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Farmer Perception of the Effectiveness of the Extension Service in Communicating Climate Change Information, Kingdom of Swaziland

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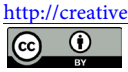

Abstract

Agriculture remains an important sector in the economy of the Swaziland. Small scale farmers support the majority of the population, about 70%, who live in the rural areas. It is the assertion of this paper that very little attention has been focussed on the impact of the extension service and how famers perceive their impact with regards to information dissemination on climate change. The impact of Agriculture Extension Messages to influence adoption of new technologies is vital for improved crop productivity. Primary and secondary data were used for the study including the administration of a questionnaire from 170 farmers in the four agro-ecological zones. The data was analysed using descriptive statistics. The results showed that about 67.3% of the respondents sourced information on climate change from mass media (radio). About 60.7% of the farmers said that extension does teach on climate change, despite the fact that their visibility was inadequate at 38.7%. The study also revealed that this low level of visibility affected farmers' level of understanding which stood at a low 45.2%. Among the majority of the respondents that understood the messages, about 61.9% said they utilized the information in planning for their agriculture production for the coming seasons. It is recommended that the whole agriculture extension service including private, public and Non-Governmental Organizations (NGO) extension should improve their visibility, in terms of increased numbers or organized extension activities among the communities where they have jurisdiction. Similarly, even in instances where they are visible, it is recommended that the quality and effectiveness of the teaching be improved to get farmers to understand what is being taught or communicated. Also, capacity building of extension staff should be made a priority to improve the quality of officers, and in retrospect the messages disseminated. Last but not least, structured or targeted capacity building programs should be developed for farmers within

commodity groups to enhance effectiveness of adoption of messages. Lastly, even though the economy is on the decline it is recommended that funds be made available for extension programs and activities to improve overall effectiveness of the service.

Subject Areas

Agricultural Science

Keywords

Perception, Extension Workers, Climate Change

1. Introduction

Davies, K. (2009) [1] defines extension as the entire set of organizations that support people engaged in agriculture production and facilitates their efforts to solve problems; link to markets and other players in the agriculture value chain; similarly, obtain information, develop skills, and acquire new technologies to improve their livelihoods. The study explored farmer perceptions on the performance of the extension service in disseminating information on climate change, impacts and vulnerability. The analysis of the prevailing climatic regimes in the four agro-ecological zones of the country showed that amelioration of climate change impacts is critical for improved productivity. The findings of this study are expected to be used by stakeholders in the agriculture sector including small holder farmers and policy makers to address issues on climate change. As part of the broader study, the paper presents the perception of the effectiveness of the extension service in communicating climate change information to small holder farmers in Swaziland.

Effective communication of extension messages, including agriculture knowledge, is aimed at raising awareness and promoting understanding among farmers. In Swaziland, like in most other countries, the agriculture extension service has been, tasked with such responsibility. Therefore, getting the right messages, including messages on climate is critical if this phenomenon of climate change impacts is to be ameliorated. If small holder farmers are not assisted, their agriculture productivity will continue to go down resulting in food insecurity and poverty. If extension intends to impact small holder farmers, with the climate change information, they have to focus on creating a community of small holder farmers that understands climate change and its impacts to the extent of being able to make reliable choices (Mwazi *et al.*, 2011) [2].

The vast majority (70%) of the 1.2 million people depend, directly or indirectly on subsistence farming for their livelihoods, which has been drastically handicapped by a struggling economy and recent droughts linked to climate change (FAO, 2014) [3]. Nkambule and Dlamini (2012: 4007) [4] state that even though agriculture has a significant role in the economy of a developing country,

the dependence on rainfed agriculture and lack of water, tends to be the most limiting factor in its development, especially for the majority of small holder farmers in the rural areas. Moris (1991) [5] states that extension, whether public or private, operates in a context or environment that influences the organization, form, and content of transfer activities. The dominant characteristic of that context changes, because, it is these changes that affect all aspects of Extension impact.

Purpose and objective:

It is the intention of this paper to examine the perception of smallholder farmers on the effectiveness of the extension service in disseminating climate change information to help ameliorate the impact of this phenomenon on agriculture productivity.

The broad objectives of the study are:

1) Identify the perceptions of farmers on the performance of extension;

2) Establish the level of knowledge farmers have on climate change.

