Asian Journal of Agricultural Extension, Economics & Sociology

38(2): 1-13, 2020; Article no.AJAEES.54896
ISSN: 2320-7027

Knowledge Management Practices, Challenges and Coping Strategies Adopted by Public Agricultural Extension: A Case of Nandi-Hills Sub-County, Nandi County, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. All the authors designed the study, discussed and developed data collection tools, analyzed the data and jointly contributed to the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2020/v38i230304
Editor(s):
(1) Dr. Kwong Fai Andrew Lo, Institute of Earth Science, College of Science, Chinese Culture University, Taipei, Taiwan, China.
Reviewers:
(1) Mohammad Rondhi, University of Jember, Indonesia.
(2) Irene S. Egyir, University of Ghana, Ghana.
Complete Peer review History: http://www.sdiarticle4.com/review-history/54896

Original Research Article

Received 16 December 2019
Accepted 24 February 2020
Published 04 March 2020

ABSTRACT

Aims: Knowledge Management (KM) in agriculture is a core aspect of agricultural productivity and profitability, but is one area with scanty literature. The aim of the current study was to determine the knowledge management practices, challenges and coping strategies adopted by public agricultural extension agents in Nandi-hills Sub-county, Nandi County, Kenya under a fairly new devolved system put in place by the constitution of Kenya in 2010.
Study Design: Descriptive cross sectional case study survey design was adopted for the study.
Place and Duration of Study: The study was conducted in Nandi-hills Sub-County, Nandi County, Kenya. Data were collected between January and April, 2019.
Methodology: All the Extension agents in the Sub-county were targeted. A questionnaire with closed and open ended questions was used to collect data from the 32 participants in the Sub-county and the data was analysed using Statistical Package for Social Sciences (SPSS) version

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20. Descriptive statistics were utilized to document the practises based on their frequencies and associations. 7% of the respondents were certificate holders, 37% were diploma holders while a majority; 56% were degree holders. Associations between attributes was analysed by running Goodman and Kruskals' gamma.

Results: Findings indicated that lack of organized knowledge sharing fora, poor ICT infrastructure, lack of budgetary support and transport were the major challenges facing knowledge management. There was strong negative correlation between education levels with rating of knowledge storage (Gamma = - 0.647, p = 0.001) and with access to stored information (Gamma = - 0.824, p = 0.001).

Conclusion: Diverse methods of knowledge capture and storage were utilized and faced varied challenges mostly attributed to inadequate facilitation to support knowledge capture and storage in modern forms such as ICT. Cooperation and collaboration with private sector players was adopted as a strategy to cope with the challenges.

Keywords: Knowledge; agricultural productivity and profitability; practices; challenges; coping strategies; extension.

ABBREVIATIONS

ECLAC : Economic Commission for Latin America and the Caribbean
ICT : Information Communication Technology
KM : Knowledge Management

1. INTRODUCTION

1.1 Background Information

Kenya's agricultural sector provides a livelihood for about 80% of Kenya's population most of whom are rural dwellers [1]. Estimates suggest that over 18 million Kenyans earn income from agriculture [2]. This dependence on agriculture by a significant proportion of the Kenyan population underscores a need for agricultural productivity. Muyanga and Jayne [3] have argued that an effectively functioning extension service provides farmers with information and knowledge, thus improving agricultural productivity. Studies conducted demonstrated that long distance to agricultural extension services were associated with low crop productivity [3] an observation that was attributed to varying levels of knowledge sharing between extension and the farmers.

Knowledge management has been considered an important aspect of agricultural productivity and profitability [4,5,6,7]. It has been demonstrated that a lack of knowledge among farmers and those who generate relevant farm knowledge can present major challenges to agricultural development [4]. Agricultural knowledge management systems are expected to produce accessible content so as to satisfy the rural community needs as argued by Islam [8]. The author asserts that such content should be available at the grassroots and not in far distances out of the reach of farmers. The Constitution of Kenya (2010) devolved the agricultural functions to the lower tiers of Government making county governments the custodians of Agricultural development programs in the country. The core functions of Agriculture to Kenyans is in its contribution to food and livelihood security; a role that requires productivity of land, labour and capital resources. In order to achieve this productivity, knowledge is an important input that provides technical knowledge and skills to the farmers so that they are able to exploit the potential of their resources to the fullest.

Agricultural extension; a devolved function in the Kenyan context, is part of a knowledge and information system charged with the responsibility of empowering the rural communities through capacity building. According to Kenyan policy on agricultural sector, the decentralized government structures were expected to provide facilitating mechanisms for knowledge sharing and to allocate resources to agricultural knowledge and information systems [1]. Localized knowledge systems at the Sub-county and county levels; rather than at the central government level, would be of significant value to small scale and medium scale farmers. Is such knowledge and information available at the counties? If so, is that information readily available and accessible at the Sub County? Is knowledge captured, stored and shared readily with the users at the Sub counties? These are questions of concern in light of devolution of an important sector responsible for food and nutrition security and an economic backbone of the country.

