

**AN ANALYSIS OF EFFECT OF USE OF TACIT KNOWLEDGE
TRANSFER TECHNIQUES ON ORGANIZATIONAL PERFORMANCE
OF KENYA AGRICULTURAL AND LIVESTOCK RESEARCH
ORGANIZATION RESEARCHERS**

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2022


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This thesis is my original work and has not been presented for the award of a degree in any other university.


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DEDICATION

I dedicate this thesis to the living God, who gave me the ability to pursue this study, and to my cherished mother, wife and children in appreciation of their persistent prayers.

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LIST OF ABBREVIATIONS AND ACRONYMS

AAR	After Action Reviews
AGRA	Alliance for a Green Revolution in Africa
ASTGS	Agricultural Sector Transformation and Growth Strategy
ATIs	Agricultural Technologies and Innovations
AIVs	African Indigenous Vegetables
CoP	Communities of Practice
CAADP	Comprehensive Africa Agriculture Development Programme
GDP	Gross Domestic Product
GoK	Government of Kenya
ICT	Information and Communication Technology
KALRO	Kenya Agricultural & Livestock Research Organization
KIT	Knowledge, Information and Technologies
KMS	Knowledge Management Systems
PTS	Provision of Technical Services
SSA	Sub-Saharan Africa
SDGs	Sustainable Development Goals
SECI	Socialization, Externalization, Combination and Internalization
TKM	Tacit Knowledge Management
WAN	Wide Area Network

ABSTRACT

Tacit knowledge (TK) transferred among employees drives organizations' effectiveness. However, it is not clear how use of TK transfer techniques affects the performance of agricultural researchers, and how social and organizational factors affect TK transfer among themselves. This study assessed the effect of use of TK transfer techniques on performance of Kenya Agricultural and Livestock Research Organization (KALRO) researchers and how the social and organizational factors affect TK transfer among them. This study used a descriptive survey research design, cluster sampling, a semi-structured questionnaire to collect data from 191 researchers in KALRO research centers, and SPSS Version 20 to analyze the data using the Likert scale and Chi-square test. Collaborative research, workshops and seminars were the most used and adequate techniques for transferring TK and enhancing performance among KALRO researchers. Cognitive Self-Motivation (93.2%) was the most useful and performance enhancing type of TK. Management of agricultural research projects (90.1%) was the performance indicator that researchers were most enabled to meet by TK. The social factors that supported TK transfer most among researchers were Mutual Trust (83.2%) and Length of Service (77.5%) while organizational factors were ICT (80.6%) and space (75.9%). There was a significant association between TK and researcher's performance; Cognitive Self-Motivation TK ($\chi^2=62.66$), Collective TK ($\chi^2=53.78$), Global TK ($\chi^2=48.70$), Local TK ($\chi^2=79.307$) and Relational TK ($\chi^2=46.77$) all with a p-value of ($p=0.000$). There was a significant association between social at ($\chi^2 =21.12$) with a p-value of ($p=0.05$) and organizational factors at ($\chi^2=27.58$) with a p-value of ($p=0.001$), and researchers' performance. In conclusion, TK transfer enhances agricultural researchers' performance and most social and organizational factors support it. KALRO needs to enhance further the social and organizational factors that support TK transfer among its researchers, and encourage more use of the most employed TK transfer techniques in enabling the management of research projects and the writing of research fund winning proposals through workshops, seminars and knowledge management policy.

Keywords: Agricultural Researcher, Tacit Knowledge, Transfer Techniques, Performance, Social and Organizational factors

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Agricultural sector forms the backbone of the global economy and serves as the means of revenue of about 50% of the world's population (Chemutai et al, 2012). As put by Pardey (2014), this sector plays a key role in economies of developing countries and can assist in reducing poverty, raising incomes and improving food security for 80 percent of the world's poor particularly in rural areas. In Africa, agriculture is key to the future, because it has most of the world's arable land with over half of its population employed in the sector, being the largest contributor to the total Gross Domestic Product (AGRA, 2018). As put by Shimeles et al. (2018), this sector is the bedrock of the economy and thus provides jobs, food security, poverty reduction, and sustains overall social stability in Sub-Saharan Africa (SSA). According to the World Bank (2018), agriculture in Kenya anchors the economic growth and poverty reduction while playing a key role in employment, food security, and generation of foreign exchange earnings. This sector is key to Kenya's economy, contributes 32.5 percent of GDP and another 27 percent of GDP indirectly together with other sectors (Kenya Economic Report, 2018). Further, this sector employs more than 40 percent of the total population and more than 70 percent of rural people (GoK, 2018). According to KALRO (2017), success in the agricultural sector is attributable to research and development initiatives over the years. These initiatives inevitably depend on knowledge from researchers in agricultural research organizations.

Knowledge is information that is distilled into a context-based form that can be applied to real-life issues (Igbinovia and Ikenwe, 2017) and is categorized into tacit and explicit types (Nakano et al., 2013 and Mucai, 2018). Explicit type, is knowledge that is articulated, written down, or published academic one found in books, manuals and papers and therefore codified, and transmittable in formal, systematic language (Panahi et al., 2013 and Mucai, 2018). On the other hand, tacit knowledge is knowledge embedded in minds of individuals in form of skills, know-how, expertise, experience, ideas, values, emotions, insight, and mental models that employees obtain as they interact and learn through organizational processes (Chugh, 2015; Cheng and Chang, 2020). Although explicit knowledge is tangible, visible and often given

more regard, tacit knowledge is its bedrock because before knowledge becomes explicit, it first exists as tacit. Explicit and tacit knowledge interact with each other through externalization and internalization processes (Nonaka, 2000). Externalization entails turning tacit knowledge into documented knowledge such as a manual while internalization involves ingesting explicit knowledge such as a documented report into a person's mind. Due to the invisibility nature of tacit knowledge, most organizations mistakenly think improvement in their organizational performance depends entirely on documented knowledge. In this way, they employ minimal effort to appreciate work done behind scenes by various types of tacit knowledge which include collective, relational, local, global and cognitive self-motivation tacit knowledge (Collins, 2010; Insch et al., 2008). Tacit knowledge is an intellectual resource which organizations rely on to sustain their improved performance.

Performance, according to Gharakhani and Mousakhani (2012), is the capacity of an organization to produce outcomes and activities at a level that is acceptable while organizational performance, according to Ho (2011), is a measure of how effectively an organization achieves its objectives. Clarke et al. (2011) fronts four dimensions for measuring organizational performance including return on assets, return on equity, revenue growth, and employee productivity. As agricultural research organizations measure their researchers' productivity in terms of how they achieve their performance indicators, they also need to know or understand the extent to which tacit knowledge transfer enables this process.

Tacit knowledge transfer comprises of tacit to explicit process, which refers to changing tacit knowledge to documented knowledge and tacit to tacit process, being the transmission of tacit knowledge from a person's mind to that of another (Nonaka, 2000). Most organizations often concentrate more on tacit to explicit knowledge transfer. This tendency almost causes the work of such organizations to be inadequate when their experienced employees exit without having transferred their tacit knowledge to those they leave behind. For this reason, organizations need to ensure besides their employees converting tacit knowledge to explicit form using documentation technique, they also pass it on to each other using appropriate transfer techniques. The techniques or strategies researchers in agricultural research organizations use to transfer tacit knowledge among themselves include, After Action Reviews, Collaboration Research, Communities of Practice, Job Rotation, Knowledge Interviews, Mentorship, Peer Assist Meetings, Retrospective Meetings, Seminars, Staff Meetings, Storytelling and workshops (Liebowitz, 2008; Nikki, 2014; Bansal et al., 2019; Mohajan, 2017). Tacit

knowledge depends on social context and its sharing is influenced by individual, organizational, and structural factors, and the knowledge management strategy (Alves and Pinheiro, 2022). According to Nonaka et al. (2000), socialization is the sharing of tacit knowledge from person to person. In this regard, it is key that agricultural research organizations understand the extent to which their researchers' transfer of tacit knowledge among themselves affects their organizational performance and how the social and organizational factors affect their transfer of tacit knowledge to each other. This information is very important and necessary to KALRO policy makers and other agricultural sector stakeholders for coming up with strategic interventions on how to enhance knowledge management for improved organizational performance and in promoting timely knowledge dissemination to the end users.

1.2 Statement of the Problem

Tacit knowledge is key in facilitating organizational performance especially when transferred among employees (Murumba et al., 2020 and Muthuveloo et al., 2017). During this process, organizational members interact and convert their existing tacit knowledge to new tacit knowledge Mucai (2018) and this enhances their ability to perform. Agricultural research organizations that concentrate more on transferring their tacit knowledge to documented knowledge with minimal regard to their researchers passing it on to each other, may not register sustained improvement in their research efforts. This is because their experienced researchers come to exit without having adequately transferred their tacit knowledge to those they leave behind. According to Kenya's Agricultural Sector Transformation and Growth Strategy (ASTGS) for 2019-2029, KALRO in 2014 needed to increase its agricultural researchers by 40 percent; but the capacity was expected to decline in the next 15 years with over 50 percent of the staff being over 50 years of age and about 21 percent being PhD holders. Such decline in researcher numbers especially of PhD holders, makes KALRO's research capacity inadequate. Although documented knowledge is durable and often outlasts its authors, its appropriate interpretation and application relies on tacit knowledge. Furthermore, whereas documented knowledge is static and becomes obsolete with time, tacit knowledge enables its beholders to dynamically respond to context-specific issues as and when they arise. Therefore, there is need for agricultural researchers to pass on their tacit knowledge using transfer techniques to enhance their ability to perform and ultimately contribute to improved performance of their organizations.

Previous studies outside and inside Kenya focusing on tacit knowledge management including its transfer, had not addressed the use of the techniques for passing on different types of tacit knowledge among researchers in agricultural research organizations. Further, they had not adequately addressed how use of these techniques by researchers affected their performance. The study by Kabiru (2015), on “Knowledge management strategies and practices in Nigerian Agricultural Research Institutes”, addressed the techniques through which tacit knowledge is generated but did not look at the extent to which each of those techniques was used to transfer specific types of tacit knowledge among researchers. Baguma (2016) asserted that effective retention and use of knowledge in agricultural research institutions in Uganda could be achieved by continuously acquiring, capturing and storing new knowledge, using knowledge sharing techniques, availing and applying knowledge. Although this study mentioned methods by which knowledge may be retained or transferred, it did not establish the extent to which researchers use them to transfer specific types of tacit knowledge among themselves. In Kenya, none of the studies had looked at the effect of use of the techniques for transferring tacit knowledge from agricultural researcher to another. Goga et al. (2017) addressed the role of Knowledge Management Systems (KMS) in retaining tacit knowledge in Kenyan research institutes and concluded that they needed to fully support the use of KMS in retaining tacit knowledge. Kahiga (2014) addressed knowledge sharing practices among crop researchers in former Kenya Agricultural Research Institute (KARI) by looking at general methods of sharing knowledge.

Overall, previous studies on tacit knowledge transfer in agricultural research organizations had not addressed how researchers use various transfer techniques and the effect thereof on their organizational performance, and how factors in their working environment affect the transfer of tacit knowledge among themselves. In this way, it was not well understood how researchers in Kenyan Agricultural Research Organizations including KALRO use different techniques to transfer tacit knowledge among themselves and how this enables them achieve their organization’s performance indicators. Further, it was not clear how the social and organizational factors affect tacit knowledge transfer among these researchers.

