate rural poverty by ensuring food security and sustainable improvement in people's well-being, research-based technologies must reach and be widely adopted by farmers. Change agents may know the solution to problems confronting farmers, yet be unable to communicate these solutions if they lack effective communication skills, and do not apply sound extension education principles. These principles emphasize two-way communication between farmers and change agents, focus on farmers' practices and priorities, consider gender and land tenure issues, and enable agents to better understand how farmers make farm and marketing decisions (Mung'ala, 1996; Rudebjer & Temu, 1996).

Developing countries are particularly susceptible to the problems of low agricultural productivity and environmental degradation. These problems can be alleviated if extension education systems have a sound research and technology base, and understand and apply extension education principles to enable farmers to adopt new and improved technology, so that they can reap the economic benefit flowing from these technologies. For instance, Christensen (1983) and Easter, Leitch and Scott (1987) refer to the adverse consequences of soil erosion such as decreased land resale value, loss of soil fertility, sedimentation of streams and lakes, and contamination of water supplies with pesticides and fertilizers. In contrast, extension education programs have been found to enhance soil and water conservation, improve farming systems, aid in transfer of appropriate technology, and develop rapport with and persuade farmers to adopt improved farm practices (Earle, 1993; Kenya Government, 1985).

It is the purpose of this paper to present extension education principles, and the characteristics of new technologies which facilitate transfer and adoption of technology among farmers. Examples from the experiences of the author in extension work are provided to show what happens when these principles are observed or violated.
Extension Principles Facilitating Technology Transfer and Adoption

Seven principles that should facilitate the delivery of technology to farmers by an extension system and its eventual adoption by farmers are suggested in the literature.

Consultation. Because rural people mistrust outsiders (MacDonald & Hearle, 1984), they will resent agents who take ready-made plans for them to follow without prior consultation. Failure to consult may negatively affect technology transfer. For example, in the last two years, elders of a local African Inland Church (AIC) initiated an agricultural and community development project to address the area’s socioeconomic problems. The pastor was not consulted at this stage. The elders, who sought advice from agricultural professionals, were supported by other community leaders from within and outside the AIC. They requested the church’s pastor to provide opening remarks for field days which were well attended. Though the pastor complied, he later told us in an evaluation interview, that the initiative was doomed to fail because, according to him, the elders were nothing more than a clique of relatively rich, close friends who were working without consulting others. We discovered that the pastor was unwilling to support the initiative because he resented being excluded from key decision making and planning.

Building mutual trust. In addition to consulting all relevant stakeholders, any mistrust among individuals and/or groups should be removed. A recent interview with a prominent Bahati farmer and community leader revealed that many farmers in the area were suspicious of any one trying to collect money for a community project. They feared that the money might be diverted to personal use. This fear came from past experience with a water development project in which funds were misappropriated by members of a management committee. Consequently, raising money in this community for whatever cause is likely to fail unless farmers are convinced that the organizers are trustworthy. For technology transfer to succeed, there must be mutual trust between leaders and their followers. Mutual trust must also exist among the leaders themselves. For example, when the Bahati Divisional Extension Officer could not get public funds to train farmers in crop and livestock husbandry, he convinced farmers to take financial responsibility for their training. They collected money and the extension officer successfully conducted the first training session. However, his supervisors did not support the initiative. Instead of commending him for starting a sustainable way of carrying out extension, they frustrated his efforts and forced him to abandon the idea. As the officer later discovered, his superiors were uncomfortable with his increasing popularity among farmers. Furthermore, they suspected he might gain financially, even though he did not keep any of the farmers’ money. For successful technology transfer, extensive consultations to remove mistrust between interested parties are essential.

Establishing rapport with stakeholders. Farmers and change agents should operate in mutual interest networks by establishing rapport through friendship, and by avoiding any sense of superiority by either party. While evaluating extension projects in Keiyo Marakwet District a few years ago, a young farmer told us that his extension agent, being a high school graduate like himself, could not teach him anything. In this case, the farmer’s superior attitude made him unteachable. Farmers also resent advice from agents who adopt superior attitudes (Boone, 1989).

