THE RESEARCH-EXTENSION-FARMER INTERFACE IN THE CASSAVA INDUSTRY IN THE VOLTA REGION: THE COMMUNICATION LINK

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Abstract

The study focused on the communication link between farmers, agricultural extension agents and cassava researchers in the Volta region of Ghana. A descriptive survey approach was used to study cassava farmers and agricultural extension agents in five districts. Cassava research scientists in the country's public universities, research institutions and agricultural research stations took part in the survey. A multi-stage sampling technique, involving two steps was used to sample farmers based on the intensity of cassava cultivation in the selected districts. Results show that all three categories of respondents ranked farm visits, method and results demonstrations as most efficient methods to transfer technology. The identified linkage mechanisms were characterized by personal contacts, home and farm visits, mostly by extension agents to seek first hand information about farmers' problems. Group methods that were used included workshops, joint meeting and farmers' training sessions that were organized by extension agents, non-governmental organizations (NGOs), and a few research institutes, notably, the Crop Research and Soil Research Institutes. The results demonstrate that individual and group methods were the most used methods of communicating with farmers, agricultural extension agents and researchers. Mass communication methods ranked low among respondents, an indication that radio, personal letters and print materials were less frequently used. The implication is that mass communication methods, considered to be advantageous in reaching large audience should take into account radio programming that will have relevant agricultural extension messages to benefit extension work.

Introduction and Statement of the Problem

Links between agricultural research institutes and their clients – farmers and technology transfer agencies – are vital for successful technology development and delivery. Direct links with farmers, developed through on-farm research, ensure relevance and rapid feedback. Links with technology transfer agencies ensure impact through a wider dissemination of technologies.

Agricultural extension depends to a large extent on information exchange between and among farmers on one hand, and a broad range of other actors. Extension along with education and research is typically seen as a service – public or private – that responds to the needs of farmers and rural people for knowledge that can be used to improve productivity, farm incomes and welfare and to manage the natural resources on which farmers depend in a sustainable way. Extension brings information and new technologies to farming communities, allowing them to improve production, incomes and standards of living.

Communication plays a critical role in the dissemination of technology to farmers. In the last two decades, communication models, technology transfer models, and farming systems have contributed to the development and transfer of useful information to farmers. In order to facilitate the flow of technologies from research institutions through extension institutions to farmers there is the need for links between them. These links are usually brought about through linkage mechanisms.

Links are about people. No linkage mechanism can succeed unless staff working on research station, on farms, and in technology transfer institutions is motivated to collaborate. However, the challenge for research and extension managers is to get these staff, with their differing backgrounds, skills, aspirations, and responsibilities, to work together and to recognize that they depend on one another to reach a common goal.

Kaimowitz et al. (1989, p.228) referred to linkage mechanism as "the specific organizational procedures used to maintain research-technology transfer links. Similarly Roling (1989, p.29) referred to linkage mechanism as "the concrete procedures, regular events, arrangement, device or channel which bridges the gap between components of a system and allows communication between them".

Bagchee (1994) stated that good communication and attitudinal reorientation are perhaps more important than "linkage" institutions. Links between research and extension are often characterized by ignorance of each other's work which leads to conflict of competence and mutual accusation in an event of failure. The situation is made worse by the lack of formal and informal contacts due to institutional barriers and the difference in training and approach. Furthermore, scientific training could give researchers "superiority complex", and the outcome being that research work is directed more towards publishable work rather than towards the generation of technology that would benefit farmers.

Scientists have been accused very often as lacking the skills necessary to pass on their knowledge and findings through the training of extension specialists. Extension personnel have been looked upon as lacking confidence, feel frustrated and conclude, too easily, that they have nothing to offer to help researchers better understand farmer's practices, constraints and potentials. Farmers also tend to assume that research institutes do not assess their needs and problems before conducting research (Doamekpor, 1999 p. 2). They develop technologies, not taking into consideration the farmers' indigenous knowledge, before packaging technologies to farmers. The results are that the technologies do not fit into the socio-economic needs and to some extent, the agro-ecological zones that farmers operate (Baggchee, 1994; Haverkort, 1991).

