

Full Length Research Paper

Effective extension methods for increased food production in Kakamega District

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Despite the importance of agriculture to Kenya's economy, the Kenya government's budgetary allocation to the sector has declined over the years. This resulted in the sector being resource constrained with a high farmer to staff ratio, hence the need for extension methods that can effectively reach more clients at the lowest cost. This paper reviews effective extension methods which have the least constraints and most cost effective that can be used by extension staff in Kakamega district. Kakamega district experiences low food production, despite the fact that it is one of Kenya's food baskets. One hundred extension staffs were systematically sampled from the department of livestock and the department of agriculture from the Ministry of Agriculture and Livestock Development. Data was analysed using descriptive statistics, cross tabulations, correlations and Chi-square. The research revealed that group demonstrations were the most cost effective extension methods with the least constraints. The study therefore recommended that group demonstrations and a combination of group demonstration and individual farmer follow-up be used to pass extension methods in Kakamega district.

Key words: Extension methods, food production, Kenya, Kakamega district, extension service.

INTRODUCTION

Kenya's economic and social development challenges include unemployment, poverty and food insecurity (Ministry of Agriculture (MOA), 2005). Food insecurity is a condition in which a population does not have access to sufficient, safe and nutritious food over a given period to meet dietary needs and preferences for an active life. The world food summit defines food insecurity as a state of food security that leads to lack of physical and economic access to safe and nutritious food for an active and healthy life (Food and Agriculture Organisation (FAO), 2000). FAO's most recent estimates put the number of hungry people in the world at 923 million in 2007, an increase of more than 80 million since the 1990 to 1992 base period (FAO, 2008).

Kenya like most of the countries in Intergovernmental Authority on Development (IGAD) region is one of the most foods insecure in the world (United States Agency for International Development (USAID), 2009a).

According to the USAID (2009b), in East Africa, food insecurity results from among other factors, below average harvests, limited storage capacity, lack of post harvest services, high food prices, conflict and insecurity. The Government of Kenya (2010) has further attributed food insecurity in Kenya to limited storage capacity, lack of post harvest services and poor access to input market (GOK, 2010). Kakamega district, which is one of Kenya's food baskets, also experiences chronic food shortages despite favourable weather conditions.

One of the government's strategy to address the imbalances caused by unemployment, poverty and food insecurity, has been to promote economic growth through public sector programme and measures in support of small-holder and large scale farming (Ministry of Agriculture (MOA), 2005). Extension service is one such programme that could bring about improvement in agricultural production and subsequently food security.

The extension service is charged with the responsibility of ensuring sustainable food production that is sufficient for domestic use and for export. Thus the objectives of extension service include: Ensuring sustainable

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agricultural development; Introduction of high quality, appropriate agricultural technology; maintaining the ecological balance in the natural environment; establishment of export oriented agro-processing industries; Sustaining and balancing production, consumption and income, and reduction of rural poverty (Republic of Kenya, 2005).

The Kenya extension service, Kakamega district inclusive, is severely resource constrained. Extension staffs have limited operating funds. Funds for transport, vehicle maintenance and fuel, field days, telephone communication and basic stationary are inadequate. Extension staff's pay and morale is low, yet at times, officers spend their own money on fuel to go to the field or their own materials for field days (Kodhek, 2005; Nyoro and Muiruri, 2001). This may be as a result of the low budgetary allocation to the agricultural sector (USAID 2010; KEPCO and CGD, 2010). Though the sector contributes significantly to the gross domestic product (GDP), the Kenya Governments' budgetary allocation to the sector has declined over the years, from 13% in 1983 to 5.6% in 2010 (KEPCO and CGD, 2010).

In Kakamega district, like all parts of Kenya, farmer to extension staff ratio continues to remain high particularly during the structural adjustment programme due to reduction of the number of extension staff through natural attrition and a freeze on new hiring (Nyoro and Muiruri, 2001; Kodhek, 2005). This makes the service ineffective in reaching many small scale and large scale. This study, therefore, identified extension methods that are effective in reaching many clients, had least constraints and most cost effective to be used by extension staff in Kakamega district.

Purpose of the study

The purpose of the study was to determine effective extension methods used in Kakamega district that have least constraints and are cost effective.

