Efficacy of Conventional Extension Approaches: A Case of Morogoro District, Tanzania[21]

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ABSTRACT

In Tanzania, smallholder the adoption of agricultural and livestock recommended practices and technologies is remains constrained. At the hub of the problems is the limited level of knowledge and skills, which is compounded by lack of money among small holder farmers to buy the improved technologies. This study's findings go further to emphasize that the agricultural inputs should be available when they are need and at prices that small holder farmers can afford. This requires that there are supportive policies towards smallholder farmers, such as the government subsidizing the price of some agricultural inputs. This study stresses that agricultural extension agents should use available conventional extension methods and approaches in order to teach small holders farmers to raise the productivity of the inputs they use, and subsequently increase their income from crop sales.

Key Words; smallholder farmers, adoption, technologies, extension methods

Introduction

In Tanzania, several extension approaches have been tried with the aim of increasing agricultural production. In all these experiments the role of the extension agent has been central. The level of adoption of improved technologies and practices is clearly related to the quality of the extension worker (Rolling, 1995). Although, several extension approaches have been handed down to farmers under different pseudo names all without exceptions have used one or a combination of the three conventional methods of extension, which entails using individual, group and mass approaches. Likewise, it can be concluded that in extension work, there is no one "best" method or methods (see Bender *et al*, 1972; Nzondo, 1995; Wanga, 1995; Oyebanji, 1995). An extension agents' role is to provide small holder farmers with the necessary agricultural and livestock knowledge and skills to enable them to make rational production decisions for increasing production that ultimately improves their socioeconomic status. At the centre of this linkage rubrics are the extension agents, researchers and the farmers. This paper discusses research findings

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based on a study of farmers in Mogororo region who received some support from FAO. Here, the extension agent used the conventional extension approaches to convince farmers to adopt the improved technologies and practices for rice and maize production. This paper is based on a study whose that was conducted in Morogoro region in Tanzania. whose details are presented below.

Morogoro region has benefited from several agricultural projects and programmes. Their main aim has been to help small holder farmers increase their agricultural yields and total production. Some of these programmes include the National Agricultural and Livestock Extension Rehabilitation Programme, Sokoine University of Agriculture Extension Programme, Gairo Agroforestry and Land Use Project, plus several others. One of the recent projects is the Special Programme on Food Production in Support of Food Security (SPFP), which was coordinated by the Ministry of Agriculture and Cooperatives from 1996 to 1999, with financial support from the Food and Agriculture Organization (FAO). The project operated in two districts, Kilombero and Morogoro.

This study was done in 1999 with the main objective of understanding the adoption pattern and the constraints encountered by farmers in adopting recommended technologies and practices in the pilot phase of the SPFP project.
Hence the specific objectives of this study were

a) To analyze the adoption pattern of farmers for practices and technologies in, which were recommended during the Pilot Phase areas of the SPFP.
b) To analyze the constraints of non-adoption of recommended practices and technologies faced by farmers in the Pilot Phase areas.
c) To analyze factors associated with adoption as well as constraints experienced by farmers in Pilot Phase areas.

Description of the study area and Methodology

Morogoro region covers an area of about 73,000 km^2 which is 8.2% of Tanzania mainland (Morogoro Region Development Profile (MRDP), 2000). The region has four districts (Kilombero, Kilosa, Morogoro, and Ulanga). The total arable land in the region is about 6 million hectares and of these about 2.5 million hectares are suitable for raising livestock. It is estimated that the total potential land for irrigation is about 400,000 hectares, but only 3% of the total land is under irrigation. The region cultivates about 290,000 hectares of food crops each year, producing about 560,000 tons of food. At the time of the study, there were 458 villages with a population of about 1.3 million people of whom about 500,000 were small holder farmers with an average farm size of 2 hectares (World Bank and Ministry of Agriculture and Cooperatives, 2000). Morogoro region experiences bimodal rainfall. The short rains start in October continuing up to December while the long rains last from mid-February to May. The average precipitation is between 600 mm to 1200 mm per annum (MRDP, 2000).

