Kenya Forestry Research Institute

KEFRI KNOWLEDGE AUDIT REPORT

TOWARDS DEVELOPMENT OF A KNOWLEDGE MANAGEMENT STRATEGY

Abridged version

Sheila Shefo Mbiru, Vincent Oeba, Ebby Chagala-Odera, Gillian Mutua
Paul Tuwei, Dorothy Ochieng and Francis Ochung

KEFRI is ISO 14001 : 2004 Environmental Management Systems Certified

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Executive Summary

In today's global knowledge economy, knowledge is considered a key asset that needs to be effectively managed to give organizations a competitive edge. This is especially true for research organizations where new knowledge, technologies and innovations must be generated, shared, applied and managed for maximum impact. In order to successfully implement Knowledge Management (KM) activities within any organization, it is essential to have a Knowledge Management Strategy (KMS) that is aligned with the organization's overall strategy and objectives. The Kenya Forestry Research Institute (KEFRI) in recognition of the importance of knowledge as an asset has embarked on a process of developing a KMS. This process requires a Knowledge Audit (KA) in order to review existing knowledge assets, knowledge flows and reveal the organization's KM needs, strengths, weakness, opportunities, threats and risks.

Therefore, the objectives of this Knowledge Audit were to: determine status of information and knowledge access and sharing among employees and research management team in order to strengthen mechanisms of information flow; determine the level of staff capacity and competency in information and knowledge access and sharing; identify and analyze information and communication technology infrastructure for knowledge creation, capture, sharing and application among employees and stakeholders; evaluate stakeholder awareness and perception of KEFRI information and knowledge products and services; identify and analyze the effect of barriers on information and knowledge sharing among employees and stakeholders. A survey design using probability and non-probability sampling techniques were used to select 11 KEFRI Research Management team members, 333 employees and 222 stakeholders. A structured questionnaire was administered to each of the respondents. Descriptive statistics, chi-square, Kruskal-Wallis H test, Mann-Whitney U test and analysis of variance were used in data analysis. Results showed that the Research Management team agreed at a mean score of 3.62 and 3.64 that they were aware about information shared on development, funding and implementation of government of Kenya and donor-funded projects, respectively. Similarly, they agreed at a mean score of 4.23 that they were aware about information shared on human resource procedures. Additionally, the Research Management team and employees agreed there was sufficient knowledge at KEFRI to undertake various tasks and responsibilities.

This was in contrast to the methods used for passing knowledge which was moderately rated by both the Research Management team and employees. This suggested both categories of KEFRI respondents (Research Management and employees) were not adequately exposed to capture tacit knowledge from fellow colleagues which is passed through mentorship, coaching and informal

interactions among others. On analysis of staff capacity and competency in knowledge creation and sharing, the Research Management team agreed that the training and development opportunities are well linked to Strategic Plan of the Institute. This was in contrast to employees who moderately agreed. This was further evidenced by a significant difference on long-term training between employees in Research and Administration/Finance Departments where the staff from the former were more trained than from the latter department. The analysis on knowledge management infrastructure showed there was no central repository in the institute for information storage, access and sharing. Most of the information was stored in paper-based documents and with other fellow colleagues in different formats. The speed of access was rated moderate for paper-based storage compared to colleagues' workstation desktops.

Results from stakeholders indicated they were aware that KEFRI provides seeds and seedlings. These were rated as good. Other services and products were rarely identified. Stakeholders strongly agreed that the Institute's publications were easily readable, informative and of high quality. The respondents identified access to technology, poor information systems, lack of organization policy, lack of trust, weak team work and understaffing among others as barriers to knowledge access and sharing. In order to enhance information and knowledge access and sharing within the Institute and to stakeholders, the following major recommendations were made: develop robust knowledge management system, create databases and protocols for research projects, create oppurtunities for formal and informal learning and sharing of knowledge, develop mentorship programmes, strengthen staff capacity on ICT applications and provide a linkage to relevant regional and international knowledge-sharing platforms.

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CHAPTER ONE:

Introduction

1.1 Background

Knowledge is considered a key asset that needs to be effectively managed to give organizations a competitive edge. This is especially true for research organizations where new knowledge, technologies and innovations must be generated, shared, applied and managed for maximum impact. Knowledge plays a crucial role in organizations and has become a strategic organizational asset, a critical source of competitive advantage and a key factor in organizational value creation. Organizations need to institutionalize mechanisms to systematically manage both tacit and explicit knowledge so as to create new knowledge and make better use of the knowledge already existing in the organizations to spur innovation, improve decision-making and to reduce continuous reinvention of the wheel, duplication of efforts, poor decision-making and loss of knowledge when staff leave or retire.

If knowledge is managed well, organizations can leverage on their knowledge to make it more accessible and enhance creation of new knowledge and innovation helping to create value for organizations . Management of knowledge therefore becomes an important strategy for improving organizational competitiveness and performance. This is because the proper management and leveraging of knowledge can propel an organization to become more adaptive, innovative, intelligent and sustainable .

Globally, the importance of Knowledge Management (KM) in organizations continues to be recognized to be the key driver of new knowledge and ideas contributing to the innovation process and to new innovative products, services and solutions. Consequently, Knowledge management is applied today across the world, in all industry sectors, public and private organizations, humanitarian institutions and international charities and the benefits of implementing effective knowledge management strategies have been known to be highly strategic, transformational as well as operational.

Kenya intends to become a knowledge-based economy. This vision is backed by several national policy documents including; Constitution of Kenya 2010, Kenya

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Alonso Perez-Solteo et al. (2006). Knowledge Audit methodology with emphasis on core processes. European and Mediterranean Conference on Information Systems, July 6-7 2006, Costa Blanca Alicante, Spain.