1.3 Research Objectives

1.3.1 Main Objective

The purpose of this study was to analyze the effect of use of tacit knowledge transfer techniques on organizational performance of KALRO researchers.

1.3.2 Specific Objectives

- i) To assess the effect of use of tacit knowledge transfer techniques on performance of KALRO researchers.
- ii) To evaluate the effect of social and organizational factors on tacit knowledge transfer among KALRO researchers.

1.4 Research Questions

Research questions of this study were:

- i) What is the effect of use of tacit knowledge transfer techniques on performance of KALRO researchers?
- ii) What is the effect of social and organizational factors on the transfer of tacit knowledge among KALRO researchers?

1.5 Justification

Academic researchers and scholars can benefit from the contribution this study has made to the field of knowledge management. Specifically, the benefit here is knowledge on use of tacit knowledge transfer techniques in passing on specific types of tacit knowledge among agricultural researchers and the effect thereof on their organizational performance.

Policy makers can use these study findings in influencing their policies on tacit knowledge transfer in their organizations. For instance, the extent to which KALRO researchers were found to use tacit knowledge transfer techniques in passing on studied types of tacit knowledge, could be a pointer to what policy makers can employ in influencing their tacit knowledge transfer policies.

This study contributed to sustainable development goal number two on ending hunger, achieving food security and improving nutrition and promoting sustainable agriculture and also Kenya's big four agenda component on food security. This is because, acquired tacit knowledge empowers researchers to develop and upscale agricultural technologies to curb hunger.

CHAPTER TWO

LITERATURE REVIEW

2.1 Knowledge

Different knowledge management researchers have defined knowledge in various ways. According to Baguma (2016), knowledge could comprise of expertise substance, reasons for particular decisions reached by the organization, previous research experiences and projects undertaken and the social connections of collaborators in research. Knowledge is of tacit and explicit types (Martins and Meyer, 2012, Nakano *et al.*, 2013 and Mucai, 2018). According to Igbinovia and Ikenwe (2017), knowledge is distilled and context based information applicable in handling real life situations.

2.1.1 Tacit Knowledge Categories

Different knowledge management scholars have categorized tacit knowledge based on various perspectives. According to O'Toole (2011), tacit knowledge is either articulable or inarticulable on the basis of accessibility to human consciousness. The inarticulable tacit knowledge is not accessible to human consciousness while that which is articulable is accessible and also known as implicit knowledge.

a) Strong and Weak

As to how easy tacit knowledge converts to explicit knowledge, Collins (2010) indicates that weak tacit knowledge is easiest to convert or transfer while strong is hardest to do so. According to Baguma (2016), weak tacit knowledge is easily articulable when compared to strong tacit knowledge.

b) Individual and Collective

Hall and Andriani (2002) categorize tacit knowledge as individual when held by a person and collective when held by a community or society. In an agricultural research setting, know-how about the way plant breeders work would be collective while a plant breeder's personal know-how about doing a task would be individual.

c) Technical and Cognitive

Tacit knowledge is also viewed in technical or cognitive dimensions. Examples of the technical dimension would include best practices, expertise, hands-on experience and lessons learned while cognitive dimension examples being those that are mental or cerebral in nature for instance, understanding, ideas, insight and viewpoints.

2.1.2 Types of Tacit Knowledge

This study focused on types of tacit knowledge which are articulable, weak and exist either in sub-conscious or conscious memory of persons and therefore transferrable among individuals including agricultural researchers. Further, these types of tacit knowledge were studied for reasons and extent they are applicable to an agricultural research setting.

i) Relational Tacit Knowledge

According to Collins (2010), relational tacit knowledge refers to what people know and do not explain or tell because they don't know what the other party needs to know. To explain a relational tacit knowledge concept, this author used an old warehouse man, who when given a description or sample of what was needed, traced and retrieved items even when he had not included them on the display list. From this example, the old warehouse man, may be did not list all items because he did not know what the other party needed. This author further indicates that relational tacit knowledge may be tacit because of secrecy, low effort or motivation to avail it, a deliberate decision not to do so or logistical shortfalls on the side of the knower or failure to seek or relate well by the party that needs it. Researchers in KALRO have developed various innovations and technologies including animal breeds and crop varieties behind which exists concealed scientific know-how. Such know-how is relational because whether knowers will transfer it or not, depends on how the other researchers will relate with them and how the employer logistically facilitates that to happen. Therefore, KALRO needs to appreciate the existence of relational tacit knowledge among its researchers and ensure they transfer it among themselves to sustain its improved research effort.

ii) Collective Tacit Knowledge

Collective tacit knowledge according to Collins (2010), is knowledge held socially and collectively by members of a given society about the way they work. This author explains how collective tacit knowledge works with reference to how bicycle riders coordinate and work out their actions with other road users (society or community of road users) at a busy road junction.

Perhaps, this explains why when one of the riders misses to apply well the collective tacit knowledge of the society of riders, the other members exclaim saying “that is not how we work or do things!”. As put by Nkuruziza et al. (2016), employees' collective knowledge is a critical aspect in generating creative and competitive products or services. Such knowledge would include knowledge held by experts in various disciplines. Specifically, in KALRO, various researchers belong to different disciplines where work is done differently. KALRO has categories of collective tacit knowledge equal to the number of its research disciplines with examples including Animal production, Animal breeding, Fodder and forages, Animal nutrition, Animal health and Epidemiology in livestock research. Examples of crops disciplines include Crop health or Crop protection, Crop biotechnology, Sericulture, Agronomy, Breeding, Soil science and Postharvest management. KALRO therefore needs to ensure researchers in each of its research disciplines transfer collective tacit knowledge among themselves.

iii) Local Tacit Knowledge

Local tacit knowledge refers to practical knowledge used to accomplish short-term specific tasks. Individual technical skills as put by Insch et al. (2008), are an example of local tacit knowledge. How best a task is done depends on the skill developed by individuals as they undertake and accomplish assigned short term tasks. In KALRO, different individual researchers have excelled to different levels in various technical skills. This difference causes them to deliver high quality results than their colleagues. For instance, researchers with long service in specific research areas or disciplines, have lots of local tacit knowledge than those with short service periods. This means that KALRO needs to know how far each of its individual researchers are able to undertake specific short-term tasks in particular research areas. In this way, it will be able to ensure individual researchers with lots of local tacit knowledge transfer it to colleagues who have less of it.

iv) Global Tacit Knowledge

Global tacit knowledge refers to knowledge persons use to fit long range objectives of their work areas into the bigger picture or processes of their organizations. As put by Insch et al. (2008), global tacit knowledge captures a bigger picture of the organization. Institutional technical skills are an example of global tacit knowledge. In an agricultural research setting, an example of global tacit knowledge is knowing how to fit the objectives of research projects into organizational research goals. For instance, in KALRO, long serving agricultural researchers who have implemented research projects, are deemed to have accumulated more

global tacit knowledge. This is because, they have undertaken various projects and fitted their long-range objectives into the bigger picture of KALRO before. Therefore, it is from such researchers that global tacit knowledge can be acquired. KALRO, therefore, needs to ensure such researchers transfer that global tacit knowledge to their colleagues so that its research is sustainably undertaken within the confines of its bigger picture.

v) Cognitive Self-Motivation Tacit Knowledge

According to Insch et al. (2008), cognitive self-motivation tacit knowledge is know-how of behaviors (frame of mind) necessary for attaining self-drive to deliver own goals. People with this knowledge have self-drive behaviors by which they deliver superior performance. Such behaviors or measures include arriving at work early while knowing tasks to accomplish, seeing the need for new skills and acquiring them, among others. Cognitive self-motivation tacit knowledge like other types of tacit knowledge can be transferred via behaviors as recognized by Szulanski (2006) that behavior is an important way through which tacit knowledge can be transferred. In KALRO, there are researchers who know and invoke extra role behaviors necessary for attaining a self-drive that earns superior performance. Such researchers conduct themselves in ways that give them a self-drive that leads to excellent results. Such ways or behavior include being punctual at work while knowing what to do, working according to work plans with spelt out milestones besides other work arrangements that give outstanding results.

2.1.3 Tacit Knowledge Transfer Techniques

Although various tacit knowledge transfer techniques exist as fronted by different knowledge management authors, the techniques this study addressed in context of agricultural research were as follows:

After Action Reviews (AAR) involve sharing about project events so far completed as put by Nikki (2014). According to Liebowitz (2008), these reviews involve putting together a team that includes facilitators, writers, and subject matter experts. During AAR, subject matter experts share their past experiences in context of lessons learnt so far about the project and in the process transfer tacit knowledge to participants.

Collaborative research is an avenue in which the parties involved who could be researchers or organizations, team up to deliver agreed and shared objectives of a project. As put by Bansal et al. (2019), collaborative research involves researchers, institutions, organizations as

communities working together in a coordinated manner. Further, a collaboration provides an avenue for stakeholders to create new knowledge. This new knowledge would include tacit knowledge because according to Mucai (2018), organizational members who interact, convert their current tacit knowledge to a new set of it. According to Hussin et al. (2012), collaborations between researchers and their external collaborators succeed if they communicate based on their skills. Through collaboration, researchers transfer tacit knowledge among themselves as they use their skills to undertake various project activities. In this way, less experienced members acquire new tacit knowledge from their more experienced colleagues in that collaboration.

Communities of Practice (CoP) as indicated by Mucai (2018) while citing Mohajan (2017), are about how explicit and tacit knowledge are created and shared, and involves people with similar passions or concerns interacting regularly in group settings to exchange ideas on best practices in their areas of interest. This technique could be used to transfer tacit knowledge by agricultural researchers of same disciplines within and beyond organizations.

Job rotation involves the transfer of trainees from one job to another and sometimes from one office to another (Geet et al., 2009). Lu and Yang (2015) indicate that job rotation is a tool that is effectively used to pass on tacit knowledge in an organization. However, Lukwago et al., (2014) indicates that job rotation is neither common in agricultural research nor among the factors for removing discomfort among researchers. This is because researchers are highly specialized professionals in their respective fields and may not necessarily be rotated around.

Peer assist meetings as put by Nikki (2014), involve seeking the advice and expertise of peers who have solved a similar problem and also learning from them different ways of handling a particular issue. In context of agricultural research, a project team invites relevant and experienced researchers to provide their tacit knowledge from past research projects to benefit a starting project. Through this sharing of past research experience, listeners acquire new tacit knowledge.

Retrospective meetings are detailed meetings at the end of a project or major piece of work during which a working team through presentations, dialogue, and question and answer sessions, bring out knowledge about work already undertaken. In an agricultural research setting, these meetings would be likened to conferences held at the end of research projects.

Stalesen (2015) indicated that retrospectives facilitate shared learning in a team or an organization after an event, and in that way focus on improving current work activities or teamwork. Further, during this process, participants listen, learn, and create new tacit knowledge from the different issues experts address as per their respective disciplines.

Knowledge interviews are forums where experts are interviewed about their line of work occasionally during their tenure or when about to exit. According to Hashem (2008), an interview is a communication where the interviewer asks the expert questions aimed to bring forth an understanding of a given knowledge area. This technique could be used by agricultural researchers to transfer tacit knowledge to each other since they eventually become experts in their areas of work.

Mentorship involves mentors transferring their tacit knowledge in a particular work area to those they guide. According to APM (2006), mentoring is a useful way to pass on and increase knowledge. It involves supporting, guiding and advising by an experienced person. In an agricultural research setting, experienced researchers can use mentorship to transfer their technical know-how skills and what they know about routines of in the organization to their less experienced colleagues.