The specific objectives are:

1) Identify the preferred extension methods used for communicating information on climate change;

2) Establish whether extension Officers teach about climate change;

3) Establish farmers' perception on the visibility of extension officers in the communities;

4) To establish farmers level of understanding of climate change; and

5) Verify if farmers use the knowledge gained on climate change for planning their production for the coming season.

2. Methodology

The study was carried out in Swaziland's traditional four agro-ecological zones, between Latitudes 25˚43' and 27˚19' Longitude 30˚47' and 32˚08'. The country has a total area of 17,360 Square Km (FAO AQUASTAT 2014) [3] and is traditionally divided into four agro-ecological zones. However, according to Murdoch (1968) [6], based on elevation, landforms, geology, soils and vegetation, the country was further divided into six Agro-ecological Zones or Physiographic regions. However, for the purposes of this study the four Agro-ecological Zones shall be used. Small Holder Farmers (SHF) from a total of 17 Rural Development Areas (RDA's) were subject of the study for a period of three months during the 2016/17 agriculture season, covering the winter Months June to August, after Maize harvesting. These areas are located in all the four Agro-Ecological Zones (AEZ): Highveld (6), Middleveld (6), Lowveld (4) and Lubombo plateaux (1).

Data Collection and Analysis:

A total of 17 Rural Development Areas (RDAs) in the four agro-ecological zone were used for the study. A list of respondents was selected by the local agriculture extension officer. The selected farmers were drawn from a comprehensive data source of all maize farmers in the RDA. About ten (10) farmers were

given a questionnaire to answer, while five (5) formed the Focus Group for Discussion. Qualitative data was collected using the structured questionnaire, from the ten farmers per RDA resulting in a total of 170 respondents interviewed. Quantitative data was obtained through the questionnaire; including variables such as important demographic and socio-economic information from the identified households; farmers' perceptions on the local climate status; any changes in their farming practices overtime; and explanation of those changes in terms of specific types of crops and crop varieties as well as factors that motivate farmers' decisions to undertake such changes farming practices. Other aspects included socioeconomic implications of the changes at both household and community levels; and long-term policy and strategic interventions for coping strategy, which farmers believe they could be able to support them to not only adapt but also enhance their resilience to climate change and variability. The data was analysed using the SPSS version 16 program. Rainfall and temperature trend analysis was done from series data obtained from the country's Meteorology Department spanning a 30-year period from 1985 to 2015. Descriptive statistics were run to give frequencies and percentages. Cross tabulations were used for comparison of selected parameters within and without the agro-ecological Zones.

Climate Change and Small Holder Agriculture:

Climate change and agriculture are inter related processes. Any change in climate can have significant alteration in crop yield (Mall *et al.*, 2006) [7]. Agriculture production is vulnerable to environmental change, including climate-induced change. Climate change and the associated rise in global average temperatures, as well as increased unpredictability of rainfall, will have profound impacts on agriculture in the twenty-first century. Thus they will inevitably affect smallholder production systems. Climate change is linked to extreme anomalies in weather events and increased variability and unpredictability (Hansen, Sato and Reedy, 2012) [8]. Rainfall, which may have more serious consequences with associated extreme weather events include spells of very high temperature, torrential rains and droughts, are more disastrous biophysical effects on small holder production. It has been predicted that agricultural production will decrease throughout much of the developing world (Cline, 2007 [9]; Gornall *et al.*, 2010 [10]).

Climate variability is evident in Swaziland, as it manifests itself in hydrological disasters, change in rainfall regime as well as extreme weather conditions (Manyatsi *et al.*, 2010) [11].

The National Maize Production trends for the past decade show that, the country has been struggling to meet its average national maize requirement of 140,000.00 MT. The year 2016 was the worst ever, recording and annual maize production of 33,460.00 MT (60% decrease), which was mainly attributed to the last season El Niño resulting in crop failure. This 2017 season was mainly characterised by normal to above normal rainfalls. This phenomenon resulted in conditions getting back to normal with maize production at 84,344.00 MT.