Wong Kuan Yew & Aspinwall Elaine (2006). Development of a knowledge management initiative and system: A case study Expert Systems with Applications 30 (2006) 633–641

Young R. Why KM - the importance of knowledge management. 11th June 2012. http://www.knowledge-management-online.com/the-importance-of-knowledge-management.html

Vision 2030, the National Information Communication Technology (ICT) Master Plan 2012-2017, and the National Broadband Strategy for Kenya 2013-2017. As a result, many government institutions are in the initial stages of developing systems for managing knowledge. This is especially important for research organizations where new knowledge, technologies and innovations are generated, shared, applied and managed for maximum impact.

1.2 Justification

Kenya Forestry Research Institute (KEFRI) has recognized that knowledge is a valuable resource and a strategic asset that needs to be effectively and efficiently managed. Although there is some degree of management of knowledge in KEFRI and several attempts to institutionalize it, there has been lack of a systematic, coordinated and integrated approach to drive the process. Therefore, there is need to institute mechanisms to improve management of knowledge in KEFRI to enhance capture of critical existing knowledge to increase workplace productivity, improve knowledge access and sharing to support better decision making and enhance the impact of knowledge internally and externally. Consequently there is need to have a Knowledge Management Strategy (KMS) that is aligned with the organization's overall strategy and objectives and guides knowledge management practice in KEFRI. The initial step towards developing a KMS is to undertake a Knowledge Audit (KA) in order to review existing knowledge assets, knowledge flow and associated KM systems and reveal KEFRI's KM needs, strengths, weakness, opportunities, threats and risks. Therefore the objective of this KA was to systematically examine and evaluate knowledge needs, identify knowledge gaps and provide a basis of where KEFRI needs to focus its knowledge management efforts.

1.3 Specific Objectives

i) To determine status of information and knowledge access and sharing among employees and Research Management team.
ii) To determine the level of staff capacity and competency in information and knowledge access and sharing.
iii) To identify and analyze information communication technology infrastructure for knowledge creation, capture, sharing and application among employees and stakeholders.
iv) To evaluate stakeholder awareness and perception of KEFRI information and knowledge products and services.
v) To identify and analyze the effect of barriers and challenges of information and knowledge sharing among employees and stakeholders.

CHAPTER TWO:

Methodology

2.1. Study design, target population, sampling and sample size

Survey design was used in this audit. The target population was research management team, employees and stakeholders across KEFRI regional research centres. Both probability and non-probability sampling techniques were used. In particular, employees were stratified into research management team, research and development and finance and administration. Similarly stakeholders were stratified according to their mandates. In each stratum, simple random and purposeful sampling were used to select 11 research management team members, 333 employees and 222 stakeholders (Table 2.1).

Table 2.1. Sample size of employees, research management team and stakeholders KEFRI Headquarters, Centres and sub Centres

Centre / Sub Centre	Research management team	Employees	Stakeholders	Total (n)
Headquarter	11	83	0	94
Muguga	-	47	47	94
Karura	-	35	25	60
Kitui	-	33	40	73
Gede	-	30	27	57
Kibwezi	-	18	18	36
Londiani	-	46	34	80
Maseno	-	41	31	72
Total	**11**	**333**	**222**	**566**

2.2. Knowledge audit instruments, data collection and analysis

Three types of semi-structured questionnaire were designed and administered to selected sample of research management team, employees and stakeholders. Pre-testing of questionnaires was done to ensure consistency, validity and reliability during data collection. The areas assessed, number of variables measured, type of measure and associated attributes for research management team, employees and stakeholders are summarized in Tables 2.2 and 2.3. The data was analyzed using descriptive statistics, chi-square, Kruksal-Wallis H test, Mann-Whitney U test and analysis of variance. The statistical package for social scientists (SPSS V17) was used for data analysis. Data outputs from SPSS were further manipulated using MS-Excel 2007.

Table 2.2. Areas assessed, number of variables measured and associated attributes on research management team and employees

Areas assessed	Associated attributes
Research, finance and administration activities	All variables were closed ended and measured on a Likert scale of 5 as follows: 5=strongly agree; 4=Agree; 3=Moderately agree; 2=Disagree; 1=Strongly disagree
Knowledge and information sharing	28 variables on closed ended were measured on a Likert scale of 5 as follows: 5=strongly agree; 4=Agree; 3=Moderately agree; 2=Disagree; 1=Strongly disagree. 2 variables were closed ended and nominally measured on different categories. 1 variable was open ended and measured nominally on different categories
Staff competency and knowledge	2 variables were open ended whose measurement were nominally coded. 5 variables were closed ended and nominally measured on different categories 5 variables were closed ended and measured on a Likert scale of 5 as follows: 5=strongly agree; 4=Agree; 3=Moderately agree; 2=Disagree; 1=Strongly disagree
Knowledge management infrastructure	7 variables were closed ended and nominally measured on different categories 2 variables were open ended and nominally coded
Barriers to knowledge flow	2 variables were closed ended and nominally measured 3 variables were open ended and coded on nominal measure
Background information	4 variables were open ended and coded on nominal measure 1 variable was closed ended and nominally measured 2 variables were open ended and measured on scale/ interval

Note: Ordinal measure is characterized by ordered responses and nominal measure characterized by non-ordered responses and the scale is an interval or continous measure

Table 2.3. Areas assessed, number of variables measured and associated attributes on stakeholders