Some critics of researchers argue that published research findings hardly get to farmers who should make use of them. In addition, these published findings are in scientific journals which tend to be too technical, or they are in annual reports which have limited circulation. Furthermore, apart from being technical, these publications are often voluminous and do not benefit extension work.

In spite of these accusations and differences of views held against research scientists and extension personnel, some extension approaches have succeeded in bringing relevant and appropriate technologies to the Ghanaian farmer. Current approaches to research-extension-farmer linkages in the last decade have been coordinated by the research-extension liaison committees (RELC) which was established in all ten regions of Ghana. The adoption of a participatory approach to technology development and delivery to farmers through Farming Systems Research (FSR), Participatory Technology Development (PTD), and Farmers Field

Schools are some extension concepts being used to facilitate technology generation and dissemination to farmers.

Theoretical Framework

Participatory extension approaches emerged in the late 1980s after it was realized that most technologies developed by researchers alone were inappropriate for small holder farmers (Jurgen et al., 2000). Participatory approaches have long enjoyed success primarily with nongovernmental nonprofit services that largely operate in smaller localities (Birmingham, 1999). The training and visit (T&V) based extension emphasized the use of contact farmers in disseminating information, and focused on agricultural extension and rural development agents trained in participatory diagnostics, primarily using rapid rural appraisal tools (Birmingham, 1999).

The unified agricultural extension system (UAES) is a World Bank and other major donors to extension services in the sub-Saharan Africa (Birmingham, 1999). The approach was introduced to deliver extension methods through a single agent rather than through multiple agents who separately disseminated information on fisheries, livestock, or different type of crops. The approach thus called for agricultural extension agents to be generalists who were to be trained intermittently by subject-matter-specialists.

The general notion about extension is that it should be a two-way process of transmitting problem solving information to farmers and information on the farmer's problems back to agricultural research (Oladele, 2002). Numerous factors determine whether this could be practical. For instance, extension services has other tasks to perform, such as advising farmers on farm input availability and sources of agricultural credit. Even though it is argued that extension agents need not address these issues, they play major role in determining whether or not farmers will adopt research findings.

Chizari et al. (1998) studied obstacles facing extension agents in the development and delivery of extension educational programs to adult farmers in Iran, and found that identifying and organizing training content, extension teaching methods and need analysis were the top ranked needs of extension agents. The study concluded that result demonstration, method and formal group meetings were the most effective educational teaching methods perceived by agents to reach adult farmers. However, major constraints of the extension agents include: lack of needed equipment and facilities, dispersion among farmers (in terms of age, gender and education) and lack of linkage between research centers and extension organization.

Studies conducted on the use of rural radio in agricultural extension to disseminate soil and water conservation in Northern Ghana in the local languages saw an improvement in soil and water conservation practices, agroforestry, and organic manuring after farmers had listened to radio programs on the topics (Chapman et al., 2003). The study concluded that the radio program was well received by the target audience, emphasizing that the vernacular used in broadcasting was important in communicating extension messages.

Currently, there is a call for researchers and extension personnel to implement a people-centered rather than a technology-centered extension for sustainable agriculture development. According to Van de Fliert (2003), sustainable agricultural systems center on people rather than technologies. Hence, extension efforts that promote such systems should focus on capacity building of people by enhancing ecological knowledge, problem-solving and decision-making skills (Van de Fliert 2003, p. 31).

Purpose and Objectives

About three decades ago, Volta region was one of the model regions in Ghana that experimented with the training and visit (T&V) extension system, during which improved cassava cultivars and maize varieties were introduced to farmers. Also, the institution of the research-extension liaison committees (RELCs) in the region might have enhanced the communication links between farmers, extension agents and researchers. Hence, this paper assesses the perceptions of cassava researchers, extension agents and farmers regarding the efficiency of educational methods for disseminating (cassava) technologies and the frequency of use. In addition, the channel of communication and the characteristics of the linkage mechanisms which facilitate the use of these educational methods are explored.

