EFFECTIVE TECHNOLOGY DEVELOPMENT AT THE GRASSROOT: A CASE STUDY OF FARMER FIELD SCHOOL IN OGUN STATE, NIGERIA

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ABSTRACT

The unprecedented growth in agricultural production and productivity in the developed world, had its root in the development of modern technologies. The same were passed to the developing world through the Conventional Extension (CE) system but could not achieve the expected goal because it is top-down, information – driven, and most often, alien to the environment. Consequently, the Farmer Field School (FFS), as a participatory system was introduced to Ogun State in the 1990s. The objective of this study therefore was to evaluate the process of technology development in both systems and compare, to ascertain any significant difference. Respondents were made up of 50 FFS and 90 CE participants which were drawn using random sampling technique, while information was elicited through structured questionnaires. Data collected were analyzed using simple descriptive and discriminant function analysis. The results showed a significant difference in local technology development between the two systems and, in favour of the FFS strategy. This is indicative of the fact that more local technologies were developed under it than the CE system.

Key words: Farmer Field School, Conventional Extension

INTRODUCTION

Agriculture has continued to remain the mainstay of most of the developing countries. Even in places where nature has bestowed on them other natural resources like petroleum, the effect in terms of positive changes to the living standard of the people has been very minimal. Examples abound in many African countries like Nigeria.

With modernization and development of science, the level of agricultural production and productivity have gone up in developed countries like the United States of America, while it has remained almost static in the developing world. The reasons are not farfetched as there has been a neglect of the sector for easy wealth-making ventures, illiteracy, lack of sustaining infrastructures and institutions, and top-down approach, among other things. Hitherto, the farmers have been very active, able to produce enough food both in quantity and preferences. As asserted by Harverkort et al (1988,) from the earliest stages of agriculture, farmers have been active developers of technology for production, processing and storage of food. Farmers discovered, selected and domesticated all of the major crops and animals. Through their innovative activities many different farming systems emerged adapting to local conditions and available resources. The above is a clear indication of the activeness and knowledge ability of the farmers in the art and science of crop and animal production. But when science and extension became the vogue, these qualities of the farmers were not recognized while technologies which were alien to them, some of which were not even applicable to their environment were imposed on them. Farmer thus became or were seen as mere agricultural producers who depend on external agencies such as research, extension and commercial enterprise for innovation. Aggravating the problem as time progressed was population explosion, rural-urban migration, insensitivity of the ruling class etc, all of which pummeled agricultural production to its kneels for increased starvation and greater poverty of the masses.

Charged with the responsibility of improved agriculture was agricultural extension services which is basically conventional in approach. Being conventional, needs of the people and the technology to remedy the situation are determined for and passed to them through information. As defined by Swanson and Claar (1984) extension is an on-going process of getting useful information to people and then assisting those people to acquire the necessary knowledge, skill and attitude to utilize effectively the information or technology. Maunder (1973) opined that it is an assistance to farm people through educational procedure while Fenley and Williams (1964) saw it as educational which must be a carefully planned and organized programmes, starting in the villages to tackle the problems of the villagers. In all cases, the farmers themselves were not seriously considered for solutions to their problems. This is the crux of the matter as information per se may be unable to change the knowledge, skill and attitude of a person. This was why Thumbery et al (1979) opined that it is not the increase in information alone that necessarily leads to an increase in knowledge gained or acquired because people may remain passive to information.

The conventional extension (CE) is pivoted on the diffusion model with its three basic components viz.

i) The adoption process of awareness, interest, evaluation, trial and adoption
ii) Innovation classification which includes relative advantage, compatibility, complexity trialability and observability and
iii) The diffusion normal bell-shaped frequency curve, which categorizes the farmers into innovators, early adopters, early majority, late majority and laggards or non-adopters.

Some assumption which emanated from the model include first; that the technology recommended by the researcher is desirable, rational and photo proof in meeting the needs of the people and must therefore be adopted. This notion has failed as many changes have occurred in the agricultural sector and the rural areas over the years, hence recommended innovations have not been commensurately adopted. This was why Rogers et al (1976) asserted that extension services have focused narrowly on immediate technical problem in agriculture rather than the long-range social, political, economic and ecological consequences of technological change. The second assumption is that changes would diffuse from individual innovators throughout farming communities. In which case, adoption is seen as information driven. However the model underestimated the importance of the relevance, applicability to the majority, appropriateness and interaction among the different groups all of which would combine before any manifestation of effect can be witnessed. In many cases, recommended technologies are only relevant and applicable to few rich individuals. As rightly observed by Paul (1970) the policy has become highly questionable because by focusing on innovators, the hard-core group is overlooked with extension not providing information that is relevant for them.