Areas assessed	Associated attributes
Perception and awareness of KEFRI products	2 variables were closed ended and nominally measured on different categories. 5 variables were open ended and measured nominally on different categories. 1 variable was open ended and measured on a scale/interval
Information and dissemination	9 variables were closed ended and measured on a Likert scale of 5 as follows: 5=strongly agree; 4=Agree; 3=Moderately agree; 2=Disagree; 1=Strongly disagree; 0=not applicable. 1 variables was open ended whose measurement were nominally coded
Knowledge and competency levels	12 variables were closed ended and measured on a Likert scale of 4 as follows: 4=knowledgeable and competent; 3=Fairly knowledgeable and competent; 2=Not knowledgeable and competent; 1=Not interacted 1 variable was open ended and nominally coded
Barriers to knowledge flow	1 variable was closed ended and nominally measured 1 variables were open ended and coded on nominal measure
Background information	1 variable was closed ended and nominally measured 4 variables were open ended and captured as string (not for analysis)

Note: Ordinal measure is characterized by ordered responses and nominal measure characterized by non-ordered responses and the scale is an interval or continous measure

CHAPTER THREE:

Results and Discussion

3.0. Introduction

This chapter provides results and discussion on the Knowledge Audit (KA). It is divided into seven sections, namely: Status of information and knowledge sharing; Staff capacity in knowledge creation and sharing; Knowledge management infrastructure; Dissemination of KEFRI knowledge information products and services; Stakeholders' perception of KEFRI products and services; Stakeholders' perception of KEFRIs staff competency on Knowledge creation and sharing; Barriers and challenges to information flow.

3.1. Status of information and knowledge access and sharing

This covered status of information access and sharing, status of knowledge access and sharing, systems of information and knowledge sharing. The results showed that 29%, 57% and 14% of the Research Management team strongly agreed, agreed and moderately agreed respectively that they were aware of KEFRI Strategic Plan. This provided an overall mean score of 4.1 implying that they agreed on their level of awareness of the Institute's Strategic Plan. In addition, 43%, 43% and 14% strongly agreed, agreed and moderately agreed respectively that they were aware of ISO 14001: 2004. This resulted in a mean score of 4.3 corresponding to overall rating of agree. The expectation was that the Research Management team who are the senior managers and form part of the Executive Committee and who oversee the implementation of the Strategic Plan need to have strongly agreed on the awareness of the plan since this is the document they refer to when implementing the various activities within the period of the plan. This suggests need to improve awareness on the content of the Strategic Plan as this forms the core of implementing organizational activities. Strategic planning is an important responsibility of the senior management of an organization and it is therefore imperative that all senior staff members are not only aware of the Strategic Plan but are also involved in the development process.

3.1.1. Information sharing on development, implementation and funding of GoK projects

The KA revealed that the Research Management team agreed that they were aware of research concepts developed in all programmes. Awareness of research activities developed had the highest mean score of 4.28. This was followed by communicating the information on the amount of GoK and internally generated funds to all departments, programmes, divisions and centres at a mean score of 4.00. The other areas of information sharing that the Research Management team agreed they were aware of included; approved projects in all programmes, updates on the accomplishment of the projects undertaken each year, collaborators of each project in all programmes, project development history in all programmes and updates on the implementation schedule of all projects (Table 3.1). However,

it was expected that since the Research Management team were few, majority if not all should have strongly agreed on the awareness and updates of information sharing on various components assessed in this knowledge audit.

Table 3.1. Areas of information sharing by Research Management team on development, implementation and funding of GoK projects

	Rating, mean score and overall percentage					
Areas of information sharing	SA (%)	A (%)	MA (%)	D (%)	Mean score	Overall %
Aware of total number of projects in all programmes	17	33	17	33	3.33	67
Aware of the current status of each project in all programmes	17	17	33	33	3.17	63
Updated on the progress of the projects undertaken in various programmes periodically	33	17	17	33	3.50	70
Aware of the project development history in all programmes	29	14		57	3.71	74
Updated on the current trends of funding in each project	14	43	14	29	3.43	69
Aware of the collaborators of each project in all programmes	29	29	29	14	3.71	74
Aware of research concepts developed in all programmes	57	14	29		4.28	86
Aware of the approved projects in all programmes	43	14	29	14	3.86	77
Updated on the implementation problems of projects in each programme	14	29	14	43	3.14	63
Updated on the accomplishment of the projects undertaken in each year	29	43		29	3.71	74
Amount of GOK and internally generated funds are communicated to all departments, programmes, divisions, centres	29	43	29		4.00	80
Updated on the implementation schedule of all projects	29		71		3.57	71

Note: SA: strongly agree; A: agree; MA: moderately agree; D: disagree

3.1.2. Information sharing on development, implementation and funding of donor projects

The results showed that the Research Management team agreed that they received updates on all donor-funded projects, their objectives and outputs. They also agreed that the amount of donor funds approved were communicated to all programmes and centres. However, they moderately agreed that they were updated on the status of upcoming projects from collaborators and development partners (Table 3.2). This continued to demonstrate existing gaps in mechanisms of information access and sharing among Research Management team who are key in delivering the mandate of the Institute.

Table 3.2. Areas of information sharing by Research Management team on development, funding and implementation of donor projects

	Rating, mean score and overall percentage					
Areas of information sharing	Strongly agree%	Agree %	Moderately agree %	Disagree %	Mean score	Overall %
Updated on all donor funded projects	29	14	57		3.71	74
Updated on the objectives and outputs of each donor-funded projects	43	29	14	14	4.0	80
Amount of donor funds approved are communicated to all programmes and centres	29	14	57	43	3.71	74
Updated on the status of upcoming projects from collaborators and development partners	29		29		3.14	63

3.1.3. Information sharing on budget, accounts and supplies

It was evident from the analysis that the Research Management team agreed on their level of awareness on KEFRI budgeting procedures, budget components, Accounts Manual, Accounts Procedures, Supplies Manual and Supplies Procedures (Table 3.3). However, the levels of strongly agree and agree varied widely on budgeting procedures and other components.