Specifically, the paper :

1. describes the demographic characteristics of farmers
2. identifies the language and channel of communication farmers use with extension agents and researchers
3. assesses the efficiency and frequency of use of education methods for disseminating (cassava)technologies
4. identifies and describes the linkage mechanism between researchers, extension agents and farmers

Methods/Procedures

The study used a descriptive research design. A multi-stage cluster sampling technique was used to select 40 extension agents based on the sub-districts or operational areas in the 15 districts of Volta region of Ghana. Villages in five districts, namely Akatsi, Ho, Hohoe, Ketu, and Kpando were selected based on the intensity of cassava production and cassava related activities, and from these villages, 60 farmers were selected with the help of the extension agents to participate in the study. In addition, 20 cassava research scientists (including research support staff) from research institutions and universities in Ghana were identified to take the survey. Three different sets of questionnaire were developed and administered to farmers, extension agents and researchers for data collection. There were a five parts to each questionnaire: Part one was on demographic information of respondents. Part two contained information relative to language and channel of communication between farmers, extension agents, and researchers, while part three elicited information on what linkage mechanisms were used to plan research-extension activities and to contact farmers. Part four assessed the efficiency and frequency of use of the educational methods for transferring technology. It consisted of 17 items that elicited the perceptions of farmers, extension agents and research scientists, and was measured on a five-point Likert scale. The scale ranged from 1=very inefficient to 5= very efficient. The frequency of use of the educational method was measured on a scale of 1=not use at all to 5=very much use as a method for transferring technology. Part five which was mainly open-end elicited comments from the researchers and extension agents. The questionnaire was validated for content and face by a panel of experts from University of Cape Coast, Ghana. In addition, the questionnaire was pilot tested and had acceptable reliability (Cronbach's alpha ranged from 0.81 to 0.87 on the summated Likert scale). Data were collected by personal interview method. Both descriptive and inferential statistics were used to summarize the data.

Results and Discussions

On average the farmers were 45 years old. Twenty-one percent were female. Majority (82.7 %) were married, 9.6 percent single, 5.8 percent widowed, and 1.9 percent separated. About seventy-seven percent (76.9 %) were by social status farmers, while 15.4 percent were chief farmers. The remaining (7.7 %) included a teacher, businessman, and assemblyman and unit committee chairman. Thirty-six percent of the farmers had completed and obtained a middle school leaving certificate, 17.3 percent had completed secondary school education, whilst 13.5 percent indicated they have had no formal education. On average, the farmers had 14.3 years of farming with respect to the cassava crop. Forty percent said they have spent 6-10 years growing cassava, 17.3 percent have spent 11-15 years and 16-20 years respectively and 8 percent indicated spending 31-35 years of farming cassava. The average family size was about 9. Forty percent of the farmers had farm size between 0.25 and 3.0 acres (small-sized), 21.2 percent had sizes between 3.1 and 5.9 acres (medium-sized) and 38.5 percent had over 6 acres of cassava plantation. Majority (90.4%) of the farmer grew cassava as a major crop.

Tables 1 and 2 show the language and channels of communication farmers use to communicate with agricultural extension agents and researchers respectively. Majority of farmers communicated in ewe, the local language of the region. Twenty-three percent communicated in both English and Ewe. Thirty-seven percent had had contact with researchers since they started farming. Out of this, 7.7 percent communicated with researchers in English. About 15 percent communicated in Ewe, while 11.5 percent communicated in both English and Ewe. However, more than half (55.8 %) communicated with agricultural extension agents in Ewe, while 23.1 percent communicated in both English and Ewe.

Table 1. Farmers' Language of Communication with Frontline staff and Researchers (n=52).

Medium of Communication	Agricultural Extension Agents		Researchers	
	Number	Percent	Number	Percent
English	1	1.9	4	7.7
Ewe	29	55.8	8	15.4
Ewe and local dialect	2	3.8	-	-
English and Ewe	12	23.1	6	11.5
English, Ewe and Akan	1	1.9	-	-
Ewe and Akan	2	3.8	-	-
English, Ewe, Akan and Pidgin	1	1.9	1	1.9
Total	48	92.3	19	36.5

Table 2 shows that 69.2 percent farmers used individual and group methods to communicate with extension agents. About twelve percent (11.5%) used individual methods, while 7.7 percent used a combination of individual, mass and group methods. Nineteen percent (19.2%) used individual methods to communicate with researchers. In addition, 5.8 percent each used group method and both individual and group methods respectively to communicate with researchers. However, none indicated using mass method of communication.