1.2 Statement of the Problem

The core duties of the Departments of Agriculture in Kenya is to generate and deliver knowledge and information to the rural communities with the goal of promoting new knowledge, skills and raising the desire for higher achievements in farm productivity. This core duty calls for a seamless management of agricultural knowledge. Management of the knowledge has the intention of re-use through sharing with the farming community and with other employees in the Department as suggested by Dalkir [9]. Projects that have been implemented in the Departments, whether short term or long term projects, have generated experiences and lessons learnt that deserve attention in knowledge management. Best practices in knowledge management suggest that experiential knowledge gained in the course of project implementation should be captured, stored and made accessible to self or others as and when required for re-use.

An assessment of the practices and challenges faced by Agriculture Department employees of Nandi County in agricultural knowledge management is a key element to understanding aspects of knowledge management for administrative and policy value. Under a devolved governance structure as envisaged by the Constitution of Kenya (2010), agricultural knowledge management infrastructure remained with the national government and the counties were expected to build their own capacity on the same [1]. A review of literature suggested a lack of documented studies on knowledge management under the fairly new county dispensation.

1.3 Objectives

The purpose of the current study was to assess the challenges of knowledge management in public agricultural extension in Nandi County; with a case study of Nandi Hills Sub County. The study was guided by the following objectives:

(i) To identify the current knowledge management practices used by public agricultural extension employees in Nandi-hills Sub-county.
(ii) To determine the challenges facing public agriculture department employees in knowledge management in Nandi-hills Sub-county.
(iii) To establish the strategies adopted by public agricultural extension employees in coping with the challenges of knowledge management in Nandi-hills Sub-county.

1.4 Literature Review

1.4.1 Importance of knowledge sharing

The most important aspect of knowledge management is that knowledge should be shared widely in an organization and widely in terms of time. This is specifically important in agricultural extension which can be viewed as a knowledge system involving agricultural research, extension agents and the ultimate consumers of the knowledge; the farmers. One important process through which knowledge is shared is personal communication and interaction between individuals as explained by [9].

1.4.2 Knowledge sharing and the spiral model

The Nonaka and Takeuchi knowledge spiral model suggests that knowledge conversion from one form to another is an interactive spiral process which is not uni-directional. This implies that tacit knowledge held by employees in an organization can be converted to available forms and back to unavailable form. The model recognizes four forms of conversion, namely; tacit to tacit through socialization, tacit to explicit through externalization, explicit to explicit through combination and explicit back to tacit through internalization. These are the modes of conversion of one form of knowledge to another which an individual can experience and the same can be embedded in organizational knowledge through its employees as explained by [9]. Following this argument, socialization may be regarded as processes that include face to face interactions. Such face to face interactions are experienced in meetings, workshops, brainstorming sessions and other forms of interaction during which there is knowledge sharing. During such interactions there is also externalization of knowledge.

Externalization, which is described by Dalkir [9] as giving a visible form to tacit knowledge, may be related to documentation, audio visual and electronics system, while combination corresponds to explicit knowledge recombination from different sources. The resultant knowledge from combination is explicit knowledge which can be passed on to others through the process of diffusion. When the explicit knowledge is passed on to others a new behavior emerges in the recipient as the individual embeds the knowledge

into the self as suggested by Dalkir [9]. In order to extract value from these processes in the interest of the organization, an initiative that improves the creation, distribution and the use of the knowledge is imperative as explained by Nonaka and Takeuchi [10]; this is what Nonaka and Takeuchi model refers to as the enabling conditions for knowledge creation. This argument brings to fore the need for knowledge creation and storage in order to facilitate the process of sharing. The question that arises then is; what conditions do we require for knowledge creation in an organization?

1.4.3 Favourable conditions for knowledge creation

Effective knowledge creation is associated with strong relationships between members of an organization. Relationships are important as one cannot scan knowledge from the human mind to extract the knowledge required [11]. The author has explained that an important form of knowledge; the tacit knowledge, is with the holder. The implication here is that social interactions, what has been referred to as socialization by Nonaka and Takeuchi [10] cannot be replaced by technology. This kind of interaction requires the right facilitating organizational culture that promotes the sharing of knowledge [12].

According to [13] some important aspects of organizational culture that influences knowledge sharing and by extension its creation includes; organizational mission, involvement of employees in decision making and organizational consistency; aspects which lead to empowerment, team-orientation and capability development in the organization. Other factors such as the dynamics of power and opportunism that have been identified among non-governmental organizations also make contributions in influencing knowledge management as reported by Smith and Lumba [14]. The authors explain that a culture of competition and opportunism hinders inter-organizational knowledge sharing for those organizations that are involved in similar work.