Table 3.3. Areas of information sharing by Research Management team on budget, accounts and supplies

	Rating, mean score and overall percentage				
Areas of information sharing	Strongly agree%	Agree %	Moderately agree %	Mean score	Overall %
Aware of KEFRI budgeting	29	43	29	4.00	80
procedures	29	57	14	4.14	83
Aware of KEFRI budget	43	43	14	4.29	86
components	43	43	14	4.29	86
Aware of accounts manual	43	43	14	4.29	86
Aware of accounts procedures	43	57	-	4.43	89
Aware of supplies manual					
Aware of supplies procedures					

3.1.4. Information sharing on human resource procedures

The Research Management team were aware of the Scheme of Service at a mean score of 4.29, Human Resource manual (4.0) and Human Resource procedures (4.43) as shown in Figure 3.1. This implied that information flow among Research Management team was well coordinated in regard to Human Resource procedures. People are a key component in management of organizational knowledge. Consequently Human Resource Management (HRM) in organizations should be structured to develop HRM policies and practices that promote information and knowledge flow to meet organizational strategic objectives.

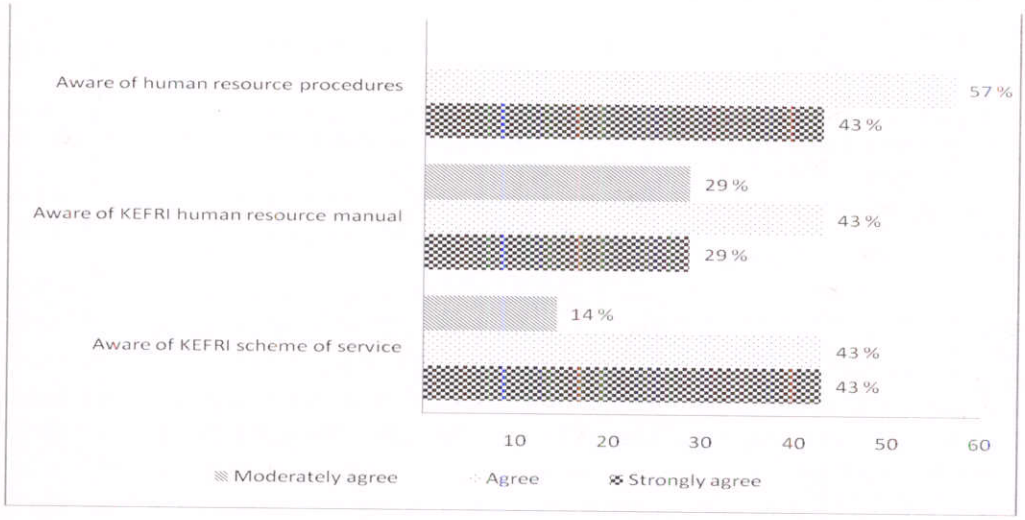

Figure 3.1. Rating on awareness of human resource procedures by Research and Management team

3.1.5. Status of Knowledge access and sharing

The Research Management team and employees essentially agreed there is sufficient knowledge at KEFRI to do their tasks. A similar rating on the level of agreement was scored for other measurement variables as shown in Table 3.4. However on whether KEFRI employees are rewarded for their contribution to the development of organizational knowledge, the Research Management team agreed, compared to employees who moderately agreed. Overall, there were variations on rating among areas of knowledge access and sharing between Research Management team and employees. For instance, on access of specific knowledge the Research Management team need in their work, the rating was agree at a scale of 4.00, while that of employees was at 3.64. The failure to have an overall rating of strongly agree on knowledge access and sharing, indicated there is a need to have a robust knowledge management system to support capture, access, sharing and application of both tacit[1] and explicit[2] knowledge.

Table 3.4. Areas of knowledge access and sharing among Research Management team and employees

	Strongly Agree%		Agree %		Moderately agree%		Dis-Agree	Strongly disagree %	Mean score	
Areas of knowledge access and sharing	RM	EMP	RM	EMP	RM	EMP	EMP	EMP	RM	EM
There is sufficient knowledge at KEFRI to do my tasks	29	29	43	40	29	26	5	1	4.00	3.91
Find specific knowledge I need in my work place	29	22	43	36	29	30	10	3	4.00	3.64
Specific knowledge I need resides with experts rather than a specific location	29	25	29	29	29	23	18	5	3.71	3.52
Satisfied with available knowledge with my core team	14	24	14	36	71	26	11	4	3.43	3.64
Core team are very supportive of knowledge generation		27	57	42	43	22	5	4	3.57	3.83
Designated departments facilitates knowledge storage and retrieval	14	18	29	33	57	30	13	6	3.57	3.45
Designated departments encourages and facilitates knowledge transfer/ sharing	14	22	71	34		22	15	6	4.00	3.50
KEFRI employees are rewarded for their contribution to the development of organizational knowledge	17	10	50	20	33	24	28	19	3.83	2.73

Note: RM – Research Management team ; EMP – Employees

[1]*Tacit knowledge is based on experience, beliefs, values and perspectives. Tacit maybe be difficult to express, formalize and is therefore not easy to capture, store, and share.* [2]*Explicit knowledge is in physical form and can be captured, articulated, transferred, shared and communicated in a physical or electronic form. It can be shared formally and systematically and its existence does not depend on a person.*

Overall the Research Management team moderately agreed that knowledge was passed among themselves through coaching, formal training and colloquia. Similarly, employees moderately agreed knowledge was passed through coaching, mentoring, informal interaction, formal training, colloquia and workshops. Conversely, the Research Management team agreed knowledge was shared among staff through mentoring, informal interaction, formal meetings, seminars and workshops as compared to employees who agreed knowledge was passed through formal training and seminars (Table 3.5). This resulted to significant association ($\chi 2$ =88.73; d.f.= 28; p=0.000) on the rate of agreement and methods of passing knowledge among employees.