The third assumption is about learning and knowledge. Learning is equated with adoption. It is seen in the narrow perspective of innovation messages and subsequent response. The same with knowledge but it is obvious that if adoption through the conceived approach of the adoption process has not achieved the desired effect, it is therefore most improbable that learning and knowledge perceived in the same process can achieve the ultimate goal and be sustained (Odeyemi 2004).

In light of this and the fact that most of the recommended technologies are capital intensive and are often adopted by people of vantage position, while the majority do not benefit, some pertinent questions became imperative. These are

- Should extension services be information dissemination or knowledge enhancing?
- Should the determination of farmers need and solutions to them remain that of the external agency, the government, the farmer themselves or a joint venture of all the stakeholders?

- How can the system of agricultural extension be better implemented and sustained to meet the challenges of the 21st century farmers and the people at large?

The above questions may need more than straitjacket answers. This is because of the normative and pluralistic nature of the people. However an empirical research that provides an alternative system for comparison will give a credible analysis, on the basis of which decisions can be taken. In this case, a participatory approach, the farmer field school as implemented in Ogun State makes a good option.

The Farmer Field School (FFS) is a problem solving approach, first introduced in central Java, Indonesia in the 1980s and has spread to more than 40 countries across Asia, Latin America and Africa by the end of year 2000 (Gallagher 2000). It was introduced in Nigeria (Ogun and Oyo states) in 1993. The FFS through its various activities has the aim of bringing together groups of farmers regularly in a field where studied subjects are practically demonstrated. It is a participatory extension approach, which allows farmers to combine indigenous knowledge (IK) with scientific ecological approaches, using the field itself as a teacher (Settle et, al 1996). In this regard, he role of the extension agent changes from knowledge source to that of a facilitator of knowledge while the farmer transformed from mere recipient of information to generator and manipulator of local data for problem solving (Manga and Manga, 1998).

The purpose of this study therefore is to

i) Determine any variance in technology development between conventional extension and FFS systems
ii) Determine the extent of application of innovation in each system.
iii) Determine the reasons for any disparity and
iv) Make appropriate recommendations

METHODOLOGY

The research was carried out in Obafemi Owode Local Government Area (L.G.A) of Ijebu Agricultural zone and Odeda Local government area of Abeokuta agricultural zone, both of Ogun State, Nigeria. The state was one of the two states in the country where the FFS approach was introduced. The two populations used were the FFS participant and the contact farmers of conventional extension (CE) system in Odeda LGA. Altogether, 52 FFS participant and 92 contact farmers who were randomly selected made the sample size who were interviewed.

Data were collected using two different structured and validated questionnaires between January 2003 and February of year 2004. Information was gathered in different areas leading to technology development viz field observations, brainstorming, contribution of IK and scientific knowledge setting up of trials, data collection and analysis and evaluation of result. Also data were collected on the extent of application of innovations in areas covering land preparation, planting practices, identification of pests and disease, control of pests and diseases etc.

Analysis was carried out using simple descriptive statistics involving addition, mean, frequency and percentages to determine the involvement of farmers in technology development, while discriminant function analysis was used to determine any variance in the developed technology between the two approaches and whether such variance show significant difference.

The discriminant function is mathematically denoted by

Yi = bo + biXi + bnXn + ei, where

Yi = 1 if ‘yes’ and ‘0’ if No

Xi = observed value of explanatory variables
Bi = discriminant coefficient
Bo = constant
ei = error term

For technology development it is implicitly expressed as follows;
Yi = bo + biXi + b2X2 + b3X3 + b4X4 + b5X5 + b6X6
Where Yi = technology development
X1 field observation for problem identification
X2 = Free brainstorming as to the various options of combating the identified problems
X3 = Contribution and adoption of IK as part of solution
X4 = setting up trials
X5 = collection of data on the trial
X6 = Evaluation of result
X7 = adoption of result

Hypothesis
There is no significant difference in technology development in FFS and CE systems

RESULTS AND DISCUSSION
Seven conditions for technology development were used to test the involvement of the participants in both the FFS and CE in developing the innovations meant to solve identified problems. They were field observations, free brainstorming, contribution of Indigenous Knowledge and Scientific Knowledge, setting up of trials, data collection, e\valuation and adoption as shown in Table 1.