Objectives of the study

The study aimed at determining:

1. Frequency at which extension staff used various extension methods.
2. The extension methods with the least constraints.
3. The extension methods with the most constraints.
4. Cost effective extension methods.

Definitions of terms

1. Constraints: Limitations such as lack of funds, low pay and morale, lack of materials and equipment, low staff to

farmer ratio among others.

2. Cost effective extension methods: These are methods that can be used to teach a large number of clients on new or improved practices, using minimum resources.
3. Farm and home visits: Involves meeting and teaching individual or farm worker on the farm or home
4. Field days: A trade show to which all stakeholders in agricultural sector are invited to display their products and pass information to.
5. Group demonstrations: This is made up of both result demonstration and method demonstration. In result demonstration, the farmer is shown the end product of two practices, that is, a new or recommended practice and an old practice for them to compare. In method demonstration, the group is shown how to carry out a practice step by step.
6. Group demonstration and farmer follow up: The extension staffs follows up the clients to their farms or homes after a group demonstration to establish whether they have adopted the innovation and what challenges they are facing in adopting the innovation.
7. Group meeting: A formally arranged gathering between extension staff and the clients.
8. Seminars: Comprise a small group of trainees engaged in specialised study under the leadership of an expert in this case an extension staff.
9. Workshop: An educational seminar emphasizing interaction and exchange of information among a usually small number of participants.

METHODOLOGY

Research design

The research design used was ex-post facto based on one-time cross-sectional survey, with the data collected at one point in time. The design was selected because the independent variables cannot be manipulated by the researcher. In any case, manifestations of these variables have already occurred. The ex-post facto design uses naturally occurring treatments or subjects having a self-selected level of the independent variable (Kathuri and Pals, 1993; Kerlinger, 1976) which is the condition that existed for this study. The researcher also dealt with human subjects in the study, which was free to choose what they would or would not participate in. The independent variable of the study was the personal characteristics of the extension staff, while the dependent variables were the extension methods used and the frequency at which the extension staff used the extension methods.

Study population

The study was carried out in Kakamega district, which has a high potential for food production, however, the district experiences chronic food shortages. The target population which was also the accessible population was the extension staff both in the department of livestock and agriculture in the ministry of agriculture and livestock development.

Table 1. Association between the extension staff's personal characteristics and the extension methods used.

		Level of deployment	Area of deployment	Gender	Age	Designation	Department	Years of service
Extension method used	χ^2	146.713*	113.806	334.856*	22.674	98.199	279.047*	30.03
	DF	104	104	260	26	78	208	26

Sampling procedure and sample size

One hundred extension staffs were proportionately sampled from the department of livestock and agriculture in the ministry of agriculture and livestock development. The staffs were then systematically sampled.

Data collection and analysis

Questionnaires containing closed and open ended questions were administered to the extension staff with a request that they fill and return to the researchers. Data was analysed using descriptive statistics, cross tabulation, correlations and Chi-square with the help of Statistical Package for Social Sciences.

RESULTS AND DISCUSSION

Profile of extension staff

Eighty eight extension staff filled and returned the questionnaires, of the extension staff studied, 77.9% were men while 22% were women. Thirty percent were deployed at the district level, 37.3% at the divisional level, 10.5% at location level, 18.6% at the sub location level and 3.6% at training centre. Among the extension staff interviewed, the highest percentage (39%) had been trained in general agriculture, 21% in animal production and 10% in animal health. Few extension staff (1%) had been trained in the other fields including agricultural extension and education.

More than half (53%) of the extension staff had also worked for over 11 years. This indicates that the extension staff interviewed had served for long in the service thus they could give informed judgement of the field situation.

Forty one percent of the extension staff interviewed had a certificate in agriculture related courses, 25% said they held a diploma, 23% held a bachelors degree, 1% held a masters degree while 2% had been trained on the job. Due to the long years of service indicated by most extension agents and the fact that most of them were certificate holders, there was need for refresher courses and upgrading training for extension staff in order to increase their capacity to understand, utilize and disseminate new research findings.

The researchers further sought to find out the association between the extension staffs' personal characteristics and the extension methods used, using

Chi- square. The results revealed that the extension method used was not significantly related to the level of deployment, gender, age, nor the department in which the extension staff was deployed (Table 1).