Table 3.5: Methods of passing knowledge among research management team and employees

Methods	Strongly agree %		Agree %		Moderately agree %		Disagree %		Strongly disagree%		Mean Score		Total (n)	
	RM	EMP	RM	EMP	RM	EMP	RM	EMP	RM	EMP	RM	EMP	RM	EMP
Coaching	14	13	14	26	57	29	0	23	14	10	3.14	3.09	7	253
Mentoring	14	11	29	33	57	34	0	17	0	6	3.57	3.25	7	255
Informal interaction	14	17	57	38	29	30	0	9	0	7	3.86	3.45	7	255
Formal training	0	17	43	38	57	26	0	12	0	7	3.43	3.46	7	256
Formal meetings	14	20	57	45	29	22	0	9	0	4	3.86	3.69	7	259
Colloquia	0	11	57	30	29	28	14	19	0	13	3.43	3.07	7	245
Seminars	0	20	71	40	29	24	0	11	0	6	3.71	3.55	7	256
Workshops	0	15	71	36	29	26	0	16	0	7	3.71	3.35	7	247

Note: RM – Research Management team; EMP – Employees

3.2. Staff capacity in Knowledge creation and sharing

On enhancing capacity of the staff to effectively handle tacit and explicit knowledge, the Research Management team agreed on the following: training and development opportunities are explicitly linked to the strategic direction of KEFRI; KEFRI's position towards its employees is credible as reflected in career development; KEFRI's position towards its employees is credible as reflected in institute wide goals and employees know the skills that KEFRI needs in the next five years (Table 3.6). In contrast, the employees moderately agreed over the same except that training and development opportunities are explicitly linked to the strategic direction of KEFRI. This demonstrates a clear gap in handling KEFRI's knowledge assets in order to effectively achieve desirable goals within a specific period of time.

Table 3.6. Capacity in knowledge management among Research Management team and employees

Capacity in knowledge management	Strongly agree%		Agree %		Moderately agree%		Disagree %		Strongly disagree%		Mean Score	
	EMP	RM	EMP	RM	EMP	RM	EMP	RM	EMP	RM	EMP	RM
Training and development opportunities are explicitly linked to the strategic direction of KEFRI	23	14	37	43	25	43	9	0	6	0	3.62	3.71
Employees know the career development philosophy of KEFRI and what their role is in the development process	12	0	35	14	32	43	16	43	5	0	3.34	2.71
KEFRI's position towards its employees is credible as reflected in career development	14	14	34	43	33	0	11	0	8	0	3.34	3.71
KEFRI's position towards its employees is credible as reflected in core values	20	0	34	29	31	0	10	0	5	0	3.54	3.29
KEFRI's position towards its employees is credible as reflected in institute wide goals	15	29	37	29	34	0	10	0	5	0	3.47	3.86
Employees know the skills that KEFRI needs in the next five years	12	14	26	43	34	14	19	14	10	0	3.10	3.57
The strategic plan of KEFRI is consistently communicated to all levels of employees	15	14	27	29	25	29	23	29	11	0	3.12	3.29

Note: RM – Research Management team; EMP – Employees

3.2.1 Staff competency, knowledge acquisition and sharing

The Research Management team acquired most of their skills/expertise to undertake their job through KEFRI, self learning, formal training, at their last job assignment and participation in workshops and seminars. This indicated the investment of KEFRI's knowledge asset in its top management to enhance service delivery. Therefore, there is a need to have a clear mechanism for sharing of information and knowledge to boost the expected outputs.

Similarly, 60% of employees acquired most of their skills/expertise from KEFRI in undertaking their job responsibilities (Figure 3.2). The other method was through participation in workshops and seminars and points to some degree of exposure through KEFRI. This implies that there is a significant contribution in building capacity of the staff to undertake their duties which culminate to a build up of explicit and tacit knowledge that needs to be accessed and shared among employees for improving productivity.

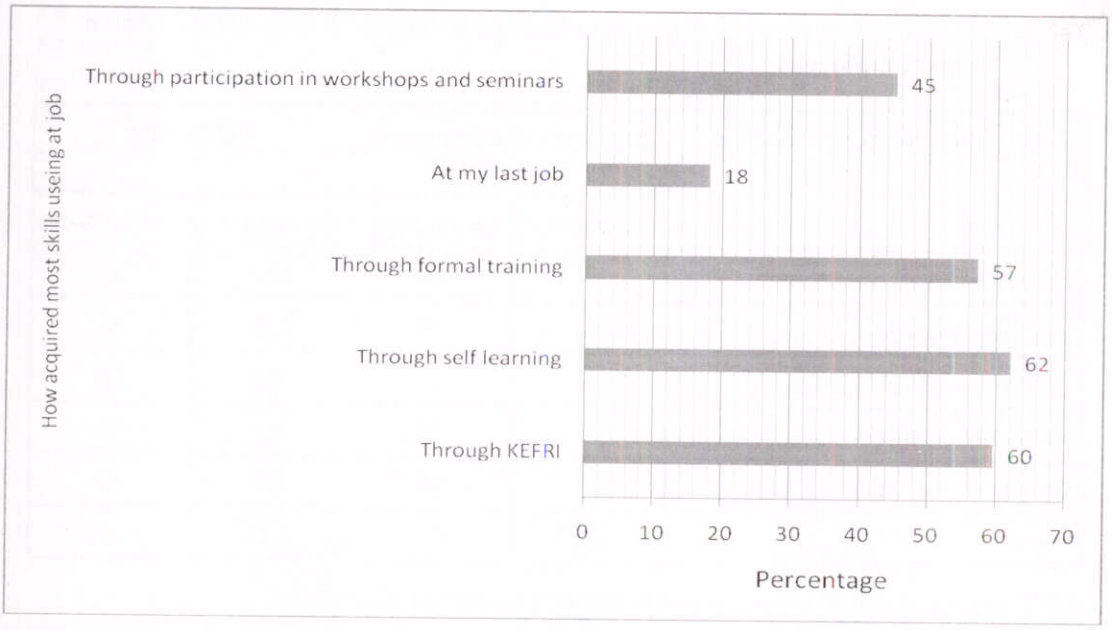

Figure 3.2 **How employees acquired most skills/expertise in their job undertakings at KEFRI**