Table 1: Involvement of farmers in technology development

Variable	Extension system	Min. score	Max. score	Mean	Frequency	percentage
Technology development	FFS	15	35	23.30	Low = 1 High = 49	2.00 98.00
	CE	5	21	11.70	Low = 86 High = 4	95.00 4.40

Source: Field Data 2003

NB: Min = Minimum score with each group
Max = maximum score within each group
L = low i.e. number of scores above the total mean score

The results showed that the minimum, score for FFS was 15 as against 5 for CE, the maximum was 29 against 21 while the mean score were 23.3 and 11.7 respectively. Also the frequency of those who scored below the mean score of 23.3 in FFS was just 2% and for those above, it was 98% conversely for CE those below the mean score of only 11.7 was 95.6% and above it was just 4.4%.

By this result, it appeared that the FFS participants were more involved in the process of technology development. Such involvement would make them to be independent in line with the opinion of Dilts (2001) that FFS farmers are experts who learn to conduct experiments independently, creating learning materials and managing a field laboratory, do not master a specific set of contents or “messages” rather, they master a process of learning

that can be applied continuously to a dynamic situation, that is, the ecology of the field.
Using inferential statistics, the two groups were discriminated against the seven independent variables which were used under the descriptive statistics. The importance of the variables were first noted under the standardized discriminant coefficient of the discriminant function analysis as shown in Table 2.

Table 2: Standardized discriminant coefficient

Variables	Coefficient
Field observation	0.263
Free brainstorming	0.317
Contribution of IK and SK	0.304
Setting up of trials	0.204
Data collection	0.164
Evaluation/Analysis of data	0.264
Adoption of result	-0.138

Source: Field data, 2003

IK: Indigenous Knowledge
SK: Scientific Knowledge

From the Table, six of the seven variables made positive contributions. The weights exerted by the various variables were relatively low without a single one particularly outstanding. The implication of this is that the six variables were all important and could not be ignored in the process of technology development. The highest contribution of 0.317 made by free brainstorming as to the various options of combating identified problem. Closely followed was contribution and adoption of indigenous knowledge in combination with Scientific Knowledge with 0.304, evaluation with 0.264, field observations to identify problems with 0.263, setting up of trials with 0.204 and lastly data collection with 0.164. However, adoption recorded the least with a negative sign of –0.138, implying that it made no contribution to technology development. Therefore, adoption is a misnomer in that position. The result is in consonance with the new thinking in agricultural extension that in order to break new grounds in the case of appropriate technology development, which will be accepted and capable of solving the clienteles' problems, the people should lay active role in terms of free suggestions as to alternatives, and participation in whatever action is to be taken thereafter for solution. This is where the contributions by the farmers of their indigenous knowledge and acceptance of it by the researchers, in blending scientific knowledge stand to be a great asset to agrarian revolution in future. For instance, through this method, farmers in Nigeria used kerosene-mud-ash slurry to combat termites in cassava and achieved 86% reduction while those in Benin Republic were also able to show a good potential for extending the storability of harvested cassava through ground storage (Asiabaka and James 1999).

Strength of Relationship of variables

The strength of relationship or correlation of the independent variables with the dependent variable was tested using the structure matrix of the dicsriminant function. This is presented in Table 3.

Table 3: Structure matrix showing strength of relationship

Variable	Coefficient
Contribution of IK and SK	0.723
Setting up of trials	0.705
Free brainstorming	0.681
Field observation	0.637
Data collection	0.534
Evaluation	0.454
Adoption	-0.329

Source: Field data, 2003

The correlation was positive for all the variables with exception of the adoption of result. Contribution f IK and SK, setting up of trials, free brainstorming and field observation showed strong correlation of 0.723, 0.705, 0.681 and 0.637 respectively, while data collection showed average (0.534) and evaluation low (0.454) correlations. The areas where strong correlations were exhibited, particularly contribution of IK to blend with SK and setting up of trials are unfortunately the aspects which had been seriously overlooked in the past, hence a very big gap in technology development had remained. For this reason, Thijssen (2003) observed that FFS fills gaps in local knowledge, conduct holistic research in agro-ecosystem, increase awareness and understanding of phenomena that are not obvious or easily observed. Their strength, he observed lies in increasing farmers skills as agro-ecosystem managers.

The four variables with strong correlations have established the fact that they are indispensable in technology development at the grassroots. With the blending of IK and SK there was mutual and symbiotic benefits for both the clienteles, the researchers and the extension agents, just as the process of technology development became more pragmatic, faster and easier. Pragmatism was enhanced in trial setting while joint filed observation enhanced the identification of real or felt needs of the people, thus removing normative or imposed needs.