Kilombero district is part of the fertile valley of Kilombero, receiving between 1000 to 2000 mm of rainfall (MRDP, 2000). The main cash crops include rice and maize, but other crops grown include cassava, cotton, cowpeas, cassava, pulses, and fruit trees. The district has a few livestock. The 2002 census showed that Kilombero district had 322,779 people (162,942 men and 159,837 women), with an average household size of 4.4 persons, down from 5.8 during the previous (1988) census.

Morogoro rural district (which at the time of this study included the current Mvomero district) covered an area of 19,296 km^2 of which 19,230 km^2 is rural and the rest is urban (United Republic of Tanzania, 1988). The district can be divided into three relief zones: the highlands, lowlands, and the valleys. The highlands lie between 1,400 and 2,033 meters above sea level and receive 6 months of rainfall ranging between 1000 to 1800 mm per annum. Here, farmers mainly grow vegetables, fruit trees and pulses. The lowlands and valleys receive less rainfall ranging from 500 to slightly above 1000 mm per annum. Here farmers mainly grow cassava in the low lands while maize and upland rice is grown in higher elevations. The 2002 Tanzania census shows that the two districts (Morogoro rural and Mvomero) had a population of 524,445 people of which 250,531 are male and 263,804 are female lived in urban centres (URT, 1988).

The average household size of Morogoro rural is 4.7 while that of Mvomero district is 4.5

For purposes of this study the population from which sampling was done consisted of three groups; women and men participating in the MAC/SPFP project, women and men not participating in the MAC/SPFP project, and extension agents working in the pilot areas of the SPFP. A total of 120 project farmers were interviewed from Kilombero and Morogoro districts as shown in Table 1. In addition there were eleven Extension agents and 57 non-SPFP farmers who were interviewed.

Table 1: Distribution of Respondents Participating in SPFP (N =120)

District	Village	Female	Male	Total
Kilombero	Ichonde	7	-	7
	Kining'ina	6	3	10
	Kisawasawa	4	-	4
	Mangula	7	4	11
	Mbasa	12	6	18
	Michenga	1	6	7
Morogoro rural	Hembeti	4	12	16
	Mkindo	6	5	11
	Mvomero	8	13	21
	Wami Dakawa	7	8	15
Total		**62**	**58**	**120**

Source: Survey data, 1999

Conventional research methodology was employed that included research design, use of structured questionnaires, group discussions, observations, random sampling, data collection and analysis. The distribution of respondents who were selected for the structured survey is indicated in Table 1.

This study assumed that conventional extension approaches, which have been criticized for being ineffective, were still better if extension agents are facilitated with extension tool kits to enhance their delivery of improved technology, and if small holder farmers are provided with the required agricultural inputs, assuming other productivity enhancing factors, such as transportation and markets were not very constrained. The results, which are presented next, show the extent to which the original assumption of the study was valid or not.

Results and Discussions

Some characteristics of farmers in SPFP project

The composition of the respondents who participated in this study has been presented in Table 1 above. Out of the 120 respondents, 48% indicated that they grew rice while 45% and 28% reported growing maize and cassava respectively. Significantly more farmers in Kilombero grew rice relative to Morogoro district. Meanwhile, maize and cassava were more dominant in Morogoro district.

Table 2: Some characteristics of SPFP Project Farmers (Respondents) in Kilombero and Morogoro Districts (N = 120)

Variable (Mean)	K'lombero District	Morogoro District	All districts	X^2 Test	Significance Level
Age of respondents	36.5	44.3	40.7	11.95	0.001*
Years of schooling	3.8	3.3	3.6	3.2	0.08
Persons per hh[1]	6.0	6.8	6.4	1.16	0.28
Male persons for hh	1.5	1.8	1.7	2.76	0.1
Female adults per hh	1.8	1.6	1.7	0.58	0.45
Male youths in school per hh	1.6	2.0	1.8	1.6	0.69
Female youths in school per hh	1.9	1.8	1.8	0.16	0.69
Male youths not in school per hh	1.3	1.9	1.7	1.06	0.31
Female youths not in school per hh	1.4	1.3	1.3	0.32	0.6
Male children < school age per hh	1.7	1.5	1.6	0.8	0.38
Female children < school age/hh	1.5	1.3	1.4	0.66	0.41