Table 2. Farmers' Channel of Communication with Agricultural extension Agents and Researchers (n=52).

Method of Communication	Agricultural Extension Agents		Researchers	
	Number	Percent	Number	Percent
Individual	6	11.5	10	19.2
Mass	-	-	-	-
Group	2	3.8	3	5.8
Individual and group	36	69.2	3	5.8
Individual, Mass and group	4	7.7	1	1.9
Individual and Mass	-	-	2	3.8
Total	48	92.3	19	36.5

Tables 3, 4 and 5 are summaries of perception of farmers, agricultural extension agents and researchers about the efficiency of educational methods used to transfer technology under objective three of this paper.

Farm visits were ranked by 86.5 percent of the 50 farmers with a mean of 4.28 as a most efficient method to transfer technology. Method demonstration ranked second with a mean of 4.00 and 61.6 percent of 44 farmers responding. Result demonstration ranked third with mean of 3.98 and 63.4 percent of 45 farmers responding. Radio, a common device used to obtain information ranked eighth among the farmers (mean=3.09) with only 38.5 percent of 47 farmers indicating it as somewhat efficient.

Agricultural extension agents also ranked farm visits as very efficient, 82.1 percent of the 37 agents responded with a mean of 4.51. Method demonstration ranked second (mean= 4.14) and 73.6 percent of 38 agents indicated it was efficient to transfer technology. Using resource personnel and result demonstration were ranked third 68.4 and 71.1 percent of the agents ranked these respectively as being efficient to transfer technology to farmers. Radio was perceived as somewhat efficient (mean=3.14) and 42.1 percent of 37 agents responded (see Table 4).

Farm visits ranked first among researchers (mean= 4.35) as efficient and most used method to transfer technology to farmers. Method and results demonstrations also ranked high with mean values of 4.18 and 4.12 respectively. However, personal letters ranked the least (mean=2.53) as inefficient method by researchers. Farm visits appeared to be the most used method among all three categories of respondents. This was followed by method and results demonstration. Personal letters had very little use among the respondents. Similarly, radio had little use.

The results indicated that all three categories of respondents ranked farm visits, method and results demonstrations as most efficient methods to transfer technology. An inter-group test of concordance performed on the ranked mean values to determine the level of agreement gave a concordance agreement of w=0.82 and was significant at .05 alpha level.

The rankings for farm visits, method and results demonstrations by the respondents as the most efficient methods to transfer technology agreed with results obtained by Androulidakis et al. (1995) where the perceptions of extension agents were sought about the appropriateness of the educational methods used to reach farmers in Greece. The results also confirm studies conducted by Chizari et al (1998) about educational methods used to reach adult farmers in Iran. Furthermore, it confirms results obtained in the study by Oladele (2002) that demonstrations and personal contact where highly ranked and most frequently used communication link with

farmers, agricultural extension agents, and researchers in South Western Nigeria. Whereas the study by Oladele (2002) concluded that radio and television were frequently used communication link between researchers and farmers and extension agents and farmers in South Western Nigeria, this survey results indicated a low ranking for radio and television. The results also demonstrate that methods which allowed for the most interaction between and among the respondents whereby two-way information flow existed, were ranked high. Significance results were found with the following methods: visit to research centers/stations, Agriculture documentary on television, use of handouts or brochures, Agricultural magazines/bulletins, personal letters, newspapers, newsletters (fact sheets) journals, and using resource personnel.

Table 3. Perceptions of farmers on the degree of efficiency of technology transfer method and the frequency of use (n=52).