The KA further revealed that employees and the Research Management team agreed they find it easy to apply training they have received at their work stations, there are opportunities to cross and learn new skills, there are opportunities for career development within KEFRI and they are encouraged to take the initiative in determining own career development. However, employees moderately agreed that there exist opportunities to work with mentors at their work station. This demonstrates a gap in exploiting tacit knowledge that staff had acquired over time through their training and other opportunities.

3.3. Knowledge management infrastructure

The variables assessed on knowledge management infrastructure included location of information storage, speed of access of information from various modes of storage, access and frequency of Information Communication Technology (ICT) tools. The results showed employees and Research Management team stored their information in paper-based documents and with colleagues (Table 3.7). This indicated that there was no central repository of information at the Institute accessible by employees and the Research Management team. Of interest was information with colleagues implying that retrieval of such information will be based on individual availability and efficient memory. This also suggested that institutional memory is mainly with individual staff. Therefore, in the event that employees leave the Institute, retire, or die, it will be difficult to access important information that will be useful for decision-making reference and re-use. This presents an opportunity to institutionalize information storage and retrieval especially for tacit knowledge.

Table 3.7. Location/modes of information storage by Research Management team and employees

Location/modes of storage	Research Management team		Employees	
	Frequency	Percentage	Frequency	Percentage
In paper based documents	7	23	193	37
With colleagues	6	19	127	24
On my personal laptop	6	19	51	10
In my office/desk	6	19	81	16
On my workstation desktop	4	19	68	13
Total	31	100	512	100

3.3.1. Speed of information access from various modes of storage

The speed of access of various modes of storage of data and in formation was mainly rated moderate and fast (Table 3.8). Eighty percent (80%) of the Research Management team rated the speed of information retrieval from paper-based documents as moderate compared to 53% by employees. Comparatively, information access stored at workstation desktops was rated fast by Research Management team (80%), compared to 52% by employees. This indicated a need for identifying a suitable ICT system and tools to facilitate faster access to information.

Table 3.8. Modes of information storage and speed of access by employees and Research Management team

Modes of information storage	Speed of access							
	Slow		Moderate		Fast		Frequency	
	EMP	RM	EMP	RM	EMP	RM	EMP	RM
In paper based documents	32	0	53	80	15	20	203	5
With colleagues	28	20	47	60	25	20	187	5
Person laptop	15	0	12	40	72	60	99	5
Workstation desktop	16	0	32	20	52	80	117	8
Specific location (mobile phones, publications, administration office)	25	-	50	-	25	-	12	-
Library/books	0	-	100	-	0	-	1	-

Note: RM – Research Management team ; EMP – Employees

3.3.2. Access and frequency use of ICT tools

All the Research Management team members (100%), had access to computers, internet and email accounts compared to about 61-66% of employees (Figure 3.3). This suggests the need for lower cadre of staff to be facilitated with access to computers, internet and email accounts in order to improve information access and sharing. ICT tools are considered important in knowledge management because they are enablers in access and sharing of information. They are also faster and more convenient for information sharing compared to paper-based documentation.

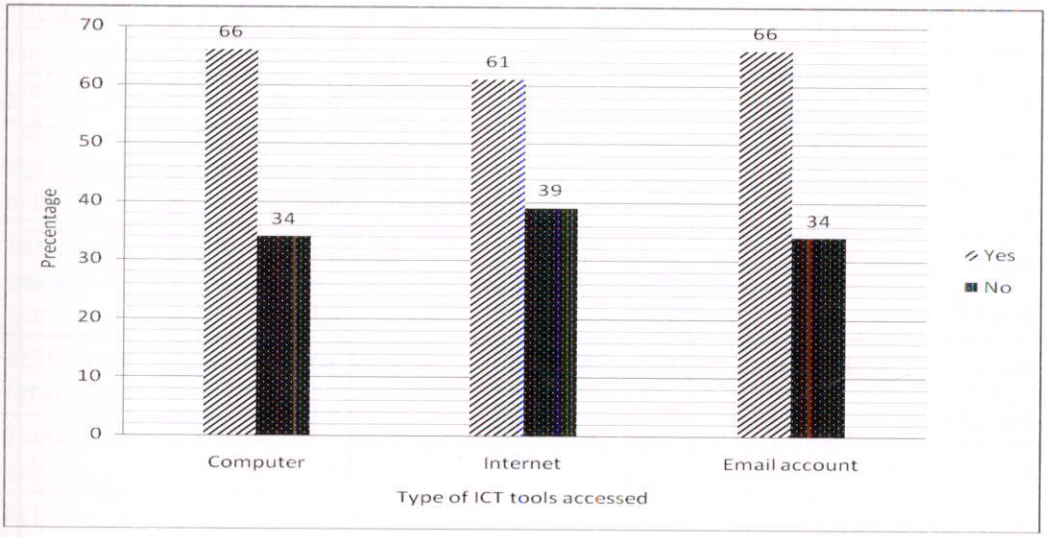

Figure 3.3. Type of ICT tools accessed by employees

3.4. Stakeholders awareness and perception of KEFRI knowledge products and services

The main product form KEFRI identified by stakeholder was seeds and seedlings (Table 3.9). The other products were sparsely identified whereas others such as water tanks, water pumps, pipes, polythene papers and water cans were not KEFRI products. However, they were related to tree nursery management requirements. This demonstrated the need to upscale information sharing of KEFRI knowledge products and services and extracting relevant extension messages in appropriate formats.