However, the method of extension used was dependent on the years of service, area of deployment of extension staff and the designation of the staff as shown on Table 1.

Frequency at which extension staff used various extension teaching methods

The extension staffs were asked to state whether they used the various extension teaching methods and the frequency at which they used these methods. Chi-square test was used to determine the association between the extension staffs' personal characteristics and the frequency of using various extension methods (Table 2).

The results revealed that there was no statistically significant association between the extension staffs' personal characteristics and the frequency at which the officers used farm and home visits, group demonstration and group demonstration, and individual farmer follow-up. However, there was a statistically significant relationship between the extension staffs level of deployment and the frequency at which they used field days, workshops, seminars and tours.

Sixty three percent (63%) of the extension staff at the district level frequently used field days. This was because more officers from the district often dealt with large numbers of farmers, hence had to use a method that could reach more. In addition, field days allowed for other stake holders such as manufacturing, institutions of higher learning and research, to reach the same at the same time. On the other hand, sixty nine percent (69%) of the extension staff at the divisional level rarely or occasionally used the field days to reach the farmers. Similarly more staff from the district level (41%) used workshops either often or very often as compared to the 7% of the extension staff at the divisional level who used the method either often or very often. This is because the extension staff at the district level are the subject matter specialists in the various departments, and therefore are charged with the responsibilities of designing messages that will be passed to the extension staff at the divisional, location and sub location levels, to be able to pass this messages effectively to these extension staff, the extension staff at the district level need to use workshops.

Table 2. Association between extension staffs' characteristics and the frequency at which they used various extension methods.

Frequency of using extension method		Extension staffs' personal characteristics						
		Years of service	Level of deployment	Area of deployment	Gender	Age	Designation	Department
Field days	χ^2	16.995	26.202	50.524	5.731	12.550	44.071	4.796
	DF	16	16	36	4	12	32	4
Group demonstration	χ^2	11.719	19.029	58.952	8.192	17.201	25.802	4.735
	DF	16	16	40	4	12	32	4
Group meetings	χ^2	16.626	10.550	71.977*	1.243	11.268	33.295	9.998
	DF	16	16	40	4	12	32	4
Group demonstrations and farmer follow-up	χ^2	7.040	11.733	48.979	9.260	12.219	32.386	6.960
	DF	16	16	40	4	12	32	4
Field days	χ^2	23.334	31.014*	93.124*	3.163	14.216	41.730	4.414
	DF	16	16	40	4	12	32	4
Workshops	χ^2	9.457	33.406*	70.430*	3.671	11.679	64.582*	11.203*
	DF	16	16	40	4	12	32	4
Seminars	χ^2	15.795	52.373*	46.701	5.738	14.550	34.108	2.588
	DF	16	16	40	4	12	32	4
Tours	χ^2	12.518	52.213*	43.918	5.622	17.952	43.906*	4.550
	DF	12	16	40	3	9	24	3

*Significant association.

It is interesting to note that only 11% of the extension staff at the district level used seminars. Owing to the time that the extension staff have been in service (81% of the extension staff at all levels were found to have been in service for more than seven years), the staff at the district level should organise regular seminars to up grade their knowledge and that of staff at divisional, locational and sub locational levels. All the extension staff at the district, divisional and locational levels never, rarely or occasionally used tours. On the other hand, 50% of the extension staff at the farmer training centres used tours very often. There was also a statistically significant relationship between the area in which the extension staffs were deployed and the frequency at which they used group meetings, field days and workshops. More staff in horticulture (80%) and soil and water conservation (60%) used group meetings either frequently or very frequently. While few extension staff (24%) in crop production, 29% in home economics, 25% in animal production and 20% in animal health used group meetings either frequently or very frequently. Likewise, more extension staff in horticulture (100%) preferred field days. In addition, 83% of the extension staff in marketing

used field days either often or very often. However, most of the extension staff in the other departments never, rarely, or occasionally used field days.

The results also revealed that there was a statistically significant relationship between the extension staff's department and the frequency at which they used workshops (Table 2). A high percentage (75%) of extension staff from horticulture preferred to use workshops as an extension method

Extension methods with the least constraints

To be able to understand why the extension staff preferred certain extension methods, the study sought to determine the extension methods with the least constraints (Table 3). Five percent of the respondents did not indicate their first choice of the method with the least constraints, 20% did not indicate their second choice and 23% did not indicate their third choice. The extension method considered to be the first choice method having the least constraints by the extension staff was farm and home visits (30%). This was followed by group

Table 3. Extension method with the least constraints.