Being sensitive to farmers’ needs, constraints, and opportunities. Farmers may differ in education, gender, age, ethnicity, needs, constraints, opportunities, and socioeconomic status. A change agent is only human, and may not have an answer for every question that farmers may have. When unable to answer questions, an agent should be willing to suggest alternative sources of answers instead of guessing or giving incomplete or wrong information. The importance of admitting that change agents cannot know everything about agriculture came out clearly in our December
1997 interview with a very successful Bahati farmer who grows passion fruits. The farmer told the author that change agents in the area knew little about passion fruit production, and therefore had nothing to offer him. He claimed that he was teaching agents how to manage the crop, and lamented that they were offering him nothing in return. Yet they were using his teachings to train other farmers without giving him credit. To further alienate the farmer, the agents, he regretted, had a habit of bringing him frequent visitors who not only wasted his time but also trampled on his crops. Obviously, the agents lacked wisdom and diplomacy in their work. A better way would have been for them to ask the farmer whether and when it would be convenient to bring visitors and the number of visitors he could handle. They should also have monitored and discouraged any behavior that was likely to offend their host. In addition, they should have readily admitted their lack of skill in passion fruit production, and assured the farmer that any knowledge and information gained from him would, with his permission, be used to benefit the community, and that they would give him full credit for it. On realizing the importance of growing passion fruits in the area, they should have requested their supervisors to organize short courses or seminars to improve their technical skills.

*Using appropriate terminology to teach farmers.* Semantics is the study of meaning in words (Kreitner, 1989). When using unfamiliar terminology to explain recommended agricultural practices, one should ensure that farmers understand. Extension education can facilitate this assurance because it encourages change agents to know farmers’ characteristics and to use simple words that express clearly the ideas being communicated. If, for example, there were 100 animals grazing in a particular field and someone said the majority of those animals had a bacterial infection, it would be difficult to know whether the word majority meant 60, 70, 80 or 90 animals unless the actual number or percentage was also given. Proper translation of English into the local language, simplification and choice of words, use of culturally acceptable gestures, and the general appearance of an agent may determine one’s success in establishing rapport with farmers, and in successfully communicating the intended message.

*Having good technical preparation and self-confidence.* It is easier for farmers to believe the teachings of a person with the right technical preparation and self-confidence. An agent, in one case, was teaching Nakuru farmers how to lay out a tomato seedbed but was uncertain of the recommended dimensions. Her lack of self-confidence made it harder for farmers to have confidence in her teaching.

*Being a good listener.* A sincere effort to listen and to avoid sexist language will improve communication effectiveness. Our December 1997 interviews with Bahati farmers revealed that most of them were dissatisfied with their agents’ listening skills. Over 80% of them complained that the agents often did not care to find out what their problems were. Yet without knowing problems it is impossible to solve them.

**Technology Characteristics Facilitating Adoption**

The literature and personal experience have shown that to be more easily adopted, a new technology must have certain characteristics.

*Relative economic advantage* is the degree to which the technology is perceived to be better than the idea it supersedes in terms of economic profitability, social prestige, physical convenience, low initial cost, lower perceived risk, decreasing discomfort, psychological satisfaction or saving of time. A cheaper technology will be adopted faster than a more expensive one (Roling, 1990). Because farmers want to make money, we should show them how a new technology will benefit them financially. For example, we convinced several Bahati farmers to start growing passion fruits instead of maize because the average gross margin from an acre of passion fruits and from an acre of maize in the area was $6,000 and $200 dollars per year, respectively. Availability and cost also
influence technology adoption. In Kenya, for example, many farmers adopted tractor land preparation, though costly, because the government made tractors readily available to farmers for hire. As an example of how physical convenience influences technology adoption, many farmers in Kenya preferred planting maize and beans in the same hole, against research recommendations, because it was more convenient. They also refused to plant two rows of beans between two rows of corn, recommended by researchers through the Training and Visit Extension System, because doing so required more labor for planting and weeding which was a major constraint during the weeding period.