Agriculture Extension Service:

The commitment of the Government of Swaziland, through the Ministry of Agriculture, in the promotion of agriculture development is unequivocal (MOAC, 1970) [12]. The Ministry has, from the beginning, set up policies and general goals regarding firstly, agriculture development, which include: 1) advancing the productivity and income generating capacity of the agriculture sector; 2) promoting and encouraging increased crop production and diversification; 3) making farm services, including credit and marketing, more reliable to farmers; 4) strengthening the crop and livestock extension services; and conserving and enhancing quality of the natural environment. Secondly, the government focussed investment in small holder agriculture (which was referred to as traditional agriculture) through the Rural Development Areas Program (RDAP) which provided support to all the developmental goals above. The provision of extension agents was critical to the functioning of these rural development areas (World Bank Report, 1983) [13].

The sharing of ideas and information—forms a large part of the extension agent's job. By passing on ideas, advice and information, he hopes to influence the decisions of farmers. Studies have revealed that scientists and extension agents having status, expertise, accomplishment, authority and experience are perceived as highly credible by the farmers in communicating information on agriculture and rural development. "Who tells, is therefore, very important in extension communication". The various methods extension uses for communicating extension messages include the following: mass media, individual and group methods. Communication—The decisions farmers take about what is to be done on their farms, by whom, how and when, are complicated. Decisions are based on information which is available, partly from the Departments of Agricultural Extension. The process which farmers undertake in deciding whether or not to use new ideas is known as the adoption process. The adoption process has five generally recognised stages: 1) Awareness or Knowledge Through the gradual accumulation of knowledge, becoming aware of new ideas. 2) Interest or persuasion seeking out more information and forming and changing attitudes about a new idea. 3) Evaluation or decision collecting detailed information and making judgements about whether to try something or reject the idea. 4) Trial or implementation testing out or trying the idea on a small scale. 5) Adoption or confirmation deciding to apply the innovation comprehensively in preference to old methods. A sixth stage is often referred to as Reinforcement which simply means gathering additional information after which simply means adoption to reconfirm that the right decision has been made. The adoption process does not always follow this sequence in practice. This is particularly true when dealing with a package of innovations. For example, after a farmer has decided to adopt a practice, the implementation or trial of this decision requires considerable additional learning and evaluation. Similarly, interest may precede awareness where farmers are looking for a solution to a specific problem, or it may not be possible to test out an idea on a small scale. This has to be done by a competent

Extension worker. Secondly, Group Extension Methods; these include, 1) Demonstrations, 2) Field days, 3) District fairs, and 4) Group meetings, 5) Motivational tours, 6) Participatory technology development, 7) Training days, 8) Farmer field school. Thirdly, individual extension methods, such as individual farm visits (Jennie van der Mheen-Sluijer, 1995) [14]. The extension systems claimed to be using these methods in the communication of climate change information to small holder farmers in the rural areas.

3. Results and Discussion

Extension Advice and Messages

The following table shows what the respondents considered their sources of knowledge and messages on climate change.

Table 1 presents sources of information on climate for small holder farmers in the various agro-ecological zones. The various sources available for farmers were analysed and from the results of the study, the majority about 67.3% of the respondents indicated having gained knowledge and advice from radio, while about 19% received messages directly from extension officers from both public and Non-Governmental Organizations (NGO). A low percentage of farmers reported receiving information on Climate change from other farmers, (farmer to farmer extension) (mean 1.47 and STD Dev = 0.917). This study reveals the superiority of mass media, in information dissemination than the tradition physical contact methods, including farm visits, workshops, and demonstration. Klasper (1960) [15] suggested that people expose themselves to messages selectively. There is a tendency for individuals to expose themselves relatively more to those items of communication that are in agreement with their ideas, beliefs, and values. In this study it is evident that farmers in Swaziland have aligned themselves with the Agriculture radio broadcasts that are aired on Swaziland Broadcasting and Information Service (SBIS) on Tuesday between 13 to14 hours and every Saturday Morning at 5 to 6 AM. This finding clarifies the collective myth by Mathur and Sinha (1991) [16] that a country's media organizations, both print and audio visual, affect the flow of extension messages to farmers. In-fact,