When the conditions for knowledge creation are favourable, the knowledge so created must be stored in ways that makes it readily accessible to the users when they need it. However, such storage is sometimes faced with challenges, both during storage as well as during its retrieval and thus hampering the efficiency of knowledge transfer [15].

1.4.4 Knowledge storage and associated challenges

Some authors have observed that storage of knowledge can present a challenge to organizations, in addition to the challenge of being unable to locate the knowledge later when needed [16]. The later retrieval is a necessary condition before the knowledge can be utilized [16]. There is also the additional challenge of being unable to predict who needs what knowledge. Additionally, when is it needed? Regular identification of needs of knowledge therefore becomes a good organizational management practice. This is where codification comes in with the assistance of technology as suggested by [17]. Since knowledge today is considered an increasingly important asset of an organization [18], the technology used either for its transmission or storage should be appropriate to ensure ease of retrieval as and when needed. The storage of knowledge and experiences is an important process in accordance with the argument by [19] that every experience is re-usable. Effectively stored experiences are readily accessible for the process of sharing when needed.

1.4.5 Knowledge sharing fora

In order to effectively share knowledge as suggested by the Nonaka and Takeuchi spiral model in reference to its socialization and externalization processes, knowledge sharing forums may be of value. The importance of knowledge sharing forums is underscored by the fact that group knowledge is more than the sum of all group members [20]. The variety contributed by the members of the group results in new knowledge as explained by [20]. The authors explain that social interaction is especially critical for delivering new services and organizational processes. This assertion suggests the importance of meetings such as professional group meetings and workshops where knowledge is shared through group work. Similarly [21] assert that knowledge can be captured effectively through processes such as project workshops and project progress meetings. The authors emphasize on knowledge sharing through face to face interactions and communications within group members as happens in workshops and seminars. The current study attempted to establish the actual practices as carried out by the department of agriculture in Nandi County.

1.5 Scope of the Study

The study was conducted in Nandi-hills Sub-county, Nandi County in the Rift Valley region of Kenya. The study targeted all agricultural extension employees in the study area on aspects of challenges associated with knowledge management. This study was conducted between January and April; 2019.The study adopted a cross sectional case study design to collect in depth case specific data.

1.6 Justification

Under the constitution of Kenya (2010), Agricultural functions including public agricultural extension services were devolved to the counties. Much of the knowledge management infrastructure, however, appeared to have been left at the national level. In the year 2012 the Government of Kenya had recognized ineffective knowledge transfer mechanisms for demanded knowledge and skills by clientele [1]. Decentralized government units were guided by National Agriculture Sector Policy (NASEP) to strengthen institutional mechanisms in agricultural knowledge and information systems [1]. The capacities of counties in Kenya to handle agricultural knowledge management have, however, not been studied and documented.

2. METHODOLOGY

2.1 Study Area

This study was conducted in Nandi-hills sub-county; one among six sub counties of Nandi county. The Sub-county is predominantly a highland area with an average altitude of about 2050 metres above sea level and its major town of Nandi-hills is surrounded by large tea plantations; an agriculturally resource rich environment covered by lush crops for much of the year. Nandi-hills, the headquarters is situated 0.12^{o} N and $135^{0}18$ E at an elevation of about 2050 Metres above sea level [22]. The entire Sub-county is a high agricultural potential area where tea, coffee and dairy farming dominate as commercial enterprises and maize and beans as major food crop enterprises.

2.2 Sampling Procedures

Nandi-hills Sub-county was purposively selected for the study on challenges of knowledge management in agriculture sector department in view of the importance of the sector in this agriculturally-rich Sub-county. The Sub-county is endowed with both commercial agriculture, in the central parts, and subsistence agriculture to the eastern side of Nandi-hills town [22]. Medium scale dairy and horticulture farming also covers a large portion to the south. The Sub-county is characterized by diversity both in terms of agricultural enterprises and in terms of scale of operation; ranging from peasantry to highly commercialized large agricultural estates where tea and coffee is produced [22]. The commercial agriculture in the sub county is dominated by tea estates with farm sizes ranging from 10 ha to 400 ha. Small scale farms on the other hand have land sizes as low as 0.1 ha mostly utilized for production of subsistence crops such as maize and beans [22].

In order to understand the knowledge management practices among agricultural professionals, the entire employees of the agriculture department composed of agriculture, veterinary and livestock production sections were targeted for the study.