[1] hh stands for household

* Implies a significant difference in the variable mean of the two districts

The number of households, which were in the SPFP did not vary widely in the sample from the two districts. As shown in Table 2 the average number of people living in a household was six (6.4), with Morogoro district having a slightly higher average household size at 6.8 persons compared to six for Kilombero. Of the 120 respondents, 82.5% lived with at least two (1.7) male adult persons in their households on average, being 1.8 in Morogoro and 1.5 in Kilombero. About 82% of

the sample respondents were married and about half of them, (49%) had completed primary education, up to standard seven. The mean age of respondents was about 41 for the entire sample, but higher in Morogoro district where it was 44.3 years while in Kilombero the respondents were 36.5 years old on average. The difference in the mean age between the two districts was statistically significant as indicated in Table 2.

Most respondents, (90%) showed that they lived with female adult persons above 18 years of age in their households, and the mean age for the two districts was 1.7 persons. The average number of female adults in rural households was 1.8 in Kilombero district and 1.6 in Morogoro was (Table 2). Respondents were also asked whether their children helped them with farm work. Less than half of the respondents (49%) agreed that their children helped them with farm work, but some of the SPFP farmers (12%) agreed that both female and male youths helped them in farm work.

Yields and income from crops

One aspect that appeared to affect the adoption of recommended technologies and practices by small holder farmers was the number of plots one had. Majority of the respondent, (72%) reported that their fields were divided into small scattered plots. As shown in Table 3, approximately 92% of all the respondents showed that they cultivated an average of 1.9 acres of maize. The average size of cultivated area in Morogoro and Kilombero districts was 2.2 and 1.4 respectively.

The difference between these means was statistically significant at $p > 0.02$. The mean annual total production of maize per farmer 12.8 bags[23] for the whole sample, but it was higher in Morogoro at 15.9 bags compared to only 9.0 bags in Kilombero district. The differences in the means of maize yield in the two districts were statistically significant at $p < 0.01$. Of the 120 respondents, As reported by 59% of the respondents, the annual average income of a farmer participation in the SPFP project T. shs. 97,939 (US$ 160)[24]. The mean annual income from maize was higher in Morogoro at Shs. 113,353 (US$ 186) compared to Kilombero was Shs 76,873 (US$ 126).

[23] A standard bag of maize weight 100 kilograms (kg)

[24] The exchange rate at the time of the study was; 1 US dollar = 610 Tanzanian shillings

Table 3: Respondents' production and income from crops 1995/96 season (N =120)

Variable (Average per farmer)	K'lombero	Morogoro	Sample mean	X^2	Significance Level
Area of maize cultivated (acres)	1.4	2.2	1.9	5.3	0.02
Maize production (bags)	9.0	15.9	12.8	6.9	0.01
Maize yield (bags/acre)	6.4	7.2	6.8		
Earning from maize (Shs)	76,873	113,354	97,939	1.1	0.3
Computed Avrg. price (Shs/bag)	8,541	7,129	7,651		
Area of rice cultivated (acres)	2.8	1.9	2.3	4.7	0.03
Rice production (bags)	28.4	17.0	22.6	10.5	0.002
Paddy rice yield (bags/acre)	10.1	8.9	9.8		
Earning from rice (Shs)	167,731	125,175	146,716	1.5	0.21
Computed avrg price (Shs/bag)	5,906	7,363	6,492		

Source: Survey data, 1999;
* = Significant difference between districts at $p < 05$; **Significant difference at $p < 0.001$.

This difference is mainly attributed to acrage and price. Although farmers in Kilombero had lower acrage and total production on average, they were able to fetch better prices for their maize compared to their collegues in Morogoro.