Table 3.9 KEFRI products stakeholders were aware of

Products	Frequency	Percentage
Bamboo products	11	4
Bamboo processing tools	9	3
Polythene papers	7	3
Seeds and Seedlings	149	55
Water tanks	7	3
Moneymaker machines	2	1
Water cans	5	2
Pipes	3	1
Water pumps	4	1
Beehives	1	0.0
Books and publications	28	10
Harvesting	1	0.0
Wood and Timber	25	9
Aloe vera products	3	1
Charcoal	2	1
Furniture	2	1
Non wood items	4	1
Technologies	6	2
Total	**269**	**100**

3.5. Dissemination of KEFRI knowledge information products and services

The results showed stakeholders agreed that KEFRI publications are easily readable, informative and of high quality, open days are well organized and convey KEFRI research activities and Technical staff effectively pass information on what KEFRI does (Table 3.10). This showed that use of publications, field days, open days and dissemination officers as well as other technical staff were effective in information sharing among stakeholders. Therefore, enhancing a platform of these dissemination outlets will strengthen information access and sharing to a wider group of stakeholders.

Table 3.10. Stakeholders' rating on KEFRI dissemination outlets

Dissemination outlets	Rating on dissemination pathways							
	SA (%)	A (%)	MA (%)	D (%)	SD (%)	NA (%)	Total (n)	Mean score
KEFRI publications are easily readable, informative and of high quality	32	48	14	1	0	5	181	4.93
Open days are well organized and convey KEFRI research activities	48	34	10	2	0	6	182	5.09
Field days are well organized and convey KEFRI research activities	43	33	15	1	0	8	181	4.94
Talk shows in vernacular are enlightening on forestry and related activities	25	26	20	6	1	22	174	3.85
Talk shows on national media are enlightening on forestry and related activities	27	28	14	5	1	25	177	4.06
KEFRI website is well updated and informative	14	28	12	3	1	43	173	3.14
Technical staff effectively pass information on what KEFRI does	43	34	16	3	0	4	175	5.11
KEFRI scientific bi-annual conferences effectively provide relevant information on research development and setting of research agenda	16	18	12	1	0	53	173	2.86
Presentations during Centre Research Advisory Committees enhance awareness on KEFRI research activities and interact with stakeholders	20	25	9	1	0	45	173	3.3

Note: SA: strongly agree; A: agree; MA: moderately agree; D: disagree; SD: strongly disagree; NA: not aware

3.6. Barriers and challenges of information flow

The key barriers to access and storage of information were access to technology, organization policy, poor information systems/processes and inadequate capacity (human, physical and financial). The key challenges identified contributing to information sharing were; lack of an open-minded sharing environment, lack of trust in each other, no proper organization guideline on sharing information, no proper IT platform to share information, lack of confidence in other people's knowledge and capacity in ICT among others (Table 3.11). This indicated a need for attitude change among employees and Research Management team to encourage information sharing, build confidence among staff and strengthen ICT capacity to enhance information access and sharing.

Table 3.11. Challenges in information sharing among employees

Challenges in sharing information	Employees		Research Management team	
	Frequency	%	Frequency	%
Don't perceive there is an urgent need to share	65	23	3	43
Lack of an open-minded sharing environment	130	46	3	43
Lack of trust in each other	126	44	4	57
Lack of confidence in other people's knowledge	86	30	2	29
Lack of perceived benefits	68	24	4	57
No proper organization guideline on sharing information	115	40	4	57
Bureaucratic procedures involved in information sharing	54	19	1	14
No proper IT platform to share information	92	32	4	57
Don't know about other people's knowledge	67	24	3	43
Don't know about other people's knowledge needs	63	22	3	43
Capacity in ICT	74	26	3	43
Task requires access of information from departments	36	13	3	7
Task requires access of information from division	21	7	2	5
Task requires access of information from programme	35	9	2	5
Task requires access of information from centre	6	12	2	5

CHAPTER FOUR:

Conclusions and Recommendations

4.1. Conclusions

The knowledge audit baseline focused on five specific objectives. The first one was to determine the status of information and knowledge access and sharing among employees and research management team in order to strengthen mechanisms of information flow. Overall, senior management and other KEFRI employees agreed and moderately agreed on various aspects of information and knowledge sharing. This indicated there was some level of management of knowledge at KEFRI.

The second objective was to determine the level of staff capacity and competency in Information and Knowledge access and sharing. It was evident from the results that majority of the employees had capacity to generate information and knowledge, were competent in undertaking their tasks and were able to share knowledge with colleagues. Nevertheless, the staff also identified areas where they needed more knowledge and skills in order share and communicate effectively among staff and other KEFRI stakeholders. This provided an overall rating of agree and moderately agree on various aspects measured on staff capacity and competencies, implying that KEFRI needs to manage its knowledge assets in order to create opportunities to share tacit and explicit knowledge among staff, which is very critical in any organization.