Extension method with the least constraint	Order of preference			Total
	First choice (%)	Second choice (%)	Third choice (%)	
Farm and home visits	30	7	8	45
Group demonstrations	25	19	15	59
Group meetings	16	16	13	45
Group demonstration and individual follow-up	14	5	6	25
Field days	2	17	13	32
Workshops	6	8	6	20
Seminars	2	7	9	18
Tours	0	1	7	8
No response	5	20	23	48

Table 4. Extension methods with most constraints.

Extension method	Order of preference		
	First choice (%)	Second choice (%)	Third choice (%)
Farm and home visit	35.9	5.4	5.4
Group demonstration	9.8	3.3	7.6
Group meetings	5.9	14.	5.4
Group demonstration and individual farmer follow-up	5.9	9.8	8.7
Field days	15.2	6.5	9.8
Workshops	2.2	12.	5.4
Seminars	17.4	18.5	13
Tours	1.4	12	14.1
Barazas	1.4	0.0	1.2
No response	3.3	18.5	29.3

demonstrations (25%), group meetings (16%); and group demonstration and individual farmer follow-up (14%) as seen in Table 3. It is worth noting that though most officers chose farm and home visits as first choice method with least constraints, few officers chose it as a second and third choice. On the other hand, more officers chose group demonstrations and group meetings as the first, second and third choice. This implies that officers would find it easier to use group approach. This is confirmed by the information on Table 4 whereby few extension staff chose group demonstrations, group meetings, and group demonstration and individual follow-up as the first, second and third choice of method with most constraints. A correlation was drawn between the extension staff's personal characteristics and the ranking of the extension teaching methods with the least constraints. The results showed that there was a statistically significant relationship ($r = 0.227$; < 0.031) between extension staff's department and the first choice extension method with least constraints. Similarly there was a statistically significant relationship ($r = 0.301$; < 0.004), ($r = 0.227$; < 0.008) and ($r = 0.210$; < 0.045) between area of deployment and second choice extension methods

with least constraints and extension staff's designation and second choice extension method with least constraints respectively.

More respondents from department of livestock (23.5%) as compared to the 7% from the department of agriculture considered group demonstrations and individual follow-up as first choice extension teaching methods with the least constraints. Similarly, most of the extension staff who had served for various years considered farm and home visits, group demonstrations and group meetings as the first choice extension methods with the least constraints. However, more extension staff (33.3 and 25%) who had served for less than two years and 3 to 6 years, respectively, considered group demonstrations and individual follow-up as the first choice extension teaching methods with the least constraints.

Cross tabulations revealed that most of the extension staff at all designations chose group demonstrations and group meetings as second choice teaching method with the least constraints. Similarly, most of the extension staff in different areas of deployment chose group demonstrations and group meetings as second choice teaching

Table 5. Cost effective extension methods.

Extension method	Order of preference		
	First choice	Second choice	Third choice
Farm and home visit	7.6	4.3	16.3
Group demonstration	29.3	10.9	8.7
Group meetings	8.7	8.7	10.9
Group demonstration and individual farmer follow-up	10.9	6.5	8.7
Field days	12.0	26.1	6.5
Workshops	8.7	12.0	9.8
Seminars	4.3	15.2	10.9
Tours	14.1	3.3	12.0
Barazas	1.1	0.0	16.3
No response	3.3	13.0	15.8

method with the least constraints.

Extension methods with most constraints

The results revealed that a high percentage (42 and 37%) of extension staff at certificate and diploma level, respectively, chose home and farm visits as the first choice extension method with most constraints. This could be because the extension staffs at certificate and diploma levels were mainly the field staff that interacted with farmers at the farm level, and therefore were able to identify more constraints with this method.