2.3 Data Collection

A questionnaire was developed for purposes of gathering data from all the County employees in the department of agriculture in Nandi-hills Sub-county. It was composed of questions that solicited for answers in two parts; one on the practices of knowledge management in capture, storage, access and use. The second part was on challenges faced in knowledge management and the coping strategies that the employees adopted in mitigating effects of the challenges. Challenges in knowledge management referred to situations being faced by employees that needed great mental or physical effort to accomplish successfully. The concept of challenges of knowledge management was measured using a number of variables; documentation of employee experiences, knowledge storage, knowledge access and knowledge sharing. A total of 32 questionnaires were sent out to the entire target group and 27 questionnaires were received back representing 84% response rate.

2.4 Data Analysis

The data collected through the use of questionnaires was analyzed using Statistical Package for Social Sciences (SPSS) version 20 for windows. Descriptive statistics were generated, including measures of association

between variables. The data was initially captured in micro soft excel and later transferred to SPSS for coding to facilitate running of analysis procedures to generate frequencies and relationship coefficients. The primary data in the questionnaires was in the form of structured and unstructured responses from the respondents. The structured data were coded, while the unstructured responses were categorized according to their contents to facilitate interpretation and summarizing of the information.

The variables that had been measured on an ordinal scale were analyzed for statistical relationships by running Goodman and Kruskal's Gamma. This analysis was deemed appropriate as it is generally suited to ordinal variables even when there are some tied ranks [23]. The authors recommend the tool for measuring the strength of ties between variables as it indicates the direction of the relationship even when sample sizes are small.

3. RESULTS AND DISCUSSION

3.1 Socio-Economic Characteristics

The participants in the study were composed of extension agents with education credentials ranging from certificate to degree; 7% were certificate holders, 37% were diploma holders while a majority; 56% were degree holders. Qualifications have implications on knowledge management and this demographic factor was captured from all the participants in the study. The respondents were aged less than 35 years to over 55 years; 22% of them were aged under 35, 4% between 35 and 45, 37% were aged 45 – 55 and 37% over 55 years of age. This means a majority were over 46 years of age constituting 74% of all the respondents. Experiences ranged from few months to over 20 years (Fig. 1). Majority of the respondents had experiences of over 20 years; this has implications when considering experiential knowledge and how it has been managed over the years.

3.2 Knowledge Capture

3.2.1 Lessons learnt and personal experiences from projects

The participants in the study were asked to rate the process of documentation of *lessons learnt* during the implementation of extension projects based on a five-point Likert –type scale. The scale ranged from poor to excellent and the same scale was used to rate documentation of *personal experiences* during the same period. An analysis for correlations between the two variables suggests that there was no correlation between them as indicated by a very weak gamma coefficient of 0.088 (8.8%). This suggests that the documentation process for lessons learnt during project implementation which was rated as "good" by a majority (82%) did not have adequate provisions for documentation of personal experiences. Whereas the documentation process was generally good, the same cannot be said of the documentation of personal experiences. This discordance between the two variables implies that there was little focus on the documentation of personal experiences from the extension agents during implementation of projects.

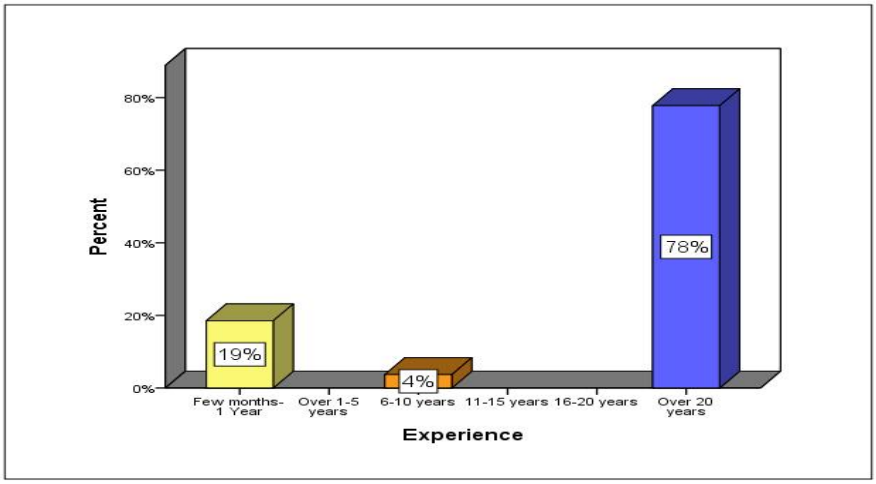

Fig. 1. Respondents experiences in extension

The knowledge capture during project implementation appears to have been viewed favorably by a majority of the participants judging by the responses given on documentation of lessons learnt. 89% of the respondents rated documentation of *lessons learnt* as good to excellent and only 11% rated the process as fair (Fig. 2). The documentation of work-related *personal experiences* during the project period on the other hand were rated 'poor' by 11% of the respondents and 'fair' by 33% (Fig. 2) suggesting that there may have been lost experiential knowledge. Outside the project period, the documentation was rated poor by 15% of the respondents and only fair by 37%