Seminars, as put by Nikki (2014), entail transferring knowledge from one expert to a group of people. Experienced professionals such as agricultural researchers share and transfer tacit knowledge as they give talks on specific topics. Seminars held by researchers in agricultural research organizations, are an avenue for transferring various types of tacit knowledge among researchers. This is because these researchers are professionals in their particular fields and qualify to give talks on various topics and thereby transfer tacit knowledge among themselves.

Storytelling is a technique where people deliver their tacit knowledge by telling stories about their experiences in context of their work either orally, in writing, filming or illustration in a structured and chronological manner (Venkitachalam and Busch, 2012; Al-Qdah and Salim, 2013). In the same way, agricultural researchers can tell stories about their work and in process transfer tacit knowledge among themselves.

Workshops, as put by Azevedo and Rezende (2015), help in transferring tacit knowledge while according to McCabe et al. (2016), they present an interaction opportunity that enhances understanding. Agricultural researchers use workshops to document tacit knowledge into informational materials such as brochures, manuals, technical notes and reports and in process also transfer tacit knowledge to each other.

2.1.4 Tacit Knowledge Transfer in Agricultural Research Institutions

A number of researches and studies done on tacit knowledge transfer in agricultural research organizations outside and in Kenya, have addressed different issues including tacit knowledge retention, knowledge management strategies and practices, and sharing.

Goga et al. (2017) addressed the role of Knowledge Management Systems (KMS) to retain tacit knowledge in research institutes in Kenya. They specifically assessed the effect of ICT technological infrastructure, organizational culture, management support, knowledge management policy dimensions, and ICT competencies on retention of tacit knowledge in research institutes in Kenya. They stressed the need for research institutions to fully support the use of KMS to retain tacit knowledge. In this way, they were silent on retention of tacit knowledge by transferring it from researcher to researcher by use of tacit knowledge transfer techniques which this study looked at. They did not consider that tacit knowledge is of various types and not all of them can be retained or transferred through documentation and storage using KMS technique. As such, they did not address retention of tacit knowledge with reference to any specific types of tacit knowledge.

The study by Kahiga (2014) on knowledge sharing practices among crop researchers at the former Kenya Agricultural Research Institute (KARI) looked at general methods of sharing knowledge. This current study sought to establish the extent to which researchers used tacit knowledge transfer techniques and the effect of that use on their performance in KALRO.

Baguma (2016) came up with a framework for retaining knowledge in agricultural research organizations. This study asserted that effective retention and use of knowledge in these institutions could be achieved by continuously acquiring, capturing and storing new knowledge, using knowledge sharing techniques, availing and applying knowledge. Further, this study indicated that components that constitute agricultural knowledge such as expertise

substance, reasons for particular decisions, past research experiences and who research project collaborators are, need to be documented as a way of retaining tacit knowledge. Although this study mentioned methods by which knowledge may be retained or transferred, it did not address the extent to which researchers use these methods or techniques to transfer the types of tacit knowledge among themselves and the effect of this on their performance.

Kabiru (2015), in the study on “Knowledge management strategies and practices in Nigerian Agricultural Research Institutes”, mentions the techniques through which tacit knowledge is generated and they include review meetings, workshops, seminars, cropping scheme meetings, community of practice, community of knowledge, knowledge networks and regular staff meetings. This study did not look at the extent to which each of these techniques was used to transfer specific types of tacit knowledge among researchers.

2.2 Effect of Use of Tacit Knowledge Transfer Techniques on Organizational Performance

2.2.1 Enhancement of Ability to Perform

According to Mucai (2018), when organizational members interact, they convert their current tacit knowledge to new tacit knowledge. Similarly, when researchers interact as they use transfer techniques, they create new tacit knowledge and this enhances their ability to perform. This is because, this process stocks researchers with types of tacit knowledge including cognitive self-motivation, collective, global, local and relative know-how. This endowment of researchers with these types of tacit knowledge, ultimately leads to improved performance of their organization.

2.2.2 Enablement to Deliver on Performance Indicators

According to KALRO (2017), KALRO’s performance indicators include generation of Agricultural Technologies and Innovations (ATIs), Provision of Technical Services (PTS), and packaging and provision of Knowledge, Information and Technologies (KIT) on agricultural products. Based on performance indicators reported by Murumba et al. (2020) for selected Universities in Kenya, “writing research fund winning proposals” and “efficient management of research projects” too qualify to be among performance indicators of a research organization such as KALRO. Therefore, this study also looked at the extent to which researchers were enabled by tacit knowledge to deliver on these mentioned performance indicators.

2.2.2.1 Generation of Agricultural Technologies and Innovations

As researchers continue to use tacit knowledge transfer techniques to pass on types of tacit knowledge among themselves, they accumulate technical know-how and use it in collaboration with other stakeholders in agriculture to generate technologies and innovations. This is in line with what Nkuruziza et al. (2016) indicated that research projects acquire new knowledge as they collaborate with other project partners. Further, at least KALRO researchers have used tacit knowledge and developed some technologies in the area of African Indigenous Vegetables (AIVs) and in innovations, community seed banking, provision recipes for production of high fibre (KALRO, 2021) among others.

2.2.2.2 Provision of Technical Services

When researchers use tacit knowledge transfer techniques over time, they increase in the know-how to formulate, tailor make and provide various technical services that suit needs of targeted clientele. Some services which researchers use tacit knowledge to provide include training and offering technical advice on various agricultural issues. For instance as indicated by KALRO (2017-2018), researchers in KALRO Coffee Research Institute rendered some of the major services such as evaluation of pesticides, soil and leaf analyses, advisory services and training programmes that assisted in maintenance of coffee on farms.

2.2.2.3 Knowledge, Information and Technologies (KIT) on Agricultural Products.

Use of tacit knowledge transfer techniques by researchers in agricultural research organizations endows them with the ability to package and provide knowledge, information and technologies for various agricultural products. According to Murumba (2020), among the deliverables tacit knowledge contributes to organizational performance under the development focus, comprise of publications, collaborations and partnerships. Publications comprising of papers published in refereed journals, conference proceedings and other information materials are some of the specific knowledge and information deliverables researchers are enabled to deliver by tacit knowledge transfer. According to KALRO (2021), examples of knowledge and information where researchers used tacit knowledge to deliver was on nutritive value and shelf life of the flour among others. They have also made recommendations on the how-to-do which constitute knowledge that enlightens target users on specific best practice(s).

2.2.2.4 Research Proposals Targeted to Winning Donor Funding

According to Murumba et al. (2020), use of tacit knowledge by researchers increases their technical know-how for writing proposals which could win funding from donors. Researchers endowed with tacit knowledge usually reflect in their proposals that they have knowledge in agricultural research which as put by Baguma (2016) comprises expertise substance, reasons for particular decisions, past research experiences and the collaborators they ever worked with.

2.2.2.5 Efficient Management of Research Projects

The more researchers use tacit knowledge transfer techniques as they undertake research, the more their efficiency in managing projects increases. Amollo and Omwenga (2017) indicated that the project manager in the research and development institution should update their technical know-how and skills on a regular basis. As project managers do this via tacit knowledge transfer techniques including seminars, workshops, short or refresher courses, more technical know-how and skills increase in their minds as tacit knowledge and this enhances their ability to manage research projects more efficiently.

2.3 Social and Organizational Factors Affecting Transfer of Tacit Knowledge

Research has been done about social and organizational factors affecting transfer of tacit knowledge. However, information on the extent to which these factors affect the transfer of tacit knowledge from one researcher to another in agricultural research organizations is minimal and inadequate.

2.3.1 Social Factors

Naturally, the older workers especially those who have aged with the organization, are deemed to have more tacit knowledge to transfer. Such elderly experienced employees ought to mentor the younger and less experienced employees like Collin (2004) reported this to have been the case among the design engineers.

Employees with high educational level though deemed to be rich in academic knowledge, are not obviously with lots of tacit knowledge. This is because, unlike academic knowledge, tacit knowledge accumulates in a person with time and is anchored on hands-on work. This explains why a PhD holder with hands-on research experience in agricultural research definitely has more tacit knowledge than one with academic knowledge but no hands-on experience.

Carroll (2002) deliberated that same-sex friendships between women are of more trust than those of men. Perhaps based on this finding, women could be more willing to transfer tacit knowledge among themselves than men. The extent to which this would happen between men to men and opposite sex, depends on how involved parties can socialize.

Language between the source and the receiver in some cases of tacit knowledge transfer may not depend much on common language. For instance passing on tacit knowledge by a craftsman may not depend much on common language between the mentor and the mentee since it relies more on observation, imitation, and practice. However, the transfer of tacit knowledge from an agricultural researcher to another, may be different since such a scenario involves use of technical language. According to Nakano et al. (2013), tacit knowledge transfer is facilitated by an engaging environment where employees use a common language to share ideas and expertise.

An employee's tenure with an organization might reduce the tendency to use tacit knowledge obtained from co-workers and increase the tendency to share such knowledge (Holste and Fields 2010). Although tacit knowledge transfer is done by all people regardless of their tenure service, long serving employees are more likely to have more tacit knowledge to transfer than their colleagues with shorter periods of service.

Trust can be defined as the belief that another party will behave as expected and not take advantage of the situation (Hsu et al. 2007). In an environment where trust reigns, employees will not be engulfed with fear of losing their power because they have shared or transferred their tacit knowledge. Connelly *et al.* (2012) puts that tacit knowledge transfer happens in an engaging environment characterized by openness and trust that facilitate reciprocal tacit knowledge transfer or sharing behaviors. As put by Baguma (2016), employees who trust one another reciprocate in sharing knowledge and build team spirit among themselves.

Religion being about religious faith of persons, may affect the scope and substance of tacit knowledge they transfer. For instance, Muslims do not keep pigs and therefore may not accumulate tacit knowledge to transfer about them while Christians do the opposite. Based on this example, religion may in some cases determine what constitutes the tacit knowledge accumulated and transferred by persons.

2.3.2 Organizational Factors

Distance between work stations is key in transferring tacit knowledge among employees. This is because it may be challenging for researchers in work stations that are far apart to pass on tacit knowledge to each other on one-to-one basis. However, as put by Jones (2016), Information Technology can be leveraged to successfully transfer tacit knowledge in geographically distant teams. ICT functionalities such as organizational Wide Area Networks (WANs) can be used to facilitate employees to interact across distant centers and thereby transfer tacit knowledge among themselves online.

Rewards encourage employees to undertake tacit knowledge transfer in organizations. According to Ratelle, et al. (2005), an employee transfers or obtains knowledge to receive a positive reward. An organization can use rewards including wage increase, prizes and promotions to motivate employees to transfer tacit knowledge. An inadequate reward system discourages employees to be involved in tacit knowledge transfer.

Information and communication technology (ICT) has been presented as a facilitator of knowledge transfer. According to Chugh (2017), technology is a key enabler of tacit knowledge sharing and can aid in the capture, sharing, and application of tacit knowledge. Further, Chugh (2019) and Panahi et al. (2016) indicated that the various technologies including groupware, intranets, discussion forums, blogs, wikis, and social media can aid in tacit knowledge transfer.

Job designations may affect tacit knowledge transfer among employees to varied extents in organizations. In the study by Ardichvili et al. (2006), both the top and middle managers did not participate in knowledge sharing efforts, and this meant that job position or designation had no impact on knowledge sharing practice.