The average size of rice farms was higher in Kilombero district where farmers cultivated 2.8 acres on average compared to 1.8 acres in Morogoro. The annual total production of rice per household was 22.6 bags[25] for the whole sample. However, farmers in Kilombero district, who participated in the project, obtained 28 bags of paddy rice on average while those in Morogoro district harvested only 17 bags, with production per farmer in Kilombero being significantly higher as shown in Table 3. About 68% of the respondents reported earning income from selling rice. A farmer who participated in the SPFP project earned Shs. 146,716 (US$ 240) on average, being higher in Kilombero (167,731 or US$ 275) compared to Shs. 125,175 or US$ 205 in Morogoro. However, the annual mean differences of farmers' income in the two districts were not statistically significant at $p < 05$. It seems that farmers in Morogoro were able to fetch better prices, probably due to their relative proximity to the market.

Approaches used by agents to impart knowledge and encourage adoption

Regarding the methods, which were used by extension agents, 119 respondents provided answers to this question. The distribution of the responses is presented in Table 4. About 86% of the 119 respondents agreed that extension agents used farmer managed demonstration plots to teach them about the recommended technologies and practices for increasing maize and rice yields. In addition, 68% and 53% of the respondents respectively said that they received such advice in discussion groups and in farmers' fields as well. Other areas where farmers reported to have received advice from extension agents include at farmers homes (49%) and at public meetings (40%).

[25] A standard bag of un-milled rice or paddy rice weighs 70 kg

Table 4: Farmers' opinion on approaches used by extension to impart knowledge (N =120).

Method used by Agent to advise farmers	Sample mean	X^2	Significance Level
Taught using demo plots	86	7.7	0.01*
Advised Discussion groups	68	8.8	0.01*
At farmers' fields	53	4.2	0.04*
Farmers advised at their home	49	14.5	0.0001*
At public meetings	40	4.0	0.004*
Farmers encouraged to listed to radio (*Ukulima wa kisasa*)	31	2.3	0.13
Handed out FOA leaflets on technologies	20	1.76	0.18

Source: Survey data, 1999
*= Significant difference between districts at $p< 0.05$.

Farmers were also asked whether project extension agents provided them with leaflets about the recommended maize and rice technologies and practices. Only 20% of the respondents agreed that extension agents gave them leaflets that FAO had prepared on maize and rice husbandry. Similarly, just about one third of the respondents (31%) said that they listened to the Ministry of Agriculture and Cooperatives radio programme called *Ukulima wa Kisasa* (meaning Modern Farming), which among others topics, sporadically talked about recommended maize and rice technologies and practices.

When asked to point out methods or approaches that were used by project extension agents to hasten the adoption of recommended technologies and practices for maize and rice production, about 84% said they were encouraged to adopt the technologies, which is somehow similar to 76% who said they were encouraged to try the recommended technologies. Another 74% reported farmers meeting as the main strategy, which was used while 52% of the respondents said the agents actually ensured that, the farmers bought the required inputs. However, about 43% of the respondents reported that project extension agents used government and ruling party officials to urge farmers to adopt the recommended maize and rice technologies and practices to increase crop yields.

Table 5: Approaches used by extension agents to enhance adoption by farmers (N =120)

Approach used by extension agent to enhance technology adoption	% of respondents	X^2	Level of significance
Encourage farmers to adopt	84	0.09	0.75
Encouraged farmers to try technologies	76	6.3	0.01*
Held farmers' meetings	74	1.5	0.21
Ensured farmers under project bought inputs	52		
Used government/party meetings to tell farmers	43	2.4	0.12

Source: Survey data, 1999; * = Significant difference between districts at $p < 0.05$.

SPFP farmers' constraints for not fully adopting innovations

When respondents were asked to give reasons that hindered them from adopting the improved maize and rice technologies and practices, they gave both internal and external factors. Of the internal factors, about 41% of the respondents indicated that lack of money to buy farm inputs (fertilizers, improved seed, fungicides) hindered them from adopting the SPFP project recommended technologies and practices (Table 6). Another 21% said that labour was also a constraining factor. However, the external factors were dominant. About 78% of the respondents felt the recommended inputs were too expensive while another 35% said such inputs were not available in shops. Poor climatic conditions, particularly lack of rains, also ranked high, being mentioned by 61% of the respondents. The field being too far was another reason, which was stated by 15% of the respondents.