3.2.2 Educational levels and documentation of personal experiences

There was a strong negative correlation between the highest levels of education of the respondents with documentation ratings (Gamma = ˉ 0.632, P = 0.001) suggesting that the more educated extension agents viewed the documentation of experiential knowledge as being weak. The capture of individual employees' experiences in the context of an organization is critical for organizational learning as suggested by Argote [24]. The author reported difficulties in the capture of knowledge among small and medium enterprises in a knowledge based construction industry. Individual thoughts as an expert in a given field and experiences gained particularly during implementation of a series of time and resource bound activities such as happens in a project context ought to be captured for organizational learning. Captured knowledge creates knowledge stock which is re-useable immediately or later [24]. According to [9], the goal of knowledge capture is to generate a form which can be shared much more by other employees in the organization. The same has been emphasized by [25] while suggesting that knowledge flows within an organization is facilitated by recorded knowledge in the form of documents, pictures, graphics, videos, audios and program plans. They argue that such knowledge artifacts provide usable representations of knowledge for the organization.

3.3 Knowledge Storage and Access

In order to share the knowledge, employees in an organization should be able to access captured knowledge or knowledge artifacts. The participants in the study had been asked to rate the ease of access to records kept about their project experiences on a five-point ordinal scale ranging from poor to excellent. The opinions of access ranged from poor (7%) to very good (7%) with a majority indicating fair (56%) and others responding that it was good (30%). A similar question to interrogate accessibility to previous records on a five-point scale suggests that previous records are only slightly available as indicated by 81% of the respondents (Fig. 3). The five point scale used covered; not available, slightly available, moderately available, quite available and highly available. This suggests a majority posted scores on the lower end of the scale.