*Compatibility* is the degree to which a technology is perceived to be consistent with the farmer's goals and aspirations; sociocultural values, norms and beliefs, and past experiences; needs; and existing farm practices. Technologies compatible with existing farm practices encourage a positive attitude toward change, improve the agent's credibility, and may be adopted faster. A Bahati farmer grew maize on six acres continuously knowing well that it had a lower gross margin than kale. She reasoned that because the farm was far from home, managing kale would be difficult and less compatible with her other work activities.

*Trialability* is the degree to which a technology may be tried out on a limited scale to determine its efficacy before adopting it on a large scale. For instance, artificial insemination can be tried with a few cows in the herd and natural service on the majority. This enables the farmer to test suitability and efficiency of the new technology. Technologies that can be tried on a limited scale will be adopted faster due to their lower risk to the adopter (Shields, Rannigar & Goode, 1993). A farmer tried to grow 20 acres of maize in Kitale District recently but lost the crop due to drought. A second farmer sowed 100 acres of wheat in Mau Narok but excessive rain destroyed the wheat. If these farmers had grown the crops first on a smaller scale, they would have avoided crippling losses.

*Complexity* is the degree to which a technology is perceived to be relatively difficult to understand and use. Technologies that are more complex to understand and use have lower rates of adoption. A young Bahati farmer attempted to keep pigs without knowing what that entailed. He consulted livestock professionals on housing and feeding but later wondered why his weaners were experiencing unusually low growth rates. He had neglected regular control of internal parasites. For him, swine production was a complex technology that required a thorough understanding for effective implementation.

*Visibility or Observability* is the degree to which the results of a technology are visible or observable. The more viable a new practice is and the easier its results are to observe, describe, and communicate to others, the more rapidly it will be adopted. Material innovations and concrete ideas that are easily observable are adopted faster than less concrete ones. Some young Bahati farmers started farming after seeing their neighbors’ success. Those we talked to were motivated by the success of farmers who had built costly residential houses or bought new vehicles with income from four acre vegetable plots.

**Applying Extension Education in Agriculture**

Knowledge and application of extension education principles help in determining farmers' needs, constraints, priorities and opportunities; teaching farmers the value of improved agriculture; recommending suitable crops and livestock for different agro-ecological zones; encouraging adoption of appropriate technologies, and evaluating farmers' reactions and attitudes towards development projects. It is also helpful in raising farmers' involvement in project identification, planning, implementation, and evaluation as well as persuading respected community leaders to legitimize and support viable development projects.

Generally, farmers act on the advice and suggestions of a person they know and like, and whose knowledge they respect. This must be an individual of considerable personal integrity who will answer questions only when certain
that the answer is correct. Bahati farmers, for example, had unfavorable opinions regarding most of their area extension agents, but they were full of praise for their divisional extension officer whom they considered knowledgeable, honest, reliable, helpful and deeply committed to his job. Good agents listen thoughtfully to farmers' opinions before suggesting changes. They develop programs that weave technological improvements into the existing culture instead of trying to make radical changes. For example, soyabean production in Bahati was conveniently introduced as a substitute for culturally valued foods in that community: soya milk was presented as a replacement for cow’s milk, soya drink as a replacement for tea and coffee, while the plant’s nitrogen-fixing properties were presented as a partial substitute for fertilizer.

Change agents who know and apply sound extension education principles in their work have a better understanding of farmers' needs as well as the characteristics of a new technology that affect its rate of adoption. When well applied in farmer education, extension principles improve the transfer and adoption of appropriate agricultural technologies. The adoption of these technologies can increase farm productivity and consequently improve farmers' food security and living standards.

References


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