Table 6: SPFP farmers' responses about constraining factors towards full adoption of recommended technologies and practices (N =120)

Variable	% of respondents	X^2	Level of significance
Recommended inputs are too expensive	78	3.5	0.06
Poor climatic conditions	61	10.7	0.001***
Lack of money to buy inputs	41	0.07	0.79
Lack of shops to buy inputs	35	4.7	0.02*
Lack of labour to work in field	21	5.83	0.02*
Fields are too far to use recommended technologies	15	2.7	0.1
Extension agents not advising farmers adequately	11	0.28	0.6

* = Significant between districts at $p < 0.05$, and ** = Significant difference at $p = 0.001$.

Source: Survey data, 1999;

Nevertheless, Most SPFP project farmers, (93%) agreed that adopting the SPFP recommended technologies and practices for maize and rice increased their crop yields, while 89% agreed that the recommended technologies and practices had increased their income from crop sales. Moreover, about 97% of the respondents were of the opinion that the technologies and practices, which were recommended

by extension agents for maize and rice, were equally suitable for small plots and therefore small farm size could not be a constraint to adoption the technology, in other words, the technology is scale neutral.

Opinion of Non-SPFP Farmers

Non-SPFP farmers were included in the study in order to elicit their opinions regarding farmers who participated in the project. As shown in Table 7, out of 57 such respondents 81% were aware that SPFP farmers used the recommended technologies and practices for growing maize and rice. Most of them (93%) said however that SPFP farmers often lacked money to buy farm inputs and therefore hindering adoption, which is somehow similar to 86% of the same respondents who said fertilizer was too expensive. This is consistent with 78% and 41% of the SPFP farmers who provided a similar response respectively.

Other reasons, which were presented by non project farmers as a constraint to technology adoption included; lack of money for tractor hire (83%) and lack of oxen as an alternative to tractors for land preparation (25%). They also mentioned poor climatic conditions (77%), absence of farmers' credit societies (63%), inadequate labour supply (40%), and farmers not having transport to distribute fertilizer in the fields (37%). They also noted that most farmers practiced mixed farming (37%) or they did not use all the recommendations (33%). Non-SPFP farmers were also asked on how the project could be used to increase the adoption of recommended maize and rice technologies and practices.

Table 7: Non-SPFP farmers' opinion about constraints that SPFP farmers faced in adopting recommended technologies and practices (n = 57)

Variable	% of respondents	X^2	Level of significance
Lack of money to buy inputs	93	0.001	0.97
Low prices of paddy rice	91	0.18	0.67
Fertilizer is expensive	86	0.003	0.96
Lack of money for tractor hire to plough fields	83	1.8	0.18
Low prices of maize	68	11	0.001**
Poor climatic conditions (e.g. lack of rains)	77	0.15	0.7
Lack of farmers' credit societies	63	0.14	0.7
Inadequate labour to work in the fields	40	22	0.0001**
Lack of transport facilities for FMY	37	0.57	0.47
Most farmers practice mixed farming	37	2.2	0.14
Farmers not using all recommendations	33	0.04	0.85
Lack of oxen to plough fields	25	0.29	0.59
Extension agents not giving enough advice	12	4.3	0.04*

* = Significant at $p < 0.05$, and ** = $p < 0.001$

Source: Survey data;

About 88% of these respondents said extension agents should make more use of demonstration plots to teach farmers. Another 86% of these respondents were of the opinion that more efforts should be made to avail shops that sell farm inputs in rural areas.

Meanwhile, 75% of the respondents also urged research stations to release new varieties of maize and rice and another 67% said that the Ministry of Agriculture and Cooperatives (MAC)[26] should increase field agriculture/livestock extension agents (Table 8).

Table 8: Non-SPFP farmers' opinion on how to enhance the adoption of SPFP recommendations (n = 57)

Variable	% of respondents	X^2	Level of significance
Extension agents should use demonstration plots to reach farmers	88	1.6	0.21
Establish shops for selling farm inputs	86	0.5	0.48
Increase price of grain maize and paddy rice	77	4.5	0.03*
Research stations should release new maize and paddy rice varieties	75	9	0.003*
Increase field extension agents	67	0.88	0.34

* = Significant at $p < 0.05$, and ** = at $p < 0.001$.