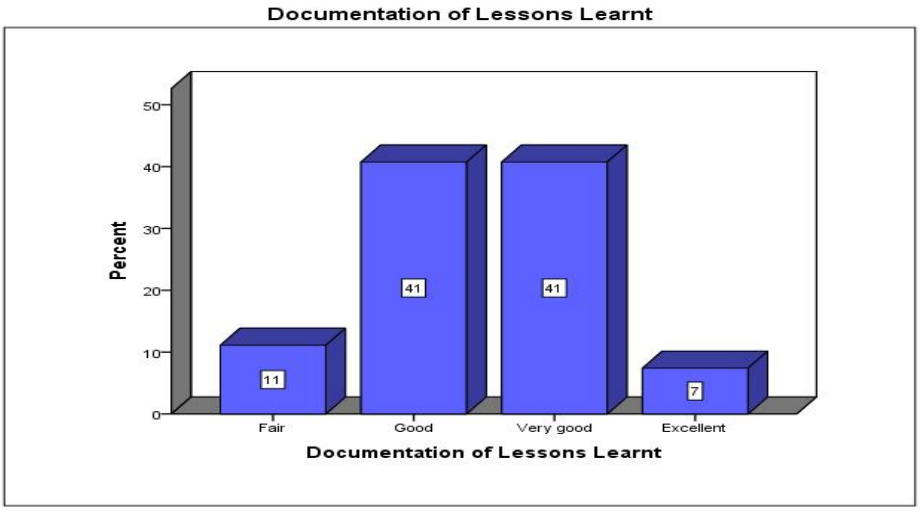

Fig. 2. Respondents rating on documentation of lessons learnt

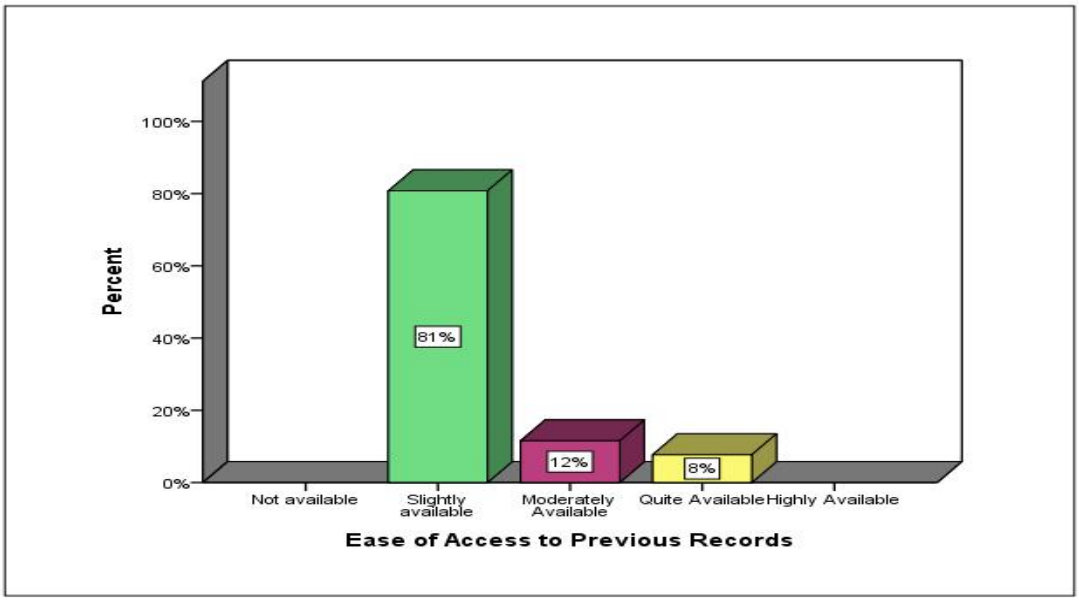

Fig. 3. Respondents rating on access to previous records

An analysis of correlations using the Goodman and Kruskal's Gamma indicated a strong negative correlation between education levels of the extension agent with their responses on access to records (Gamma = - 0.647, p = 0.001). This suggests that the more educated extension agents were more likely to report poor access to previous records. This may be attributed to their positions in the organization, since the more educated employees are in middle management. Middle management employees are required to retrieve previous records for current uses more frequently as compared to lower cadre staff. The frustrations they face in retrieval of the data may be the reason for their negative responses.

A similar question regarding access to records kept by their colleagues revealed the same pattern; levels of education was strongly negatively correlated with ease of accessibility to stored or recorded experiences (Gamma = - 0.824 , p = 0.001) suggesting some frustrations faced by employees in accessing previous records for current use. The ease of access to previous records in the organization generally was also investigated for a period outside the project implementation; the more educated agents were again more likely to report a negative experience with accessing previous records (Gamma = - 0.912, p = 0.001) suggesting major challenges may be associated with the retrieval of previous documented or electronically stored information.

3.4 Methods Used for Storage and Retrieval

The participants had been requested to indicate the methods they often used for storage of data and work related experiences. The findings indicate that a majority (78%) often used regular reports while the remaining 22% used other methods such as occasional reports. There was no indication of electronics being used as a method of storage, suggesting minimal use of modern storage and retrieval technologies. This finding is consistent with [21] report that most knowledge management technologies are document-centered. However, the authors have argued that documentation has major limitations particularly in the management of tacit knowledge which is better managed through interactive processes rather than through reports. According to the knowledge spiral model interactive processes are necessary for the externalization of tacit knowledge.

3.5 Knowledge Sharing

When asked to rate how often they shared knowledge with their colleagues in forums such as meetings, workshops and professional groups, on a scale of 1 to 5 ranging from extremely rare to extremely often, the respondents posted a median value of 2. This implied that it was generally rare for knowledge sharing to formally take place (Fig. 4). This

finding suggests the absence of processes or mechanisms that foster the social interaction required for knowledge sharing; implying that much of the knowledge held by individuals which could foster best practices in the organization may be lost as argued by [26].

When the respondents were asked about the relevance of knowledge sharing in their work, 67% indicated it was important and 33% said it was very important and no one indicated the categories of "not important" or 'slightly' important in the 5-point scale. This observation suggests the employees were fully aware of the importance of knowledge sharing in the knowledge-based extension service delivery system. What then are the challenges associated with knowledge management in the organization?

3.6 Challenges of Knowledge Management

The participants in the study were asked in an unstructured question to state the major challenges they faced in acquiring and sharing knowledge and how they went about dealing with the challenges. An analysis of the challenges presented could be broadly classified into the following categories;

i) Inadequate and/or lack of ICT infrastructure to facilitate data storage, access and sharing
ii) Inadequate/lack of organized professional forums/workshops/seminars and short courses on skills development
iii) Lack of budgetary support/ transport to facilitate knowledge sharing with farmers
iv) Low staff morale/lack of promotions/low motivation levels
v) Coordination challenges/unclear channels of communication
vi) Mistrusts among colleagues

ICT infrastructure was cited as one of the major constraints constituting 22% of the challenges identified by the respondents. This challenge included inadequacy of the infrastructure and poor maintenance resulting in an inability to store and to access previous data. Lemma and Tesfaye [27] have suggested that ICT infrastructure is critical for harnessing and utilizing information and knowledge for improved production and productivity. It can be argued that the challenge identified by the extension agents may have a significant adverse effect on the productivity of the organization as suggested by Lemma and Tesfaye [27]. A similar observation has been made by [28] who asserted that the degree of computerization is an important factor of organizational environment with the highest influence on organizational knowledge in the current age.