Table 4: Eigenvalue showing variance between FFS and CE

Function	Eigenvalue	Canonical correlation
2	5.381	0.918

Source: Field data, 2003

The eigenvalue as a tool in discriminant function analysis summarized the overall importance of all variables and explained the percentage variance between the two groups in the dependent variables. As in Table 4, the percentage variance between FFS and CE was shown by the canonical correlation which was put at 0.918. otherwise interpreted as 91.8%. This implied that there was great variance between the groups.

Determining the variables responsible for variance:

The variance expressed in table 1 was caused at different levels by the explanatory variables. Such variables and the extent to which each of them has contributed were explained in Table 4 after they have been subjected to test of equality of group means

Table 5: Test of equality of group means

Variables	Wilks' Lambda	F-cal	Df1	Df2
Field observation	0.314	300.89	1	138
Brainstorming	0.286	344.777	1	138
Contribution of IK & SK	o.262	388.337	1	"
Setting up trials	0.272	369.476	1	"
Data collection	0.395	211.450	1	"
Evaluation	0.474	153.088	1	138
Adoption	0.632	80.412	1	138

Source: Field data,2003

As shown above, all the variables have contributed to the variance and are all significant because they depicted higher F-calculated values than F-tabulated value of 2.21 at 5% probability level and degrees of freedom (df) of 1 and 138. Therefore the hypothesis of equality of group means for each of the variables was rejected while accepting that group means for each variables differ significantly.

In testing the main hypothesis of significant difference between the groups, the result was subjected to the assumption of homogeneity of covariance matrices, using Box's M of the discriminant function analysis. The result showed an F-calculated value of 2.838 which was greater than the F-tabulated value at 5% probability level. Therefore the stated hypothesis was rejected that the level of technology development in FFS and CE differed significantly.

From the various results the FFS had a clear advantage over the CE. This was exhibited in the descriptive analysis in Table 1 which manifested in the variance between the two groups. This was because under the FFS strategy, there was active participation of the farmers in developing technology and the technologies were location specific and appropriate because they were done on their fields. No doubt, for appropriate technology to be developed, it must be environmentally specific and ecologically biased with full and active participation of the people, in terms of their time, physical presence on site and resources, which must including materials, money and indigenous knowledge. If these are guaranteed, the application is certain but when one of these ingredients is missing, there is a distortion to the whole process, hence the benefit accruable becomes nill or minimal. When a technology is jointly developed by researchers and farmers, it receives the acceptance of the grassroots people and the transfer is sure to be fast and wide in coverage. According to Sherwood (2000) farmers participation in technology development, ensures capacity building while in the opinion of Waters-Bayer (1989) impossible demands on formal resources is reduced if the farmers are enabled to select and adapt technologies to suit their particular environment. The involvement of farmers in technology development promotes not only a sense of belonging and recognition but also an unquantifiable internal joy and satisfaction. It is a moral booster and independence, which are the striking features and advantages of FFS over the CE as exhibited in these results. No wonder Dilts (2001) opined that FFS farmers are experts who learn to conduct experiments independently, creating learning materials and managing a field laboratory. They do not master a specific set of contents or messages, rather they master a process of learning that can be applied continuously to a dynamic situation, which is the ecology of the field. The FFS farmers, due to their involvement, know the intricacies of the technology being introduced because they participated, hence they apply. The same cannot be said of the CE system where the process of technology development is confined to the laboratories and research institutes and the introduction remains top – down. It is therefore alien to the farmers who most often after learning the specific contents refuse to adopt it.

This is what Nitsch (1979) called a big problem and asserted that " one might argue that an understanding of innovation rejection is of even greater importance than that of adoption".

CONCLUSION AND RECOMMENDATIONS

The results of this study showed that extension services to the people through the farmer field school strategy is a better option to the conversional system. As a participatory approach, it was able to produce some striking features on the basis of which one can conclude that;

- the process of technology development has always been the same, but the difference between these two approaches is made clear by active participation of farmers in FFS approach as against their passiveness in conventional extension system,
- the involvement of farmers in technology development allows their knowledge to be tapped thereby enhancing the development of appropriate technologies for the different ecologies.
- the introduction of the FFS will bring an end the apathy of farmers to introduced technologies because they are part of the whole process of technology development.
- the rate of adoption is faster and wider than in the conventional extension system.
- The grass root approach, rather than the top – down approach can be very effective in Nigeria if given the opportunity.
- the FFS will usher – in a farmer – sustaining rather than a government – sustaining extension delivery system which is the bane of the conventional system.

On the basis of this, it is recommended that the FFS approach should be encouraged to grow in the country. Efforts should be made to extend it to the different states of the federation with well trained facilitators for an effective take off.. Where it has been established like Ogun State, new and vigorous drive should be made to set up small groups where the FFS graduates can become trainers or facilitators of other farmers.

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