Source: Survey data;

There was also a feeling that commodity prices were too low as reflected by 77% of the respondents who wanted grain prices to be raised, which under current economic policies can only be realized through improved transportation, which would reduce marketing cost and increase competition among traders, and hopefully raise farm gate price

Responses of SPFP Project Field Extension Agents

As described under the methodology, eleven field extension agents (one female and ten male) were purposively sampled from nine villages. All extension agents agreed that most of their farmers had increased the yields and income of maize and rice because of following and adopting the recommended technologies and practices. Nine out of the eleven extension agents reported an adoption rate of 41% or less and only two had attained a 60% adoption rate. All extension agents agreed that farm inputs were too expensive for most farmers and crop prices were low. Meanwhile, ten out of the eleven said that non-adoption was due to farmers not having money to buy the necessary inputs. However, four of the extension agents attributed non-

[26] The Ministry of Agriculture and cooperatives was reorganized in 2001 to form three different Ministries. The Ministry of Agriculture and Food Security (MAFS) is now responsible for crop production.

adoption to low level of knowledge and skills regarding modern agriculture and their benefits. Other reasons mentioned were that most farmers liked their traditional ways of farming (e.g. not thinning, constructing bunds, weeding on time, using fertilizers and planting in rows).

According to the extension agents farmers' adoption of recommended technologies and practices could be enhanced if the Ministry of Agriculture offered regular short courses to field extension agents, revived short courses for farmers in the Farmer Training Centres, and extension agents used result and method demonstrations when teaching farmers. This confirms what was earlier reported by both SPFP and non SPFP farmers that extension agents are not extension agents are not giving enough advice (Table 6 & 7) and by non SPFP farmers that agents should use more demonstrations in their delivery techniques (Table 7).

Other Field Observations

This section summarizes other observations that could not be captured though the structured questionnaire, which generally fall into three categories as follows; (i) the conduct of field extension agents, (ii) farmers' willingness to participate in the SPFP groups and (iii) procurement and distribution of farm inputs. Observations under each of these categories are summarized below.

a. Field extension agents had established rapport with SPFP farmers, as seen in their interactions with farmers. Also, the farmer-managed result and method demonstration plots were well kept. But farmers in the nearby fields had not used the recommended technologies and practices. Observations also showed that SPFP project farmers seldom used the recommended technologies and practices in their "normal fields" other than the project demonstration plots.
b. Project farmers were highly motivated to follow recommended technologies and practices for maize and rice on the demonstration plots where they were supplied with farm inputs at a cost. However, most farmers expressed dissatisfaction with the delays in supplying farm inputs such as fertilizers.
c. The availability of farm inputs was a problem to most farmers, which was most serious in Kilombero district because the "farm input stockist" had not procured and supplied the farm inputs early enough partly due to official red tape by MAC staff in releasing funds. Lack of fertilizers had demoralized a number of farmers who were contacted and some considered pulling out of the project in the future. In Kibasa village, for instance, a women group stalled the interview to establish if the researchers had brought fertilizers with them for the group's maize and rice farms, which were turning yellow, for lack of nitrogen in the soil.

Lessons Learned

This case study has clearly demonstrated that small holder farmers want to learn how to use new farming technologies and adopt them, but a great deal of effort on the part of the extension agents should be spent in instilling an appreciation for and a recognition of the constant need for upgrading farmers' agriculture and livestock knowledge and skills. According to the design of SPFP, the small holder farmer was supposed to be the central figure in the learning process in order to foster the adoption of improved technologies and practices, and the extension agent expected to part of the learning environment. However, learning was presumed to be in the hands of the farmers. The extension agents' role was limited to helping farmers achieve their goals by providing (i) a climate or environment that is conducive to learning, (ii) alternatives in the problem-solving process, and (iii) relevant and meaningful experiences, which would satisfy the farmers perceived needs.