A policy on Tacit Knowledge Management (TKM) is key in guiding tacit knowledge transfer among employees of an organization. This is because as put by Murumba et al. (2020), absence of policies on TKM negates the undertaking of the activities involved in application and use of tacit knowledge.

Senior management comprises of leaders who according to Ribiere and Sitar (2003) need to have leadership attributes that win trust and can be used to achieve knowledge management goals. Senior management needs to finance the implementation of knowledge management policies including tapping the tacit knowledge from employees whose skills, technical know-how and capabilities matter to the organization.

Space comprises rooms where employees can converge to transfer tacit knowledge among themselves in an organization. Space provision would include demarcating rooms for seminars, staff meetings, conferences and other avenues as put by Reychav and Te'eni (2009) for informal settings including where to have social events and coffee break.

2.4 Theoretical Framework

This study was based on the Knowledge Spiral Model by Nonaka et al. (2000) which specifies that knowledge exists as explicit and tacit, and is created and managed within an organization through four basic processes of socialization, externalization, combination and internalization (SECI). These four interdependent processes also referred to as knowledge creating spiral, are needed to create and transfer knowledge within the task environment in an organization. This spiral occurs in the organization as shown in Figure 1. During this process, knowledge converts from one type to another through four modes as shown in Table 1.

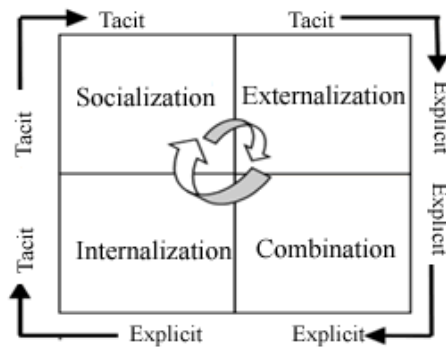


Figure 1 SECI Process.
Source: Nonaka et al., (2000)

Table 1 : The Four Modes and Types of Knowledge Each Mode Converts from and to

Mode	Conversion of Knowledge	
	From	To
Socialization	Tacit	Tacit
Externalization	Tacit	Explicit
Combination	Explicit	Explicit
Internalization	Explicit	Tacit

Adapted from Nonaka & Takeuchi (1995)

Ordinarily, every person has tacit knowledge of some kind to transfer. In context of this Knowledge Spiral Model, when persons transfer tacit knowledge to each other, they do so through “tacit to tacit” process. Similarly, when researchers use transfer techniques to pass on tacit knowledge to each other, they do so through “tacit to tacit” process. It is on this basis that the theory becomes the bedrock on which this study is founded because transfer of tacit knowledge from a researcher to another researcher anchors on its “tacit to tacit” knowledge transfer process. Tacit to explicit knowledge transfer entails passing on tacit knowledge from human mind to documented knowledge. Tacit to tacit and tacit to explicit processes form tacit knowledge transfer. Explicit to explicit knowledge transfer involves transmitting explicit knowledge to another explicit knowledge form or medium with an example such as a webmaster putting explicit content onto a website page where it will still be explicit. Explicit to tacit knowledge transfer is where for instance a person reads explicit knowledge such as documented report and internalizes it into the mind where it becomes tacit. Explicit to explicit and explicit to tacit processes form explicit knowledge transfer.

2.5 Conceptual Framework

As presented in Figure 2, this research was conceptualized around a scenario where Social factors and Organizational factors are the independent variables, and affect Tacit Knowledge Transfer as the dependent variable to end up with researchers’ Improved Organizational Performance. The dotted lines are used to show intervening variables which although were not studied or manipulated in this study, are very important because they affect the effect of independent variables on dependent variables and onto the output. This is because in this study, the intervening variables affect the social and organizational factors' effect on tacit knowledge transfer (transfer techniques and types of tacit knowledge) and still work on this transfer to ensure the researchers improve their performance.

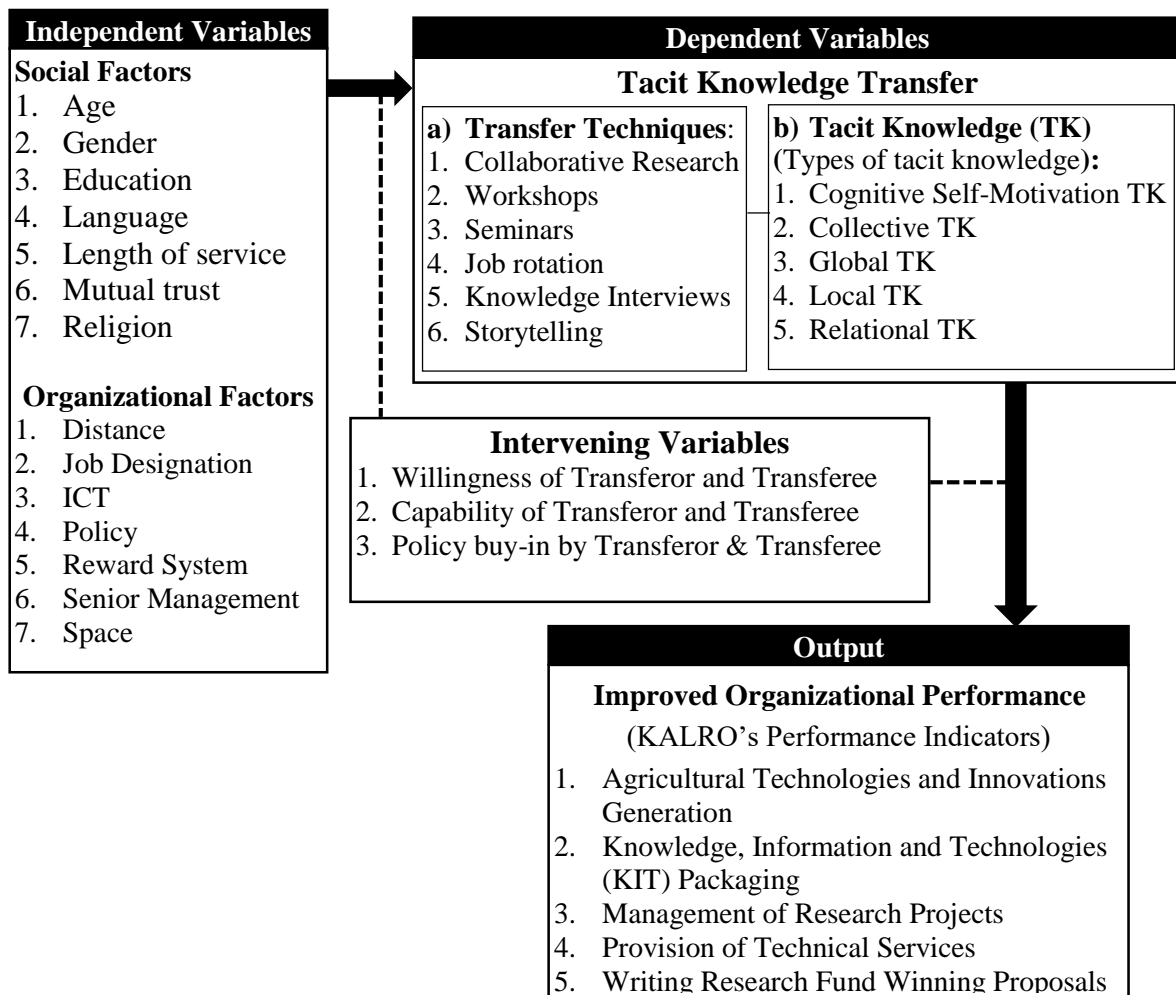


Figure 2 Conceptual Framework

(Source: Author (2022))

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

This study adopted a descriptive survey research design which as put by Mugenda & Mugenda (2003), is suitable for describing information, data, events and perceptions. Further, it is used where research aims to identify characteristics, frequencies, trends, correlations, categories, averages and patterns. It also allows use of both quantitative and qualitative research methods. Specifically, it uses a questionnaire to collect quantitative and/or qualitative responses from the primary source. It was appropriate for this study because it uses a questionnaire to collect data and its purpose is description of the state of affairs as it currently exists.

3.2 Study Area

This study was done in KALRO centers. According to (KALRO, 2017), KALRO was formed by merging of former Kenya Agricultural Research Institute (KARI), Coffee Research Foundation (CRF), Tea Research Foundation of Kenya (TRFK) and Kenya Sugar Research Foundation (KESREF). KALRO has 17 semi-autonomous research institutes, 47 centers and sub-centers (combined) spread throughout the country.



Figure 3 KALRO Centers Network (KALRO, 2017)

3.3 Sample Size and Sampling Procedure

The study population were the 402 researchers in KALRO centers at the time this study was done.

a) Sample size

The sample size was calculated using a formula derived by Yamane (1967) below:

$$n = \frac{N}{1 + Ne^2}$$

Where:
n = Number of samples
N = Total Population
e = Error tolerance (level)

The sample size was calculated at a confidence level of 95% (alpha level of 0.05) as follows:

$$n = \frac{N}{1 + Ne^2} = \frac{402}{1 + (402 \times 0.05^2)} = \frac{402}{2.01} = 200.5 = 201$$

b) Sampling Procedure

Cluster sampling method was used since KALRO centers already existed as clusters dispersed across the country. Cluster sampling method is used where population elements are already structured in sub-populations or can be formed. It is also appropriate where the population is dispersed and would be costly to collect data from every population unit. The number of questionnaires administered in collecting data at each KALRO center was equal to its proportionate sample size derived as shown below:

$$\text{Sample Ratio} = \frac{\text{Sample Size}}{\text{Population (All Researchers)}} = \frac{201}{402} = 0.5$$

$$\text{Center's proportionate sample size} = \text{Sample Ratio} \times \text{Center's Population}$$

Table 2 shows KALRO centers' populations, and the quantity of questionnaires availed to researchers and the number of those they completed and returned.

Table 2 : KALRO Centers, and Administered and Returned Questionnaires

No Center	Center Population	Sample Ratio	Questionnaires	
			Availed to researchers (Center's Proportionate Sample Size)	Filled & Returned
1. Alupe	3	0.5	2	2
2. Embu	12	0.5	6	6
3. Headquarters	28	0.5	14	14
4. Kabete Biotechnology	15	0.5	7	7
5. Kabete Food Crops	41	0.5	21	21
6. Kakamega	22	0.5	11	11
7. Katumani	24	0.5	12	8
8. Kericho	8	0.5	4	4
9. Kiboko	7	0.5	4	4
10. Kibos Horticulture	12	0.5	6	4
11. Kibos Sugar	21	0.5	10	10
12. Kisii	7	0.5	3	3
13. Kitale	22	0.5	11	11
14. Lanet & Garissa	8	0.5	4	4
15. Macadamia & PTC	6	0.5	3	3
16. Matuga & Mariakani	4	0.5	2	2
17. Marigat Perkerra	4	0.5	2	2
18. Marsabit	8	0.5	4	4
19. Molo	2	0.5	1	1
20. Mtwapa	14	0.5	7	7
21. Muguga Veterinary	18	0.5	9	9
22. Muguga South	24	0.5	12	12
23. Muguga Biotechnology	12	0.5	6	6
24. Muranga Horticulture	12	0.5	6	6
25. Muranga Sericulture	5	0.5	3	3
26. Mwea	8	0.5	4	4
27. Naivasha & Sub-Centers	11	0.5	5	5
28. Njoro	20	0.5	10	6
29. Ruiru-Coffee Center	16	0.5	8	8
30. Tigoni	8	0.5	4	4
Total	402		201	191

3.4 Data Collection and Collection Tools

A semi-structured questionnaire was used to collect quantitative and qualitative primary data from respondents. Data was collected on the extent researchers used given tacit knowledge transfer techniques to pass on specified types of tacit knowledge to each other, and the extent tacit knowledge acquired from this process enabled researchers to deliver on KALRO's performance indicators. Further, data was collected on the extent to which researchers agreed given social and organizational factor affected the transfer of tacit knowledge among themselves in KALRO.