When the extension staffs were asked to rank in order of preference the extension methods with the most constraints, about three percent of the respondents did not indicate their first choice method with the most constraints, 18.5% respondents did not indicate their second choice and 29.3% did not indicate their third choice method with the most constraints as seen in Table 4

It is worth noting that though the extension staff chose farm and home visits as extension method used very often, it ranks highest (35.9%) as the first method with most constraints. This could be because the extension staff are used to this method and hence have identified its constraints than any other method of extension. Alternatively, home and farm visits could be the best method of extension (method that encouraged more adoption of innovations) and therefore was used more though it had the most constraints.

Group meetings, seminars, workshops and tours were considered by a relatively high percentage of extension staff (14, 18.5, 12 and 12%) respectively as the second choice methods with most constraints (Table 4). Group meetings, workshops and seminars require that the clients be assembled at a common place and taught for a period of time. This entails planning for the venue, contacting the clients, buying teaching materials and probably providing some meals or snacks. This is expensive and time consuming.

Tours was also considered by relatively more officers as the second (12%) and third (14.1%) method with the most constraints. This explains why extension staffs do not use the method either often or very often. On the other hand, relatively few extension agents chose group demonstrations (first choice, 9.8%; second choice, 3.3% and third choice, 7.6%), group meetings (first choice 4.3%; second choice 14.1% and third choice, 5.4%), and group demonstrations and individual follow-up (first choice 4.3%; second choice, 9.8% and third choice, 8.7%), as the method with most constraints (Table 4).

Cost effective extension methods

The extension staffs were also asked to indicate in order of preference three extension methods that they considered to be most cost effective. Group demonstration was chosen by a relatively high percentage (29.3%) of extension staff as the first choice extension method that was cost effective as seen in Table 5. This could be because in group demonstrations, farmers are taught in groups hence the same demonstration materials are used as could have been used for an individual client. In addition, a client is taught skills in full, for example the group may be taught practically on all steps in maize planting among others; hence, adoption rates may be high. The group demonstration also has the advantage of multiplier effect (whereby if one client is convinced about an innovation he/she may convince the others to adopt). In addition, relatively more officers considered this method as their second and third choice of the method that was most cost effective.

Relatively high percentage of extension staff (26.1%) chose field days as the second choice extension method that was most cost effective while 16.3% chose tours as the third choice extension methods which were most cost effective.

Correlation analysis was run between extension staff personal characteristics and the extension methods

considered to be cost effective. The results illustrated a statistically significant relationship between the first choice cost effective extension method and the extension staff designation ($r = 0.308$; < 0.003), professional qualification ($r = 0.270$; < 0.009) and extension staffs' years of service ($r = 0.237$; < 0.023).

It is important to note that few officers considered farm and home visits as first choice (7.4%), second choice (4.2%) or third choice (8.7%) most cost effective method. Farm and home visit was also considered by many officers as having most constraints (Table 4). This implies that it is expensive and cumbersome for the extension staff to use farm and home visits solely as a means of passing extension packages. Though field days (first choice, 12%; second choice, 26.1% and third choice 6.5%); and tours (first choice, 14.1%; second choice, 3.3% and third choice 12.0%) were considered by relatively more extension staff as the methods that were most cost effective, they were also considered by more extension staff as methods with the most constraints (Table 4) and by few officers as methods with least constraints (Table 3). This could be because tours and field days enable an extension staff to educate more at the same time, thus the same cost is used for several. However, these methods are cumbersome to organize, since they require a lot of capital and time.

Seminars and workshops were chosen as the second and third method that was the most cost effective by more extension staff. However, few extension staff considered them as methods with least constraints (Table 3). Seminars and workshops, like field days and tours, reach more at the same time hence cut down on the cost of passing innovations. But they are expensive and cumbersome to organize.

Conclusion

Extension staff preferred group meetings and group demonstrations, since most officers used these methods either often or very often. In addition, group meetings and group demonstrations were considered to be the methods with the least constraints. Group demonstration was also considered to be the method that was most cost effective. The farm and home visits were preferred by the extension staff though most extension staff considered it to be having the most constraints. Tours and field days were not preferred by the extension staff.

RECOMMENDATIONS

The researchers recommended that:

1. The extension service should be facilitated to use group demonstrations and group meetings to pass innovations. However, individual client follow-up should be encouraged to ensure that clients are able to practice what they were taught at the farms.
2. The Kenya government, donors and other stakeholders should provide enough funding to the extension service to enable them use group demonstrations and individual farmer follow-up to ensure increased adoption of innovations.

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