Furthermore, this case study has demonstrated that for adoption of improved technologies and practices to occur, extension agents should realize that; (i) farmers must willing to learn, (ii) farmers need to reap positive benefit from their active participation in the teaching-learning process, (iii) farmers respond better in an informal atmosphere, (iv) farmers progress more rapidly in learning situations that involve realistic problems, and (v) they maintain interest better when a variety of learning methods are used. The study has shown further that the learning process must further be facilitated by availability of inputs and good markets for farm produce, which if not adequately provided for pose a threat to the whole learning and adoption process. Table 9 above presents the role of extension agents and farmers in an interactive learning experience according to the experiential learning cycle as adapted from Kolb (19975). These should be observed in their daily conduct in order to enhance their facilitation skills and the adoption process henceforth.

Table 9: The role of agents and farmers in the learning cycle

Staged of Experiential Learning Cycle	Extension agent	Farmer
Experience	Demonstrates improved technologies Gets farmers comment on demonstration Probes farmers to say about their experiences	Uses previous experiences, knowledge to interpret the reality and act as springboard for a new learning Relates to self-perceived deficiency-enhanced learning
Observations and reflection	Facilitates farmers to relate the improved technologies versus the traditional Have farmers see demonstrations Facilitates farmers to reflect on the experiences that they see	Reflects upon learning experiences vs those stored in the memory Assimilates and transform new experiences Predicts in anticipation of future events

Staged of Experiential Learning Cycle	Extension agent	Farmer
Conceptualization and generalization	Uses small groups of farmers Employs group discussions to reflection on the improved practices Facilitates farmers to explores alternative solutions to their problems	Develops abstract concepts from the learning Thinks how to use it in the farm situation What is needed for its adoption
Testing the implications of concepts in new situations	Follow-up farmers in homes/fields Brings other farmers to see successful improved practices done by fellow farmers	Tests the implications in the field Reaches conclusion to use the improved practice or not

Source: Adapted from Kolb and Fry (1975)

Conclusion

This study attests findings show that farmers' adoption of improved technologies and practices occurs when agricultural extension agents are available to assist farmers to learn farmers when they can access other required agricultural inputs. Smallholder farmers are capable of improving agricultural production, especially if factors outside their reach such as inputs, markets technology farm equipment are optimum. The study has demonstrated that farmers who adopted realized the advantages of the recommended technologies and practices in terms of better yield and higher cash income from sales. However, the majority of farmers could not adopt due inability to access requisite inputs, which were considered to be too expensive and in most cases also not available in local markets.

Perhaps this calls for a review of input subsidy policy to smallholder farmers that have been abolished during the early 1990s and has been restored in a limited way (in terms of a transport subsidy) to the Southern highlands since 2003. Moreover, the low maize and paddy rice prices hinder most smallholder farmers from adopting improved recommendations. This study reminds us of the need to address smallholder farmers' agricultural needs if they are to improve their agricultural production at all and eventually uplift the country's economic base.

Recommendations

Based on the findings and observations, a number of recommendations are made to enhance the adoption of recommended technologies and practices for the production of maize and rice.

- Extension agents should use farmer-managed methods, group approach, field days, inter-village tours, study groups; result and method demonstration plots to enhance the adoption of recommended technologies and practices.
  Adhering to principles that underlie the learning cycle, as specified in Table 9 is very important to enhance the learning process in any extension forum

- The government, through responsible technical ministries should ensure that its role of monitoring suppliers of inputs (fertilizers, seed, and fungicide), is regularly done in order to ensure that such inputs teach farmers timely, regularly and at competitive prices. The government should also monitor product prices to ensure efficiency of farm product markets. Farmer's cooperatives should be promoted to increase competition and counter monopolistic tendencies of private traders.
- Extension agents should promote cheaper alternatives for improving soil fertility in order to reduce on inorganic fertilizers whose prices are prohibitive. Such alternatives include compost, agroforesty plus others.
- Where oxen are available, there should be programmes to teach farmers to make ox-carts for transporting farm yard manure to the fields and other farm chores (such as ploughing, weeding).
- The government through the Ministry of Agriculture and Food Security (MAFS) should introduce small hand-operated tractors and oxen to increase the acreage cultivated and make use of economies of scale.

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