3.5 Data Analysis

1) Effect of use of tacit knowledge transfer techniques on performance of KALRO researchers.

This first specific objective was achieved by collecting data on transfer techniques as used in passing on different types of tacit knowledge and delivery of performance indicators of KALRO as enabled by acquired tacit knowledge. Data was cleaned, coded and entered in MS Excel and SPSS computer packages. Frequency and percentage were used to present analyzed data in tables.

a) Likert scale was used to:

i) Establish the extent to which each tacit knowledge transfer technique used by researchers to pass on given types of tacit knowledge were adequate. The researchers were subjected to a Likert perception test where they were asked to indicate (on a 5-point Likert scale: 1=Not Adequate, 2=Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate), the extent to which the transfer techniques they used were adequate in passing on tacit knowledge to each other. The Not Adequate and Neutral results were retained as such, while those for 3= Adequate, 4=Very Adequate, 5=Extremely Adequate were combined to form the consolidated Adequate opinion.

ii) Rate the extent to which researchers were enabled by tacit knowledge to deliver on performance indicators of KALRO. The researchers were subjected to a Likert perception test where they were asked to indicate the extent to which they were enabled by tacit knowledge to deliver on KALRO's performance indicators on a 5-Point Likert scale: 1=Not enabled, 2=Neutral, 3=Enabled, 4=Strongly Enabled, 5=Extremely Enabled. The Not Enabled and Neutral results were retained as such, while those for 3=Enabled, 4=Strongly Enabled, 5=Extremely Enabled were combined to form overall Enabled opinion. Chi-Square test was used to establish the nature of association that existed between tacit knowledge transfer and performance of KALRO researchers.

2) Effect of the social and organizational factors on the transfer of tacit knowledge among KALRO researchers

This second specific objective was achieved by collecting data on social and organizational factors. Likert scale was used to establish the extent researchers agreed the social and organizational factors affected the transfer of tacit knowledge among them. The respondents were subjected to a Likert perception test where they were asked to indicate their extent of agreement on a 5-Point Likert scale: 1=Not agree, 2=Neutral, 3=Agree, 4=Strongly agree, 5=Extremely agree. The Not Agree and Neutral results were retained as such, while those for 3=Agree 4=Strongly Agree, 5=Extremely Agree were combined to form the consolidated Agree opinion. Data was cleaned, coded and analyzed in SPSS computer package with results presented using frequencies and percentages in tables. Chi-Square test was used to establish the nature of association that existed between social and organizational factors, and performance of researchers.

3.6 Reliability Test

Cronbach's alpha test was run to see how closely related the items were in the eight groupings of the Likert scale type questions in the questionnaire used in this study. These groupings were Cognitive Self-Motivation Tacit Knowledge, Collective Tacit Knowledge, Global Tacit Knowledge, Local Tacit Knowledge, Relational Tacit Knowledge, Performance Indicators, Social Factors and Organizational Factors. As shown in Table 3, all the reliability coefficients were not below the acceptable 0.7 value, indicating that there was internal consistency and interrelatedness among the items in the questions in each grouping, thereby making the questionnaire deemed reliable.

Table 3 : Reliability Test

Grouping	Cronbach's Alpha	No. of Items
Cognitive Self-Motivation Tacit Knowledge	0.9	12
Collective Tacit Knowledge	0.9	12
Global Tacit Knowledge	0.9	12
Local Tacit Knowledge	0.9	12
Relational Tacit Knowledge	0.9	12
Performance Indicators	0.9	5
Social Factors	0.7	7
Organizational Factors	0.7	7

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results from descriptive and Chi-Square test analyses done on collected data with results presented using frequency and percentabes in tables. The data analyzed included researchers characteristics, techniques used in transferring tacit knowledge, and the social and organizational factors.

4.2 Researchers Characteristics

Respondents' characteristics analyzed were designation, gender, highest level of education and length of research period. In Table 4.1, under designation, 16.23% were Research Scientists, 12.57% Research Scientists II, 23.56% Research Scientists I, 27.75% Senior Research Scientists, 8.9% Principal Research Scientists, 6.28% Senior Principal Research Scientists, 3.66% Chief Research Scientists, 0.52% Director and 0.52% Deputy Director General.

Table 4.1 : Characteristics of Researchers

Characteristics (Variable)		Frequency	%
Designation	Research Scientist	31.0	16.23
	Research Scientist II	24.0	12.57
	Research Scientist I	45.0	23.56
	Senior Research Scientist	53.0	27.75
	Principal Research Scientist	17.0	8.90
	Senior Principal Research Scientist	12.0	6.28
	Chief Research Scientist	7.0	3.66
	Director Livestock systems	1.0	0.52
	Deputy Director General Crop	1.0	0.52
	Gender	Female	69
Male		122	63.9
Highest Educational Level	BSc	87.0	45.55
	Masters	77.0	40.31
	PhD	27.0	14.14
Length of Research Period	1 to 5	12	6.3
	6 to 10	18	9.4
	11 to 15	32	16.8
	16 to 20	43	22.5
	21 to 25	17	8.9
	26 to 30	16	8.4
	> 30	53	27.7

The designations structure evidenced a system where respondents progressed based on performance. The designations begin with Research Scientist as the lowest entry level while Deputy Director is the highest. An employee working and progressing along such a designation structure would at least accumulate tacit knowledge to transfer.

For gender, 63.9% of respondents were male while 36.1% were female. This indicated that more male respondents participated in the study compared to their female colleagues. On the other hand, it could be that there are more male researchers in KALRO than there are of the female gender.

In terms of the educational level, BSc holders constituted 45.55%, Masters 40.31% and PhD 14.14%. Such highly qualified respondents understood the concept of tacit knowledge transfer and its ultimate purpose of attaining improved organizational performance. Furthermore, with such qualifications of Masters and PhD in agriculture accompanied by practical research work, these were researchers undoubtedly with lots of tacit knowledge to transfer.

On length of research period, various percentages of respondents had been doing research for different lengths of time. Respondents constituting 27.7% had done research for more than 30 years, 22.5% for 16 to 20 years, 16.8% for 11 to 15 years, 9.4% for 6 to 10 years, 8.9% for 21 to 25 years, 8.4% for 26 to 30 years and 6.3% for 1 to 5 years. At least a total of 45% of the respondents had done research for over 20 years and were undoubtedly endowed with substantial tacit knowledge transferrable to colleagues with less of it especially the 15.7% with 1 to 10 years of research.

4.3 Effect of Use of Tacit Knowledge Transfer Techniques on Performance of KALRO Researchers

The first specific objective of this study sought to assess the effect of use of tacit knowledge transfer techniques on performance of KALRO researchers and was addressed by looking at:

- 1) The extent researchers transferred the five types of tacit knowledge:
 - (i) Extent researchers used each technique to transfer the types of tacit knowledge
 - (ii) Ranking of techniques based on their adequacy in transferring each type of tacit knowledge
- 2) How useful the types of tacit knowledge were in enhancing researchers' ability to perform

- 3) KALRO performance indicators ranking based on how researchers' use of tacit knowledge transfer techniques enabled their achievement
- 4) The nature of association Chi-Square test was to establish between tacit knowledge and researchers' performance.

4.3.1 Researchers' Use of Transfer Techniques in Passing on Tacit Knowledge

4.3.1.1 Extent to which Transfer Techniques Used by Researchers were Adequate in Passing on the Types of Tacit Knowledge

A 5-Point Likert scale (1=Not Adequate, 2=Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate) was used in evaluating the extent to which transfer techniques were adequate in transferring tacit knowledge to enhance researchers' ability to perform. The 1=Not Adequate and 2=Neutral results were retained as such, while those for 3= Adequate, 4=Very Adequate, 5=Extremely Adequate were combined to form the consolidated Adequate opinion.

Table 4.2 : Percentages of the Extent to which Transfer Techniques Used by Researchers were Adequate in Passing on Types of Tacit Knowledge

Transfer Techniques	Percentage (%)														
	Types of Tacit Knowledge														
	Cognitive Self-Motivation TK			Collective TK			Global TK			Local TK			Relational TK		
	NA	N	A	NA	N	A	NA	N	A	NA	N	A	NA	N	A
After Action Reviews	4.2	17.8	78.0	5.8	24.1	70.2	6.3	27.7	66.0	6.3	24.6	69.1	12.0	30.9	57.1
Collaborative Research	0.5	8.9	90.6	2.6	16.8	80.6	2.6	19.4	78.0	2.1	21.5	76.4	4.7	20.4	74.9
Communities of Practice	5.8	23.6	70.7	8.9	29.3	61.8	7.3	28.3	64.4	6.3	29.8	63.9	10.5	23.6	66.0
Job rotation	24.6	38.2	37.2	28.8	36.6	34.6	30.4	34.0	35.6	31.9	33.0	35.1	18.3	34.6	47.1
Knowledge Interviews	29.3	29.3	41.4	20.9	33.0	46.1	20.9	34.6	44.5	18.3	34.6	47.1	20.4	27.2	52.4
Mentorship	3.1	30.9	66.0	5.2	26.7	68.1	7.9	33.0	59.2	8.4	25.1	66.5	10.5	25.1	64.4
Peer Assist Meetings	6.8	20.4	72.8	5.8	19.9	74.3	5.8	29.3	64.9	5.2	27.2	67.5	7.9	25.1	67.0
Retrospective meetings	4.7	16.8	78.5	6.3	21.5	72.3	5.2	30.4	64.4	5.8	26.2	68.1	9.4	20.4	70.2
Seminars	3.1	15.7	81.2	2.6	20.9	76.4	3.7	24.1	72.3	5.8	20.9	73.3	6.8	22.0	71.2
Staff meetings	4.7	22.0	73.3	5.2	26.2	68.6	6.3	32.5	61.3	7.9	30.9	61.3	14.7	28.3	57.1
Storytelling	17.3	26.2	56.5	17.8	28.8	53.4	22.0	36.1	41.9	19.4	33.5	47.1	22.0	31.4	46.6
Workshops	3.7	15.2	81.2	3.7	14.7	81.7	2.6	15.7	81.7	5.2	18.3	76.4	8.4	18.3	73.3

NA = Not Adequate, N = Neutral and A = Adequate

As indicated in Table 4.2, each type of tacit knowledge was most transferred through a specific transfer technique. Cognitive self-motivation tacit knowledge was most transferred through Collaborative Research at 90.6%. This indicated that researchers were inculcated more with extra role behaviors that led to superior performance as they worked among colleagues from various research backgrounds. Researchers had to ensure they acquired self-drive behaviors to continue working resiliently to deliver on their assigned tasks or goals amidst researchers from different disciplines. This resonated with what Inch et al. (2008), reported that cognitive self-motivation tacit knowledge is know-how of behaviors (frame of mind) necessary for attaining self-drive to deliver goals.