Technology transfer methods	[a]Degree of efficiency							[d]Freq	N
	1	2	3	4	5	Nr[C]	Mean SD		
Farm visits	1 [b](1.9)	2 (3.8)	2 (3.8)	22 (3.8)	23 (44.2)	2 (3.8)	4.28 0.88	3.9	48
Method demonstration	1 (1.9)	2 (3.8)	9 (17.3)	16 (30.8)	16 (30.8)	8 (15.4)	4.00 0.99	3.86	42
Result demonstration	1 (1.9)	1 (1.9)	10 (19.2)	19 (36.5)	14 (26.9)	7 (13.5)	3.98 0.92	3.54	43
Visits to Extension offices	4 (7.7)	1 (1.9)	15 (28.8)	15 (28.8)	10 (19.2)	7 (13.5)	3.58 1.14	3.37	44
Field trips to other farmers' farm.	2 (3.8)	-	20 (38.5)	17 (32.7)	6 (11.5)	7 (13.5)	3.56 0.89	3.14	43
Using resource personnel	7 (13.5)	5 (9.6)	6 (11.5)	19 (36.5)	8 (15.4)	7 (13.5)	3.36 1.33	2.72	43
Short courses (training)	8 (15.4)	5 (9.6)	9 (17.3)	15 (28.8)	9 (17.3)	6 (11.5)	3.26 1.37	2.61	44
Radio	8 (15.4)	4 (7.7)	15 (28.8)	16 (30.8)	4 (7.7)	5 (9.6)	3.09 1.21	2.75	47
Visits to Research centers	16 (30.8)	7 (13.5)	12 (23.1)	6 (11.5)	1 (1.9)	10 (19.2)	2.26 1.19	1.73	41
Use of pamphlets (handouts)	17 (32.7)	7 (13.5)	9 (17.3)	8 (15.4)	1 (1.9)	10 (19.2)	2.26 1.25	2.05	41
Agric documentary on television.	17 (32.7)	8 (15.4)	15 (28.8)	1 (1.9)	-	11 (21.2)	2.00 0.95	1.5	40
Newspapers	21 (40.4)	7 (13.5)	9 (17.3)	4 (7.7)	-	11 (21.2)	1.90 1.06	1.61	41
Agric. magazines/ bulletins	23 (44.2)	7 (13.5)	7 (13.5)	5 (9.6)	-	10 (19.2)	1.86 1.10	1.51	41
Newsletters (factsheets)	26 (50)	6 (11.5)	5 (9.6)	4 (7.7)	-	11 (21.2)	1.68 1.04	1.41	41
Personal letters	29 (55.8)	4 (7.7)	4 (7.7)	4 (7.7)	-	11 (21.2)	1.59 1.02	1.53	40

Journals	32 (61.5)	3 (5.8)	3 (5.8)	3 (5.8)	-	11 (21.2)	1.44 0.92	1.27	41

Note. [a]Scale: 1=very inefficient, 2=inefficient, 3=somewhat efficient, 4=efficient, 5=very efficient as technology transfer method. [b]Numbers in ( ) are percentages and may not equal 100 percent due to rounding. [c]No response. [d]Frequency of use of technology transfer method is a mean value calculated on a 5-point Likert scale: 1=not use at all, 2=very little use, 3=little use, 4=much use, 5=very much use as a method of transferring technology.

Table 4. Perceptions of agricultural extension agents about the degree of efficiency of technology transfer method and the frequency of use (n=38).