Table 1. Smallholders farmers source of information on climate change.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Radio	113	67.3	70.6	70.6
	Extension	32	19.0	20.0	90.6
	Farmers	6	3.6	3.8	94.4
	Print media	7	4.2	4.4	98.8
	Other	2	1.2	1.2	100.0
	Total	160	95.2	100.0	
Missing	System	8	4.8		
Total		168	100.0		

such combination assessment gives an erroneous picture of the effectiveness of each of the communication methods or platforms. When further probed, this did indicate that the main reason why radio was superseding the other extension methods was that few extension officers in the service. It can be concluded that the contribution of extension to farmer's knowledge of Climate change is significant considering the impact made through mass media. Aymone (2009) [17] states that better access to extension services seems to have a strong positive influence on the probability of choosing an adaptation measure. He argues that farmers who have access to extension are more likely to be aware of changing Climatic conditions and to have knowledge on the various management practices that they can use to adapt to changing climatic conditions. Sillumbe (2004) [18] advances that low literacy level does not allow the farmers to appreciate innovations in agriculture development in any given society as level of formal education attained by an individual goes a long way in shaping his personality, attitude to life and adoption of new and improved practices.

Teaching on Climate Change

With regards to Smallholder farmer's perception on teaching on climate change, the majority about 60.7% of the respondents did agree that extension does teach about climate change (Mean 1.52 and STD Dev = 0.732). **Table 2** indicates the frequencies of farmers disaggregated by their agreement on whether extension teaches or does not teach on climate change.

Table 2 reveals that indeed extension does teach about climate change. Schorosch, Franz *et al.* (2011) [19], assessing the national extension Service of Swaziland, state that the policy objectives, related to the transition of small holder famers from subsistence to a commercial state, are dependent on systemic delivery of research based information to farmers by the extension service. He further asserts that despite the lack of an extension policy, the extension service continues to disseminate extension messages. The extension messages delivered to farmers tend to be largely subject oriented, rather that problem oriented, reflecting, the dominant characters and inputs of the extension workers. It was interesting to note from the "Assessment of the National Agriculture Extension

Table 2. Small holder farmers perception on whether agriculture extension does teach on climate change.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	102	60.7	61.8	61.8
	No	41	24.4	24.8	86.7
	Not sure	21	12.5	12.7	99.4
	Don't know	1	0.6	0.6	100.0
	Total	165	98.2	100.0	
Missing	System	3	1.8		
Total		168	100.0		

System Report" quotes the 2010 regional report for the Lubombo Region, that out of 77 subjects and topics taught in the year, none was found to teach about Climate Change' and yet the Lubombo region is the one prone to the impacts of Climate Change. However, the current study of 2016 indicates that extension does teach about climate change. It can be deduced from the results that both Mass media and face to face training has been used effectively by extension in teaching about climate change, since 2010. It can also be deduced from the various studies including the one quoted above, that issues on awareness of climate change have been progressive since 2010. During that time extension was not aware or adequately equipped to disseminate information on Climate change impacts.

The Visibility of Extension Officers

Table 3 shows farmers perceptions on the visibility of extension officer in their areas.

An almost equal percentage of farmers felt that officer's visibility was adequate and inadequate. Where about 38.7%, stated that extension officer's visibility was adequate, while 36.9% thought the officer's visibility was inadequate (Mean 1.84 with STD Dev = 0.775). They wanted officers to be visible in their areas. However, in an era where economies are shrinking, figures of extension officers are likely to dwindle as it is highly likely that governments or NGO will be hiring more officers. This study concurs with the study conducted by Maoba, S. (2016) [20] where he found that 42.3% of farmers in the Gauteng province felt that the Visibility of Extension officers was adequate. During the Period of the Rural Development Areas Program (RDAP) in the 80's in Swaziland, the World Bank Report, stated that the Country managed the best extension service in the region. (World Bank Report, 1983) [13]. At each rural development area, almost all services were available, including finance, cooperatives, livestock and land use apart from the general extension and home economics. Transport for farm visits was available for all officers. The budget was decentralized and adequate for all extension activities.

Level of Farmer Understanding of Climate Change Information

Smallholder farmers agreed that Extension does teach subjects on Climate change, it was imperative for this study to then determine whether smallholder farmers understood what they were taught. Table 4 shows the respondents perception of their level of understanding of climate change.