Local tacit knowledge was most transferred through Collaborative Research at 76.4%. This indicated that tacit knowledge on how to accomplish short term tasks was largely transferred more among researchers via collaborative research. Researchers had to acquire and invoke technical skills at personal level to in order to undertake tasks assigned to them in collaborative research projects often undertaken in KALRO. This concurs with what Inch et al. (2008) put that local tacit knowledge involves practical technical skills for undertaking short-term tasks assigned to individual members of a working team.

Relational tacit knowledge was most transferred through Collaborative Research at 74.9%. This showed that researchers related well during collaborative research projects and this enabled them to transfer among themselves the tacit knowledge behind their concealed scientific discoveries. This resonated with what Collins (2010) indicated that tacit knowledge behind scientific discoveries is usually secretive and requires one who needs it to relate well with the knower to effect its transfer.

Collective tacit knowledge was transferred most through workshops (81.7%) and this showed that researchers in their specific expertise, discipline or related task groupings such as plant breeding, animal health, crop health and others at KALRO, passed on this resource more among themselves on how they work during workshops. This agrees with what Nkuruziza et al. (2016) that as stakeholders such as a project team and model farmers converge to invoke their collective knowledge to succeed with their projects.

Global tacit knowledge was most transferred during workshops at 81.7%. This indicated that it was during workshop researchers transferred more among themselves institutional technical skills including aligning long range objectives of their research work with the bigger picture of KALRO. This concurs with Insch et al. (2008) that global tacit knowledge captures a bigger picture or processes of the organization and includes institutional technical skills.

4.3.1.2 Ranking of Transfer Techniques' Adequacy in Passing on Different Types of Tacit Knowledge by Researchers

A 5-Point Likert scale (1=Not Adequate, 2=Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate) was used in assessing the extent to which transfer techniques used by researchers were adequate in passing on each of the five types of tacit knowledge among themselves and enhancing their ability to perform. The 1=Not Adequate and 2=Neutral results were retained as such, while those for 3= Adequate, 4=Very Adequate, 5=Extremely Adequate were combined to form the consolidated Adequate opinion.

1) Cognitive Self-Motivation Tacit Knowledge

Table 4.3 : Transfer Techniques Ranking Based on Adequacy in Passing on Cognitive Self-Motivation Tacit Knowledge

Tacit Knowledge Transfer Techniques	Frequency			Percentage (%)			Rank
	NA	N	A	NA	N	A	
Collaborative Research	1	17	173	0.5	8.9	90.6	1
Workshops	7	29	155	3.7	15.2	81.2	2
Seminars	6	30	155	3.1	15.7	81.2	3
Retrospective meetings	9	32	150	4.7	16.8	78.5	4
After Action Reviews	8	34	149	4.2	17.8	78.0	5
Staff meetings	9	42	140	4.7	22.0	73.3	6
Peer Assist Meetings	13	39	139	6.8	20.4	72.8	7
Communities of Practice	11	45	135	5.8	23.6	70.7	8
Mentorship	6	59	126	3.1	30.9	66.0	9
Storytelling	33	50	108	17.3	26.2	56.5	10
Knowledge Interviews	56	56	79	29.3	29.3	41.4	11
Job Rotation	47	73	71	24.6	38.2	37.2	12

NA= Not Adequate, N= Neutral, A= Adequate

As per the ranking in Table 4.3, the three most used and adequate techniques in passing on Cognitive Self-Motivation tacit knowledge to enhance researchers' ability to perform were collaborative research, workshops and seminars. Collaborative research was the most adequate technique at 90.6% and this result agree with that of Abbas et al. (2019) that collaboration

provided an avenue for stakeholders to create new knowledge. Job rotation was least adequate with 37.2% thereby resonating with Lukwago et al., (2014) that job rotation was not typical in agricultural research, and most researchers were experts in their fields.

2) Collective Tacit Knowledge

Workshops, Collaborative research and Seminars as indicated in Table 4.4, were the three most used and adequate techniques for transferring Collective tacit knowledge to enhance researchers' ability to perform. Workshops (81.7%) were the most adequate technique and this coincides with the findings by Azevedo and Rezende (2015) that workshops help in the transfer of tacit knowledge and also as put by McCabe et al. (2016), they are an opportunity for interaction that enhances understanding. This meant that KALRO researchers were most adequately imparted with collective tacit knowledge during work related workshops. On the other hand, job rotation was least with 34.6% and therefore in line with Lukwago et al., (2014) who indicated that job rotation was not common in agricultural research and among researchers.

Table 4.4 : Transfer Techniques Ranking Based on Adequacy in Passing on Collective Tacit Knowledge

Tacit Knowledge Transfer Techniques	Frequency			Percentage (%)			Rank
	NA	N	A	NA	N	A	
Workshops	7	28	156	3.7	14.7	81.7	1
Collaborative Research	5	32	154	2.6	16.8	80.6	2
Seminars	5	40	146	2.6	20.9	76.4	3
Peer Assist Meetings	11	38	142	5.8	19.9	74.3	4
Retrospective meetings	12	41	138	6.3	21.5	72.3	5
After Action Reviews	11	46	134	5.8	24.1	70.2	6
Staff meetings	10	50	131	5.2	26.2	68.6	7
Mentorship	10	51	130	5.2	26.7	68.1	8
Communities of Practice	17	56	118	8.9	29.3	61.8	9
Storytelling	34	55	102	17.8	28.8	53.4	10
Knowledge Interviews	40	63	88	20.9	33.0	46.1	11
Job rotation	55	70	66	28.8	36.6	34.6	12

NA= Not Adequate, N= Neutral, A= Adequate

3) Local Tacit Knowledge

As per results in Table 4.5, the three most used and adequate techniques for transferring Local tacit knowledge to enhance researchers' ability to perform were Collaborative Research, Workshops and Seminars. Collaborative research was the most used and adequate technique at 76.4% in transferring local tacit knowledge among KALRO researchers. This meant that researchers acquired knowledge on how to undertake specific short-term tasks to achieve their own and organizational goals. Further, this showed that as researchers interact during collaborative research, they convert their existing tacit knowledge to new tacit knowledge according to Mucai (2018), and this happens at individual or local level. This concurs with what Blume (2010) reported that employees' performance involves employee achieving their own goals and those of their organization aimed to realize a competitive advantage. Job rotation was the least adequate with 35.1% concurring with Lukwago et al. (2014) that job rotation was not common in agricultural research.

Table 4.5 : Transfer Techniques Ranking Based on Adequacy in Passing on Local Tacit Knowledge

Tacit Knowledge Transfer Techniques	Frequency			Percentage (%)			Rank
	NA	N	A	NA	N	A	
Collaborative Research	4	41	146	2.1	21.5	76.4	1
Workshops	10	35	146	5.2	18.3	76.4	2
Seminars	11	40	140	5.8	20.9	73.3	3
After Action Reviews	12	47	132	6.3	24.6	69.1	4
Retrospective meetings	11	50	130	5.8	26.2	68.1	5
Peer Assist Meetings	10	52	129	5.2	27.2	67.5	6
Mentorship	16	48	127	8.4	25.1	66.5	7
Communities of Practice	12	57	122	6.3	29.8	63.9	8
Staff meetings	15	59	117	7.9	30.9	61.3	9
Storytelling	37	64	90	19.4	33.5	47.1	10
Knowledge Interviews	35	66	90	18.3	34.6	47.1	11
Job rotation	61	63	67	31.9	33.0	35.1	12

NA= Not Adequate, N= Neutral, A= Adequate

4) Relational Tacit Knowledge

The three most used and adequate techniques as indicated in Table 4.6, for transferring Relational tacit knowledge to enhance researchers' ability to perform were Collaborative research, Workshops and Seminars while the least three were Job rotation, Storytelling and Knowledge Interviews. Collaborative research was the most adequate technique with 74.9% in and this meant that researchers acquired concealed tacit knowledge behind scientific discoveries from each other most during collaborative research. A collaborative research was such an opportune pool of concealed tacit knowledge from where a collaborator gained at least knew secretive knowledge in line with what Abbas et al. (2019) put that a collaboration provide an avenue for stakeholders to create new knowledge. Job rotation was the least adequate with 35.1% because it was minimally used and also as put by Lukwago et al. (2014), job rotation was not common in agricultural research as researchers were highly specialized professionals in their respective disciplines.

Table 4.6 : Transfer Techniques Ranking Based on Adequacy in Passing on Relational Tacit Knowledge

Tacit Knowledge Transfer Techniques	Frequency			Percentage (%)			Rank
	NA	N	A	NA	N	A	
Collaborative Research	9	39	143	4.7	20.4	74.9	1
Workshops	16	35	140	8.4	18.3	73.3	2
Seminars	13	42	136	6.8	22.0	71.2	3
Retrospective meetings	18	39	134	9.4	20.4	70.2	4
Peer Assist Meetings	15	48	128	7.9	25.1	67.0	5
Communities of Practice	20	45	126	10.5	23.6	66.0	6
Mentorship	20	48	123	10.5	25.1	64.4	7
After Action Reviews	23	59	109	12.0	30.9	57.1	8
Staff meetings	28	54	109	14.7	28.3	57.1	9
Knowledge Interviews	39	52	100	20.4	27.2	52.4	10
Storytelling	42	60	89	22.0	31.4	46.6	11
Job rotation	61	63	67	31.9	33.0	35.1	12

NA= Not Adequate, N= Neutral, A= Adequate

5) Global Tacit Knowledge

As shown in Table 4.7, Workshops, Collaborative Research, and Seminars were the three most used and adequate techniques for transferring global tacit knowledge to enhance researchers' ability to perform, while Job rotation, Storytelling, and Knowledge Interviews were the least adequate. Workshops were the most adequate technique with 81.7% in transferring global tacit knowledge. This coincides with what Azevedo and Rezende (2015) found that workshops help in transferring tacit knowledge and as put by McCabe et al. (2016), they are an opportunity for interaction that enhances understanding. This means that researchers at KALRO were most adequately imparted with global tacit knowledge through work related workshops. Job rotation was the least adequate technique with 35.6% in transferring global tacit knowledge among KALRO researchers because it was slightly used. This was in line with what Lukwago et al. (2014) reported that job rotation was not common in agricultural research as researchers were highly specialized professionals in their respective disciplines.

Table 4.7 : Transfer Techniques Ranking Based on Adequacy in Passing on Global Tacit Knowledge

Transfer Techniques	Frequency			Percentage (%)			Rank
	NA	N	A	NA	N	A	
Workshops	5	30	156	2.6	15.7	81.7	1
Collaborative Research	5	37	149	2.6	19.4	78.0	2
Seminars	7	46	138	3.7	24.1	72.3	3
After Action Reviews	12	53	126	6.3	27.7	66.0	4
Peer Assist Meetings	11	56	124	5.8	29.3	64.9	5
Retrospective meetings	10	58	123	5.2	30.4	64.4	6
Communities of Practice	14	54	123	7.3	28.3	64.4	7
Staff meetings	12	62	117	6.3	32.5	61.3	8
Mentorship	15	63	113	7.9	33.0	59.2	9
Knowledge Interviews	40	66	85	20.9	34.6	44.5	10
Storytelling	42	69	80	22.0	36.1	41.9	11
Job rotation	58	65	68	30.4	34.0	35.6	12

NA= Not Adequate, N= Neutral, A= Adequate

4.3.2 Ranking of Tacit Knowledge Types in Enhancing Researchers' Ability to Perform

A 5-point Likert scale (1=Not Useful, 2=Neutral, 3= Useful, 4=Strongly Useful, 5=Extremely Useful) was used in evaluating the extent to which each type of tacit knowledge was useful in enhancing researchers' ability to perform. The 1=Not Useful and 2=Neutral results were retained as such, while those for 3= Useful, 4=Strongly Useful, 5=Extremely Useful were combined to form the consolidated Useful opinion.