Technology transfer methods	Degree of efficiency							[d]Freq	N
	1	2	3	4	5	Nr[C]	Mean SD		
Farm visits	-	1 [b](2.6)	1 (2.6)	13 (34.2)	22 (57.9)	1 (2.9)	4.51 0.69	4.43	35
Method demonstration	-	1 (2.6)	7 (18.4)	14 (36.8)	14 (36.8)	2 (5.3)	4.14 0.83	4.06	33
Using resource personnel	-	2 (5.3)	6 (15.8)	15 (39.5)	11 (28.9)	4 (10.5)	4.03 0.87	3.89	35
Result demonstration	-	2 (5.3)	8 (21.1)	15 (39.5)	12 (31.6)	1 (2.6)	4.00 0.88	3.89	35
Visits to Extension offices	-	2 (5.3)	8 (21.1)	19 (50)	7 (18.4)	2 (5.3)	3.81 0.80	3.79	34
Field trips to other farmers' farm.	1 (2.6)	4 (10.5)	9 (23.7)	13 (34.2)	9 (23.7)	2 (5.3)	3.69 1.06	3.39	33
Short courses (training)	3 (7.9)	8 (21.1)	3 (7.9)	14 (36.8)	9 (23.7)	1 (2.6)	3.49 1.30	3.29	35
Use of pamphlets (handouts)	2 (5.3)	3 (7.9)	15 (39.5)	13 (34.2)	3 (7.9)	2 (5.3)	3.33 0.96	3.09	32
Radio	3 (7.9)	8 (21.1)	10 (26.3)	13 (34.2)	3 (7.9)	1 (2.6)	3.14 1.11	2.91	35
Visits to Research centers	7 (18.4)	10 (26.3)	6 (15.8)	8 (21.1)	5 (13.2)	2 (5.3)	2.83 1.36	2.42	33
Newsletters (factsheets	5 (13.2)	6 (15.8)	16 (42.1)	5 (13.2)	2 (5.3)	4 (10.5)	2.79 1.07	2.5	32
Agric. magazines/ bulletins	5 (13.2)	6 (15.8)	17 (44.7)	8 (21.1)	-	2 (5.3)	2.78 0.96	2.55	33
Newspapers	4 (10.5)	11 (28.9)	16 (42.1)	3 (7.9)	-	4 (10.5)	2.53 0.83	2.53	32
Agric documentary on television	9 (23.7)	6 (15.8)	15 (39.5)	4 (10.5)	1 (2.6)	3 (7.9)	2.49 1.09	2.62	34
Journals	6 (15.8)	11 (28.9	15 (39.5)	3 (7.9)	-	3 (7.9)	2.43 0.88	2.16	34
Personal letters	16 (42.1)	7 (18.4)	9 (23.7)	3 (7.9)	1 (2.6)	2 (5.3)	2.06 1.15	1.88	34

Note. [a]Scale: 1=very inefficient, 2=inefficient, 3=somewhat efficient, 4=efficient, 5=very efficient as technology transfer method. [b]Numbers in ( ) are percentages and may not equal 100 percent due to rounding. [c]No response. [d]Frequency of use of technology transfer method is a mean value calculated on a 5-point Likert scale: 1=not use at all, 2=very little use, 3=little use, 4=much use, 5=very much use as a method of transferring technology.

Table 5. Perceptions of researchers about the degree of efficiency of technology transfer method and the frequency of use (n=17).

Technology transfer methods	Degree of efficiency							[d]Freq	N
	1	2	3	4	5	Nr[C]	Mean SD		
Farm visits	-	-	1 b(5.9)	9 (52.9)	7 (41.2)	-	4.35 0.61	4.07	15
Method demonstration	1 (5.9)	-	3 (17.6)	4 (23.5)	9 (52.9)	-	4.18 1.13	4.00	15
Result demonstration	1 (5.9)	-	1 (5.9)	9 (52.9)	6 (35.3)	-	4.12 0.99	4.00	15
Short courses	-	1 (5.9)	5 (29.4)	9 (52.9)	2 (11.8)	-	3.71 0.77	3.13	15
Field trips to other farmers' farm	1 (5.9)	2 (11.8)	3 (17.6)	7 (41.2)	4 (23.5)	-	3.65 1.17	3.67	15
Using resource personnel	1 (5.9)	1 (5.9)	5 (29.4)	7 (41.2)	3 (17.6)	-	3.59 1.06	3.53	15
Visits to research centers	-	2 (11.8)	9 (52.9)	-	6 (35.3)	-	3.59 1.12	3.13	15
Newsletters (factsheets)	1 (5.9)	2 (11.8)	6 (35.3)	5 (29.4)	3 (17.6)	-	3.41 1.12	3.07	15
Use of pamphlets (handouts)	2 (11.8)	1 (5.9)	4 (23.5)	8 (47.1)	2 (11.8)	-	3.41 1.18	2.94	15
Radio	1 (5.9)	2 (11.8)	6 (35.3)	6 (35.3)	2 (11.8)	-	3.35 1.06	3.33	15
Visits to Extension offices	1 (5.9)	2 (11.8)	7 (41.2)	6 (35.3)	1 (5.9)	-	3.24 0.97	3.4	15
Agricultural magazines / bulletins	1 (5.9)	4 (23.5)	4 (23.5)	7 (41.2)	1 (5.9)	-	3.18 1.07	3.13	15
Agric documentary on television	1 (5.9)	3 (17.6)	6 (35.3)	6 (35.3)	1 (5.9)	-	3.18 1.01	2.87	15
Journals	2 (11.8)	3 (17.6)	5 (29.4)	7 (41.2)	-	-	3.00 1.06	2.8	15
Newspapers	1 (5.9)	6 (35.3)	5 (29.4)	3 (17.6)	1 (5.9)	1 (5.9)	2.81 1.05	2.79	14
Personal letters	2 (11.8)	7 (41.2)	5 (29.4)	3 (17.6)	-	-	2.52 0.94	2.07	15