Lack of organized forums and short courses constituted 31% of the challenges, transport and budgetary constraints (35%), low staff morale, poor coordination and mistrust among colleagues were also cited as challenges (Fig. 5). These findings are consistent with some of the challenges that have been identified by some authors. One such author [29] suggests that periodic forums such as workshops are useful for knowledge updating among professionals so that they become adequately prepared to disseminate the same to the farmers. In a study conducted in Selangor, Malaysia, the author found that extension agent forums were effective as a knowledge sharing tool to facilitate diffusion using similar forums with the farming community. Budgetary constraints cited by the respondents adversely affect the work environment. Similar arguments have been advanced by [30] who suggest that knowledge management is about the capability to get the correct information to the right people at the correct time, a practice that can only happen in the right knowledge management environment.

The low staff morale identified as a challenge by the respondents suggests a lack of motivation for knowledge creation, storage, retrieval and sharing. This is consistent with [31] findings to the effect that a lack of motivation by employees is one of the most important challenges in knowledge sharing in an organization. In another study conducted among crop researchers in Kenya, [32] cited lack of incentives to provide a favourable environment for knowledge sharing as a hindrance to knowledge management. Another author; [33] also categorically suggested that knowledge is not freely shared; the people sharing need incentives and rewards, even in the form of some recognition.

The case of lack of trust as a challenge to knowledge sharing is an interesting finding in view of the role of public extension service where knowledge is expected to be freely shared. In the words of one of the respondents "I share knowledge only with the people I trust" one gets the view that the socialization process referred to by [10] is critical in the process of knowledge

sharing. In Kenya, a similar finding in a study among crop researchers was reported, where a researcher found that trusts determined who the researchers shared knowledge with [32].

Inadequate or lack of transport and budgetary support was cited by a number of respondents as adversely affecting knowledge sharing with the clientele (the farmers). This challenge constituted 35% of the challenges cited and in the view of the respondents, knowledge sharing was their core function as they had all indicated that knowledge sharing was either 'important' or 'very important' to their work Lack of organized forums such as workshops, seminars, professional group meetings and short courses to facilitate knowledge capture and sharing was cited as the second most important challenge constituting 31% of the challenges. How then did the extension agents cope with these challenges?

3.7 Coping Strategies

The study participants had diverse coping strategies adopted to mitigate the effects of the challenges they faced. The mitigating actions included; collaborating with other stakeholders including private sector players to facilitate knowledge sharing among professionals and with the clientele (famers). The use of informal meetings with cooperating colleagues was another strategy (Fig. 6). This strategy finds support in the policy document on extension in Kenya which encourages pluralistic extension where both public and private sector players cooperate and collaborate [1]. Cooperation among extension service providers has the advantage of achieving a wider outreach at a marginal cost [34]. The issue of mistrust among colleagues brought to light an issue of organizational culture. Learning, at the individual level is fundamentally a social process that requires interaction in some form (Crossan, 1999 as cited by [3]). The process of interaction calls for the right organizational culture that fosters socialization where all employees mutually trust one another.

The lack of budgetary support was also counteracted through the use of personal resources to undertake some knowledge management activities, while also maximizing on the little resources that were accessed. These observations suggest some level of sacrifices of personal income by the extension agents in order to undertake the tasks of knowledge management. Informal meetings and consultations with trusted friends was also an important coping strategy adopted by the respondents to facilitate some knowledge sharing (Fig. 6).

Impending retirements as suggested by the demographics gathered may imply a potential loss of valuable knowledge that could have been transferred to other current and future workers. This indicates a need for creation of knowledge capture and sharing forums such as workshops and professional group meetings as well as the facilitation of knowledge sharing with the clientele. Learning from others involves extracting best practices from them and identifying better ways of doing things through interaction. It is therefore argued that the general organizational culture that provides the right environment for knowledge management in a knowledge based agriculture Department is highly called for.