Table 4.8 : Types of Tacit Knowledge Ranking Based on their Usefulness in Enhancing Researchers' Ability to Perform

Types of Tacit Knowledge	Frequency			Percentage (%)			Rank
	Not Useful	Neutral	Useful	Not Useful	Neutral	Useful	
Cognitive Self-Motivation Tacit Knowledge	0	13	178	0.0	6.8	93.2	1
Collective Tacit Knowledge	0	20	171	0.0	10.5	89.5	2
Local Tacit Knowledge	1	28	162	0.5	14.7	84.8	3
Relational Tacit Knowledge	4	29	158	2.1	15.2	82.7	4
Global Tacit Knowledge	0	40	151	0.0	20.9	79.1	5

Cognitive self-motivation (93.2%) was the most useful type of tacit knowledge in enhancing researchers' ability to perform. This meant that researchers' ability to perform was most enhanced by the know-how of behaviors necessary for attaining self-drive. According to this finding, obtaining cognitive self-motivation tacit knowledge stimulated and strengthened the self-drive of most researchers, thus agreeing with Aswani (2018) that such drive enables employees to achieve goals and empower them with goal-directed behaviors. Further, this concurred with Waititu et al. (2017) that self-drive in employees enhances their ability to undertake agreed tasks and meet performance targets. Collective tacit knowledge (89.5%) was second in enhancing researchers' ability to perform. In this way, KALRO researchers gained tacit knowledge on how work in their fields is innovatively done and as put by Nkuruziza et al. (2016), employees' collective knowledge is a critical aspect in developing innovative and competitive products or services.

Local tacit knowledge was the third most useful at 84.8% in enhancing researchers' ability to perform. Researchers therefore acquired tacit knowledge on how to undertake specific short-term tasks at work and also achieve their own goals at individual level. This matched what Blume (2010) reported that employees' performance involves employee achieving their own goals and those of their organization aimed to realize a competitive advantage.

Relational tacit knowledge was the fourth most useful with 82.7% in enhancing researchers' ability to perform. This showed that researchers related well among themselves and acquired concealed know-how behind the various technologies and innovations developed in KALRO and this knowledge was useful in enhancing their performance. This resonated with what Collins (2010) indicated that concealed tacit knowledge such as that behind scientific discoveries is usually secretive and requires one who needs it to relate well with one who has it to effect its transfer.

Global tacit knowledge was fifth with 79.1% in enhancing researchers' ability to perform. In this way, this magnitude of researchers acquired tacit knowledge on how to align long-range objectives of their research projects with the bigger picture of the organization at individual level. This matched what Blume (2010) indicated that employees' performance is about employees achieving their individual goals and those of their organization.

4.3.3 Ranking of KALRO Performance Indicators based on how Researchers' Use of Tacit Knowledge Transfer Techniques Enabled their Achievement

A 5-point Likert scale (1=Not enabled, 2=Neutral, 3=Enabled, 4=Strongly Enabled, 5=Extremely Enabled) was used in evaluating the extent to which use of tacit knowledge transfer techniques enabled researchers to achieve KALRO's performance indicators. The 1=Not enabled and 2=Neutral results were retained as such, while those for 3=Enabled, 4=Strongly Enabled and 5=Extremely Enabled were combined to represent the enabled perception.

Table 4.9 : KALRO’s Performance Indicators’ Ranking Based on how Researchers’ Use of Tacit Knowledge Transfer Techniques Enabled their Achievement

Performance Indicators	Frequency			Percentage (%)			Rank
	Not Enabled	Neutral	Enabled	Not Enabled	Neutral	Enabled	
Management of Agricultural Research Projects	5	14	172	2.6	7.3	90.1	1
Writing Research Fund Winning Proposals	6	19	166	3.1	9.9	86.9	2
Agricultural Technologies and Innovations Generation	2	27	162	1	14.1	84.8	3
Knowledge, Information and Technologies (KIT) Packaging	4	26	161	2.1	13.6	84.3	4
Provision of Technical Services	5	38	148	2.6	19.9	77.5	5

As shown in Table 4.9, efficient management of agricultural research projects had 90.1% of respondents who indicated that tacit knowledge acquired from their use of TK transfer techniques empowered them to manage projects while 7.3% were neutral and 2.6% were not enabled. This majority (90.1%) agrees with Amollo and Omwenga (2017) who stated that projects are managed efficiently when those in-charge regularly update their tacit knowledge in the form of technical know-how and skills.

Writing research fund winning proposals had 86.9% of respondents who indicated that tacit knowledge acquired from their use of TK transfer techniques improved their ability to deliver this performance indicator while 9.9% were neutral and 3.1% were not enabled. The 86.9% majority concurs with what Murumba et al. (2020) found that tacit knowledge in form of technical know-how is an enabler in writing proposals that attract funds.

Agricultural technologies and innovations generation had 84.8% of respondents who indicated that tacit knowledge acquired from their use of tacit knowledge transfer techniques empowered them to achieve this performance indicator while 14.1% were neutral and 1% were not enabled. The 84.8% majority coincides with Kabiru (2015) who reported that knowledge generated in Nigerian Agricultural Research Institutes for instance were mainly on managing various crops and was produced through various formal and informal knowledge transfer techniques such as mentorship, conferences, annual review meetings, workshops and seminars.

Knowledge, Information and Technologies (KIT) Packaging had 84.3% of respondents who indicated that tacit knowledge acquired from their use of tacit knowledge transfer techniques enabled them to deliver this performance indicator while, 13.6% were neutral and 2.1% were not enabled. The 84.3% majority agreement coincides with Murumba et al., (2020) that among the deliverables tacit knowledge contributes to organizational performance include publications, collaborations and partnerships. Publications are both knowledge and information, and as put by Baguma (2016), social connections of collaborators in research are a component of knowledge.

On provision of technical services, 77.5% of respondents indicated that tacit knowledge they acquired from their use of tacit knowledge transfer techniques enabled them to deliver this performance indicator, 19.9% were neutral and 2.6% were not enabled. The 77.5% majority could have been because most respondents were enabled to provide knowledge that is in form of distilled and context-based information for addressing real life issues as defined by Igbinovia and Ikenwe (2017). In an agricultural research setting, researchers use their tacit knowledge to guide farmers on best practices including technical issues on farms. For instance as indicated by KALRO (2017-2018), researchers in KALRO Coffee Research Institute provided services on pesticides, soil and leaf analyses among others on maintenance of coffee farms.

4.3.4 Association between Tacit Knowledge and Researchers' Performance

The study found that performance of researchers and transfer of each type of tacit knowledge were significantly associated. In this association, all types of tacit knowledge as presented in Table 4.10, had a statistic significance of ($p=0.000$) while each of them had a different Chi-Square value. Cognitive Self-Motivation Tacit Knowledge had ($\chi^2=62.66$), Collective Tacit Knowledge ($\chi^2=53.78$), Global Tacit Knowledge ($\chi^2=48.70$), Local Tacit Knowledge ($\chi^2=79.30$) and Relational Tacit Knowledge ($\chi^2=46.77$). Transfer of these types of tacit knowledge was thus significantly associated with researcher's performance with their p -values being less than 0.05. In this way, each type of tacit knowledge transferred among researchers positively affected their performance and ultimately that of KALRO. This resonates with what Murumba et al.(2020) and Muthuveloo et al. (2017), who indicated that tacit knowledge is key in affecting organizational performance.

Table 4.10 : Association between Tacit Knowledge and Researchers' Performance

Transferred types of tacit knowledge	Chi-Square (X ²) Association Researchers' Performance	P≤Value
Local Tacit Knowledge	79.30	0.000***
Cognitive self-motivation Tacit Knowledge	62.66	0.000***
Collective Tacit Knowledge	53.78	0.000***
Global Tacit Knowledge	48.70	0.000***
Relational Tacit Knowledge	46.77	0.000***

*** - significant at p<0.001

4.4 Effect of Social and Organizational Factors on Tacit Knowledge Transfer

4.4.1 Effect of Social Factors on Tacit Knowledge Transfer Among Researchers

This study sought to evaluate the effect social factors have on tacit knowledge transfer among researchers at KALRO. The results were presented using frequency and percentages in Table 4.11. Respondents were subjected to a Likert perception test where they were required to choose one extent of agreement out of those provided in a 5-point Likert scale: 1=Not agree, 2=Neutral, 3=Agree, 4=Strongly agree, 5=Extremely agree. The Not agree and Neutral results were retained as such, while those for 3=Agree, 4=Strongly agree, 5=Extremely agree were combined to form a consolidated Agree opinion.

Table 4.11 : Percentages and Frequencies of Extent of Effect of Social Factors on Tacit Knowledge Transfer among Researchers

Variables	Frequency			Percentage (%)		
	Not Agree	Neutral	Agree	Not Agree	Neutral	Agree
Mutual Trust	15	17	159	7.9	8.9	83.2
Length of Service	21	22	148	11.0	11.5	77.5
Highest Education Level	15	36	140	7.9	18.8	73.3
Age	24	34	133	12.6	17.8	69.6
Language	54	39	98	28.3	20.4	51.3
Gender	57	55	79	29.8	28.8	41.4
Religion	119	46	26	62.3	24.1	13.6

As indicated in Table 4.11, about age, majority of the respondents at 69.6% agreed that older researchers transferred tacit knowledge more than their younger colleagues while 17.8% were neutral and 12.6% did not agree at all. This majority (69.6%) of respondents meant that older researchers who aged doing research in the organization, had more tacit knowledge which they transferred to younger colleagues. These results are in line with Collin (2004) who reported that the older workers are naturally deemed to have more tacit knowledge to transfer.

Education results indicated that 73.3% of the respondents agreed that KALRO researchers with higher education qualifications transferred tacit knowledge more than those with lower qualifications, 18.8% were neutral and 7.9% did not agree at all. Such a higher majority (73.3%) is attributed to agricultural researchers progressing to higher educational levels usually through collaborative research projects where as trainees, accumulate tacit knowledge from their experienced supervisors. Furthermore, in such projects, researchers with higher educational levels are usually the principal investigators (PIs) and transferors of tacit knowledge. Even in projects where these investigators are not PIs, they still give guidance and transfer tacit knowledge to the other researchers. In addition, researchers with higher levels of education are specific subject matter experts and usually called upon to share their experiences and expertise during After Action Reviews meetings for projects. This resonated with Liebowitz (2008) that After Action Reviews involve putting together a team that includes facilitators, writers, and subject matter experts. Furthermore, during Peer Assist Meetings for projects in agricultural research settings, relevant and experienced researchers with higher education qualifications, are usually invited to provide their tacit knowledge from their past research projects to benefit projects being initiated.

Gender had 41.4% of respondents who agreed that researchers of the same gender at KALRO, transferred tacit knowledge more to each other. However, 28.8% were neutral and 29.8% did not agree at all. These majority respondents at 41.4% indicated in their views generally that researchers of same gender at KALRO freely share, tended to cluster, easily approached each other, spent longer time together, talked to each other more, interacted frequently and related more freely. This being the case, tacit knowledge transfer was bound to be transferred more among same gender and this resonates with the socialization process of the Knowledge Spiral Model by Nonaka et al., (2000) on which this study is founded.