The third objective was to identify and analyze ICT infrastructure for Knowledge creation, capture, sharing and application among employees and stakeholders. The findings pointed out that most of the employees did not have a central repository system to store and retrieve information of interest at work. In addition, the types of ICT infrastructure were not efficient in knowledge capture and application and their speed of access and storage was fairly slow. Therefore, it can be concluded that ICT infrastructure in KEFRI was not measuring to the expected standard to facilitate knowledge creation, capture and application among employees.

The fourth objective was to evaluate stakeholder awareness and perception of KEFRI Information and Knowledge products and services. In this case a limited number of knowledge products and services were identified by stakeholders leading to overall rating of good.

The fifth objective focused on identification and analysis of the effect of barriers and challenges of information and knowledge sharing among employees and stakeholders. The barriers identified had a significant effect on overall information and knowledge sharing among employees and to the stakeholders. Therefore in order to improve on information and knowledge creation, access, sharing and application in KEFRI various recommendations were proposed.

4.2. Recommendations

The overall rating of moderately agree, agree and good in most of the measurement variables of the five objectives indicated that there were gaps that needed to be addressed in order to improve information and knowledge creation and sharing among KEFRI employees and stakeholders. The following recommendations will be valuable as per the findings in each research objective.

4.2.1. Information and knowledge access and sharing among Research management team and employees

To improve/strengthen information and knowledge flow among the employees and research management team, the following recommendations were made:

i) Creation of database and research protocols to enhance information sharing on research projects among programmes, directorate and scientists. This will avoid duplication of effort and harness information flow. It can also serve as a monitoring and evaluation tool to track progress of various research projects for information dissemination of research findings. The research database will also be instrumental in providing information on types of donor funded projects, key collaborators and number of completed as well as the upcoming and new projects.

ii) Develop mentorship/coaching programme among employees in order to facilitate sharing of tacit knowledge of the most experienced staff as well as sharing of information from training. This will enhance cohesion/trust and team building among staff where confidence in each other is raised. This will lead to generation of more information and knowledge the greatest asset for the Institute.

iii) Integrate KM practices into the daily work routines by including information and knowledge sharing as performance indicators

iv) Develop an electronic platform for sharing KEFRI strategic plan, ISO 14001:2004, human resource, accounts and supplies operations. This will enable staff to access related information on various documents for their specific needs, significantly reducing paper work of various procedures.

v) Develop a robust knowledge management system to facilitate information creation, access and sharing among employees and stakeholders of the institute.

4.2.2. Staff capacity and competency in Information and Knowledge access and sharing

i) Involve employee's participation in developing key institution documents in order to strengthen the skills of information and knowledge creation. This will in turn enable employees understand revenue generating potential of their knowledge assets and develop appropriate strategies on how to market them.

ii) Develop KEFRIs corporate CV to market the employee's knowledge and skills so as to enhance information dissemination of KEFRI knowledge products and

services among staff and to the general public. This will also enable KEFRI to tap the human resource in revenue generation as a result of their investment in staff training and exposure.

iii) Provide motivation and incentives for contribution and sharing knowledge through recognition and reward programs.

iv) Provide relevant training on the use of ICT applications, internet and the internal e-communication for members of staff in the various job cadres in the Institute to enhance productivity and access to relevant information.

v) Create opportunities for informal learning and sharing of knowledge for both technical and non-technical staff to enhance tacit knowledge access and sharing.

vi) Create opportunities for building relationships and connecting both technical and non-technical staff to build trust and inculcate a knowledge-sharing culture.

vii) Provide and enhance formal and informal opportunities for open sharing of knowledge for both technical and non-technical staff

4.2.3. ICT infrastructure for Knowledge creation, capture, sharing and application

Technology is a key component of knowledge management. To facilitate KM in KEFRI there is need to improve ICT tools and services. To achieve this, the following is recommended;

i) Create awareness on various ICT tools and services and their benefits in sharing information and knowledge to the members of staff and the public at large.

ii) Undertake relevant training on the use of the internet, basic IT applications like word processors, spreadsheets for all cadre of staff

iii) Improve internet connectivity within and across all KEFRI centers and sub centres to enhance faster information access and sharing within and outside KEFRI

iv) Create and maintain a central repository or portal of critical organizational knowledge for easy storage, access and retrieval on research activities and other key support activities such as personnel, supplies and finance.

v) Provide a link to relevant regional and international knowledge-sharing platforms such as FORNIS[1] and GFIS[2] to raise the profile of KEFRI scientists and their information and knowledge products and services nationally, regionally and internationally.

vi) Incorporate opportunities for e-discussions on the corporate website or intranet to enable staff exchange ideas and share relevant information and knowledge and allow for communication and interaction within KEFRI and with stakeholders.

vii) Provide opportunities for use of social media like Facebook, Twitter, Google Talk and Linked In to connect KEFRI scientists to other scientists and allow exchange of relevant information.

[1] *FORNESSA Information Service*
[2] *Global Forest Information Service*

4.2.4. Stakeholder awareness and perception of KEFRI Information and Knowledge products and services

i) Undertake aggressive marketing of KEFRI products and services to enhance visibility and awareness among stakeholders
ii) Develop extension materials in a easy-to-read non-technical language
iii) Pretest KEFRI extension materials before final production to get feedback from farmers and stakeholders to enhance relevance and impact
iv) Use KEFRI website to market KEFRI products and services and link to other relevant databases

4.2.5. Effect of barriers and challenges of information and knowledge sharing among employees and stakeholders

i) Develop a Knowledge Management Strategy that outlines policies, guidelines and mechanisms to enhance information and knowledge sharing among employees and stakeholders
ii) Create opportunities for more interaction and knowledge sharing between KEFRI staff members within and across KEFRI centres to allow exchange of ideas and information and knowledge sharing.
iii) Create opportunities to engage with stakeholders to access and get feedback on relevance and impact of KEFRI products and service

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