Table 3. Smallholder perception of the extension officers visibility.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	65	38.7	39.4	39.4
	Not adequate	62	36.9	37.6	77.0
	Not sure	38	22.6	23.0	100.0
	Total	165	98.2	100.0	
Missing	System	3	1.8		
Total		168	100.0		

Table 4. Smallholder farmers perceived level of understanding of climate change.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Good	76	45.2	47.5	47.5
	Average	35	20.8	21.9	69.4
	Low	39	23.2	24.4	93.8
	None	10	6.0	6.2	100.0
	Total	160	95.2	100.0	
Missing	System	8	4.8		
Total		168	100.0		

The impact of the teaching on Climate change by Extension was to be evaluated by the level of knowledge gained and applied by farmers. In this study about 45% of the respondents felt they had a good understanding of Climate change as a result of training by extension officers (Mean = 1.89 with STD Dev + 0.982). According to Davies (2009) [1], one critical role of extension is to conduct capacity development programs for adults through informal education. From the results, it is evident that extension has to do more to gain quantitatively the number of farmers with adequate knowledge on climate change. Although an extension program may be successful in knowledge diffusion, adoption among farmers may be influenced by other factors such as market and logistical challenges to name a few: technology learning may not always translate into adoption. As standard household surveys, often do not detail the learning process. Most studies cannot discern whether such failures reside in the education process itself, or in other circumstances down the line (Annemie Maeterns, *et al.*, 2017) [21]. It is not surprising therefore, that even in this study only 45% of the respondents cited adequate knowledge of climate as a result of extension.

Small Holder's Farmers Use of Climate Change Knowledge for Planning Purposes

Table 5 depicts farmer's perception on the use of information for planning purposes for the next ploughing season.

Planning for Agriculture production is critical in the era of climate change and numerous uncertainties in agriculture production environments. From the results above, a high percentage about 61.9% of the 45% who obtained knowledge on climate change use the information for planning their agriculture season. This is good in that a proper plan that is well implemented will guarantee the attainment of high yield and ultimate attainment of food security. Ermolieva, T. (2013) [22] developed a planning model to emphasize the importance of planning for agriculture production. The agriculture production, planning and allocation model which she developed, is a detailed stochastic and dynamic model for spatio-temporal planning of agriculture activities to meet food security goals under natural and anthropogenic risks, resources constraints, and social targets. The model demonstrates that explicit treatments of risks and uncertainties in

Table 5. Smallholder farmers perception on the use of information for planning purposes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	104	61.9	63.0	63.0
	no	32	19.0	19.4	82.4
	Sometime	29	17.3	17.6	100.0
	Total	165	98.2	100.0	
Missing	System	3	1.8		
Total		168	100.0		

agriculture production planning may considerably alter strategies for robust outcomes with regards to sustainable agriculture development.

4. Conclusions

The study has confirmed that mass media, especially radio, is the best extension method most perceived by farmers to be the one where they receive messages about climate change. This was evident in the farmers' responses where they agreed that extension does teach farmers on climate change and its impacts on agriculture productivity. Farmers indicated that they were aware of extension officers; however, their visibility was very inadequate, and their low level of visibility affected famers' levels of understanding the intricacies of climate change impacting their agriculture productivity. This is not surprising because traditionally in extension, mass media is usually associated with awareness creation on a subject and that detailed teaching is carried through other extension methods, such as demonstrations, seminars and workshop. Due to the realization, by small holder farmers that the climate change phenomenon is indeed affecting their agriculture productivity, a relatively significant number of those who understood about climate change did incorporate strategies to ameliorate the impact, in planning their agriculture production for the coming season.

From the study, it is prudent that the following recommendations be made. The whole agriculture extension service including private, public and NGO extension should improve their visibility among the communities where they have jurisdiction. This can be done in terms of increased numbers or organized extension activities. Similarly, even in instances where they are visible, it is recommended that the quality and effectiveness of the teaching be improved to get farmers to understand what is being taught or communicated. Also, capacity building/development of extension staff should be made a priority to improve the quality of officers, and in retrospect the messages disseminated. Last but not least, structured or targeted capacity building programs should be developed for farmers within a commodity group to enhance effectiveness of adoption of messages. Lastly, even though the economy is on the decline it is recommended that funds be made available for extension programs and activities to improve overall effectiveness of the service.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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