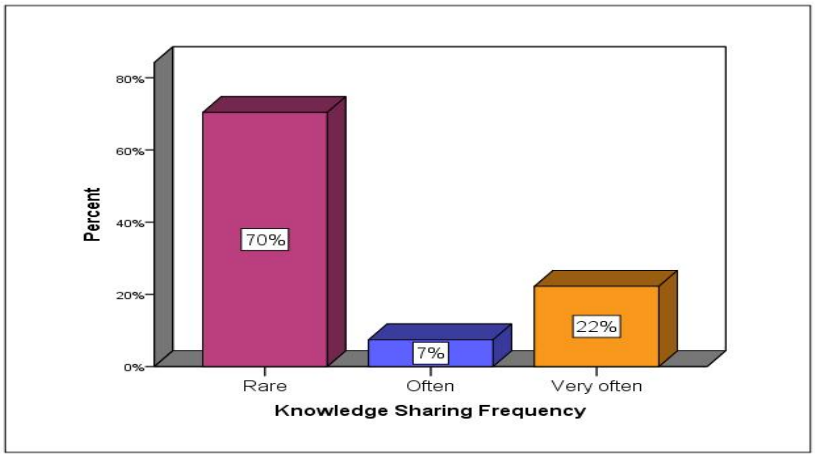

Fig. 4. Respondents rating on knowledge sharing

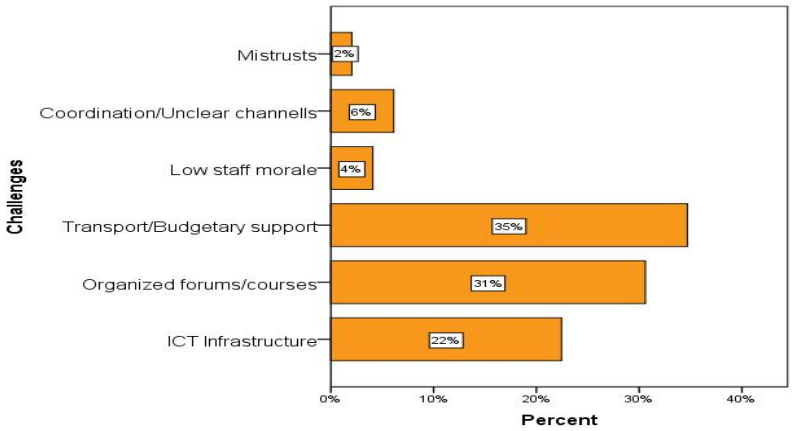

Fig. 5. Challenges in knowledge management as cited by respondents

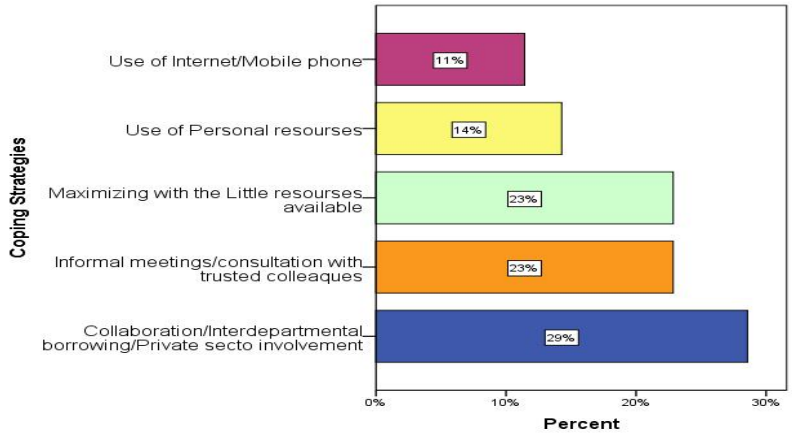

Fig. 6. Coping Strategies to mitigate challenges in KM as cited by respondents

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusions

i) Documentation in form of reports was identified as the most widely used method of knowledge capture and storage while electronic modes of storage was less frequently used due to infrastructural constraints. Documentation was rated favorably during periods of project implementation. The process of documentation was, however, rated weak particularly by the more educated extension agents. All the study participants asserted that knowledge sharing was either 'important' or 'very important' to the organizational functions; however, previous experiential knowledge was only slightly available. Knowledge sharing forums such as meetings, workshops and professional forums were generally rare for knowledge sharing to formally take place.

ii) The challenges faced by the extension agents in Nandi-hills sub-county were varied and diverse. They mostly revolved around inadequate facilitation to support knowledge capture and storage in modern forms such as use of ICT and to support transportation of employees during farm visits to share knowledge with the clientele.

iii) Public agricultural extension employees adopted cooperation and collaboration with private sector players as a strategy for coping with the challenges.

4.2 Recommendations

The Agricultural knowledge and information system is of key importance to the smooth functioning of an Agricultural Extension System. Investment in knowledge management is imperative for effective information capture, storage and ultimately sharing with the users so

that it can be applied. It is recommended that the government invests on ICT infrastructure and provide budgetary support for agriculture sector departments with a view to improving the entire knowledge management cycle. Cooperation and collaboration between the private and public extension agents should be coordinated and up-scaled. Ultimately the support from the government will ensure a sustainable knowledge flow to the farming community for application of the knowledge in the interest of agricultural productivity and profitability.

CONSENT

Individual consent was sought from the study participants prior to administration of the data collection tools.

ACKNOWLEDGEMENTS

We acknowledge the positive response of the Agricultural Extension agents who took part in the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/54896