Note. [a]Scale: 1=very inefficient, 2=inefficient, 3=somewhat efficient, 4=efficient, 5=very efficient as technology transfer method. [b]Numbers in ( ) are percentages and may not equal 100 percent due to rounding. [c]No response. [d]Frequency of use of technology transfer method is a mean value calculated on a 5-point Likert scale: 1=not use at all, 2=very little use, 3=little use, 4=much use, 5=very much use as a method of transferring technology.

Objective four of this paper sought to identify and describe the linkage mechanisms between farmers, agricultural extension agents and researchers. Subject matter specialists training at SMS workshops, and personal contact with farmers to obtain first-hand information

were among the linkage mechanisms identified by extension agents and research scientists respectively. Others were monitoring tours, participatory training, and joint meetings with agricultural extension agents. Those identified as effective include: demonstrations at training sessions, monitoring tours or farm visits, and demonstrations at field days and planning workshops.

The survey results show that the linkage mechanisms were characterized by personal contacts, home and farm visits, mostly by extension agents to seek first hand information about farmers' problems. Group methods that were used included workshops, joint meeting and farmers' training sessions that were organized through by extension agents, non-governmental organizations (NGOs), and a few research institutes, notably, the Crop Research and Soil Research Institutes. The results demonstrate that individual and group methods were the most used means to communicate with farmers, agricultural extension agents and researchers. Thus activities that bring these people together should be identified to enhance exchange of ideas and information about farming.

Conclusions, Implications, and Recommendations

Agricultural extension depends to a large extent on information exchange between and among farmers on one hand, and a broad range of other actors. Extension, education and research is typically seen as a service – public or private – that responds to the needs of farmers and rural people for knowledge that can be used to improve productivity, farm incomes and welfare and to manage the natural resources on which farmers depend in a sustainable way. Extension brings information and new technologies to farming communities, allowing them to improve production, incomes and standards of living.

Linkage mechanisms that fostered effective link between farmers, agricultural extension agents and researchers were: field days, results and method demonstrations, personal contacts, participatory training workshops, farm visits or monitoring tours, planning session workshops, meetings with farmer groups. Farmers communicated with agricultural extension agents and researchers mostly in English and/or in Ewe. However, few farmers communicated in Pidgin English and Akan. Majority of the farmers were reached through individual and group methods by extension agents and researchers.

Transfer of technologies would be enhanced through farm visits, results and method demonstrations, however, these methods tend to be constrained by inadequate resources (Doamekpor, 2005). It is recommended that demonstrations at meetings and workshops should be frequently used as a way to effectively enhance extension work in due to limited financial resources. Language of communication is critical in sending the right message to clients. It becomes more critical when scientific concepts are to be translated into local dialects or languages. Hence, training in basic extension communication and methodology for effective communication with the actors in the Agricultural Knowledge and Information System becomes very essential.

The low rankings received for the mass methods of transferring information to farmers call for critical examination of policies to radio programming in local languages would enhance effective communication of extension messages in line with the policy implication proposed by Chapman et al. (2003). In the light of this, the proliferation of FM stations in the region will help with extension efforts if the right policies are formulated.

A study to assess the impact of radio programming and print media in communicating extension messages could be explored to determine which demographic variables influence communication links in the agricultural Knowledge and Information Systems.

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