Language had 51.3% of the respondents who agreed that KALRO researchers who use the same language (technical or community) transferred tacit knowledge more among themselves than they did with other researchers while 20.4% were neutral and 28.3% did not agree at all. This large extent agreement at 51.3% was attributed to the fact that researchers of common technical or community language constituted an engaging environment for tacit knowledge transfer. This is in line with the reporting of Nakano et al. (2013) that tacit knowledge transfer or sharing is facilitated by an engaging environment where employees use a common language to share ideas and expertise.

Results for long service revealed that 77.5% of the respondents agreed that those among them who had served for long transferred tacit knowledge more than those with short service periods while 11.5% were neutral and 11% did not agree at all. This agreement to such a large extent meant that long serving researchers transferred their tacit knowledge to their colleagues with shorter periods of service especially during Peer Assist Meetings for starting projects and also during After Action Reviews. This is because long serving researchers with time begin to incline more on transferring their tacit knowledge to colleagues they will leave behind when they exit. This is in line with Holste and Fields (2010) who reported that an employee's tenure with an organization might reduce the tendency to use accumulated tacit knowledge and increase that of passing on such knowledge to others at work.

Results on mutual trust revealed that 83.2% of the respondents agreed that KALRO researchers transferred tacit knowledge depending on how they trusted each other, 8.9% were neutral and 7.9% did not agree at all. This result of majority of respondents at 83.2%, indicated that most researchers felt that transfer of tacit knowledge needed a reciprocation of trustworthiness on the side of recipients of the knowledge transferred to them. This resonated with Connelly et al. (2012) who indicated that tacit knowledge transfer freely happens in an engaging environment characterized by openness and trust that facilitate reciprocal tacit knowledge transfer.

For religion, 62.3 % of the respondents did not agree at all that KALRO researchers of the same religion transferred tacit knowledge more to each other. This higher percentage of disagreement meant that religion did not play any much role in determining which researcher should be in which research programme, seminar, workshop, conference or any other avenue for tacit knowledge transfer.

4.4.2 Effect of Organizational Factors on Tacit Knowledge Transfer Among Researchers

The study sought to evaluate the effect of organizational factors on tacit knowledge transfer among KALRO researchers. Respondents were subjected to a Likert perception test where they were required to choose one extent of agreement out of those provided in a 5-point Likert scale: 1=Not agree, 2=Neutral, 3=Agree, 4=Strongly agree, 5=Extremely agree. The Not agree and Neutral results were retained as such, while those for 3=Agree, 4=Strongly agree, 5=Extremely agree were combined to form a consolidated Agree opinion.

Table 4.12 : Percentages and Frequencies of Extent of Effect of Organizational Factors on Tacit Knowledge Transfer

Variables	Frequency			Percentage (%)		
	Not Agree	Neutral	Agree	Not Agree	Neutral	Agree
ICT	7	30	154	3.7	15.7	80.6
Space	13	33	145	6.8	17.3	75.9
Senior Management Commitment	21	56	114	11.0	29.3	59.7
Policy	28	54	109	14.7	28.3	57.1
Job designation	47	44	100	24.6	23.0	52.4
Distance	65	33	93	34.0	17.3	48.7
Reward System	85	56	50	44.5	29.3	26.2

Distance had 34% of respondents who did not agree that distance hindered tacit knowledge transfer among KALRO researchers, 17.3% were neutral while 48.7% agreed that distance between far-apart KALRO centers hindered one-on-one transfer of tacit knowledge. Those who did not see distance as a hindrance were in line with Jain (2006) who reported that ICT can be used to pass on tacit knowledge. This is because ICT functionalities such as organizational Wide Area Network (WAN) can facilitate tacit knowledge transfer among staff.

Reward system had 44.5% of the respondents who did not agree that this system at KALRO motivated researchers to transfer tacit knowledge among themselves, 29.3% were neutral while those who agreed were 26.2%. In such a scenario with respondents who did not agree at all being almost 45% and those who were neutral nearing 30%, the reward system was not positive enough to encourage researchers to transfer tacit knowledge among themselves as they should. This resonates with Murumba et al. (2020) that inadequate reward systems characterized by absence of formal reward structure negatively affect the performance of the employees.

Information and Communication Technology (ICT) had majority respondents at 80.6% who agreed that KALRO's organizational ICT including email, network and internet connection facilitated them in transferring tacit knowledge among themselves. This matches with what Panahi et al. (2013) proposed that ICT tools that support chatting, video, and text message conferencing can facilitate the transfer of tacit knowledge. Further, it is in line with, Cumberland and Githens (2012) who found that online ICT tools that enable people to discuss may help in tacit knowledge transfer. Some researchers at 3.7% did not agree that tacit knowledge can be effectively transferred through ICT and 15.7% were neutral.

Job designation had 24.6% of respondents who did not agree at all, 23% were neutral while 52.3% agreed that designations at KALRO encouraged the transfer of tacit knowledge among researchers. Respondents who did not agree at all indicated that most researchers were not well placed according to the employee establishment even though they transferred tacit knowledge based on one's free will. They too indicated that researchers in higher positions did not transfer tacit knowledge to their colleagues in lower positions. This resonated with the study done by Ardichvili, et al. (2006), where they reported that both the top and middle managers did not participate in knowledge sharing efforts

Policy had 14.7% respondents who did not agree at all, 28.3% were neutral while 57.1% agreed that KALRO's knowledge management policy called on researchers to transfer tacit knowledge among themselves. Most of the 14.7% who did not agree at all with their views, indicated that they were not aware of the KALRO's Tacit Knowledge Transfer Management Policy that was yet to be communicated to them. This therefore, indicated that there was need to communicate about this policy at research centers. This is because as put by Murumba et al. (2020), absence of policies on tacit knowledge management negates the undertaking of the activities involved in application and use of tacit knowledge.

Senior Management had 11% respondents who did not agree at all, 29.3% who were neutral and 59.7% who agreed that KALRO senior management was committed to ensuring researchers transferred tacit knowledge among themselves. Notably, respondents who were of a dissenting view, indicated that senior management was yet to do more about tacit knowledge transfer requirements such as mentorship program, a working reward system and ensuring avenues such as conferences where tacit knowledge can be transferred are held as necessary.

Space had 6.8% respondents who did not agree at all, 17.3% who were neutral and 76% who agreed that KALRO provided and demarcated various spaces where researchers could schedule avenues for transferring tacit knowledge among themselves. This provision of space was in line with what Reyhav and Te'eni (2009) reported that provision of space would include demarcating rooms for specific formal use and others for informal settings including social events and coffee break. However, researchers who dissented, raised a common and general issue that not all research centers had adequate space or rooms to hold sizeable seminars and conferences. Due to such a shortfall, the affected centers could not hold regular meetings to pass on tacit knowledge among themselves.

4.4.3 Association between Social, and Organizational Factors and Performance of Researchers

As indicated in Table 4.13, there was an association ($\chi^2 = 21.121$) between social factors and performance of researchers with a statistic significance of ($p=0.05$). Furthermore, there was an association ($\chi^2=27.580$) between organizational factors and performance of researchers with a statistic significance of ($p=0.001$). This meant that a significant positive association existed between these factors and the performance of KALRO researchers since their *p-values* were not greater than 0.05.

Table 4.13 : Association between Social, and Organizational Factors and Researchers' Performance

Social and Organizational Factors	Chi-Square (X^2) Association Researchers' Performance	P≤Value
Social Factors	21.12	0.05*
Organizational Factors	27.58	0.001***

*- significant at $p<0.05$, *** - significant at $p<0.001$

Social and organizational factors affect researchers' performance by affecting how researchers pass on tacit knowledge among themselves. Organizational members create new tacit knowledge as they interact (Mucui, 2018). In this way, this enhances their performance. Furthermore, favorable social and organizational factors lead to improved performance among staff. For instance, as put by Murumba et al. (2020), an adequate reward system encourages improved performance among employees.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Study

Agricultural sector forms the backbone of the global economy and its success is attributable to research supported by tacit and explicit knowledge from agricultural researchers. Explicit knowledge is documented knowledge while tacit knowledge is knowledge in minds of people and its types include collective, relational, local, global and cognitive self-motivation know-how. Tacit knowledge is key in managing the culture and performance of agricultural research organizations particularly when researchers pass it on among themselves.

However, previous studies indicated minimal output by agricultural researchers' use of tacit knowledge transfer techniques in passing on of technologies and knowledge. In addition, there was inadequate information on KALRO researchers' use of tacit knowledge transfer techniques and its effect on their performance. Further, the information on the effect of social and organizational factors on tacit knowledge transfer among KALRO researchers was also minimal. This study sought to appraise the effect of use of tacit knowledge transfer techniques on organizational performance of KALRO researchers. The specific objectives of this study were: (1) to assess the effect of using tacit knowledge transfer techniques on performance of KALRO researchers and (2) to evaluate the effect of social and organizational factors on tacit knowledge transfer among KALRO researchers. The research questions that addressed these objectives were: (i) What is the effect of use of tacit knowledge transfer techniques on performance of KALRO researchers? (ii) What is the effect of social and organizational factors on the transfer of tacit knowledge among KALRO researchers?

This study adopted a descriptive survey research design and was done in KALRO research centers, where it targeted 402 researchers among whom a sample size of 201 was derived using Yamane (1967) formula. Cluster sampling procedure was used since KALRO centers already existed as clusters dispersed across the country. Each center or cluster's proportionate sample size was derived by multiplying its population by a sample ratio (computed by dividing the sample size of 201 by the target population of 402 researchers). A semi-structured questionnaire was used to collect data. The first specific objective was achieved by collecting

data on the extent to which researchers used various tacit knowledge transfer techniques to pass on different types of tacit knowledge to each other, and the extent to which researchers were enabled by tacit knowledge tacit knowledge acquired during this process to achieve KALRO's performance indicators. Researchers were subjected to a Likert perception test where they were asked to indicate (on a 5-point Likert scale: 1=Not Adequate, 2=Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate), the extent to which the transfer techniques they used were adequate in passing on tacit knowledge to each other. The Not Adequate and Neutral results were retained as such, while those for 3= Adequate, 4=Very Adequate, 5=Extremely Adequate were combined to form the consolidated Adequate opinion. Further, researchers were subjected to a Likert perception test where they were asked to indicate the extent to which they were enabled by tacit knowledge to deliver on KALRO's performance indicators on a 5-Point Likert scale: 1=Not enabled, 2=Neutral, 3=Enabled, 4=Strongly Enabled, 5=Extremely Enabled. The Not Enabled and Neutral results were retained as such, while those for 3=Enabled, 4=Strongly Enabled, 5=Extremely Enabled were combined to form overall Enabled opinion. Data was then analyzed in SPSS computer package and results presented using frequencies and percentage in tables. Chi-Square test was used to establish the nature of association that existed between tacit knowledge transfer and performance of researchers. The second specific objective was achieved by collecting data on the extent to which researchers agreed social and organizational factors affected their transfer of tacit knowledge to each other. Researchers were subjected to a Likert perception test where they were asked to indicate their extent of agreement on a 5-point Likert scale: 1=Not agree, 2=Neutral, 3=Agree, 4=Strongly agree, 5=Extremely agree. The Not Agree and Neutral results were retained as such, while those for 3=Agree, 4=Strongly Agree, 5=Extremely Agree were combined to form the consolidated Agree opinion. Data was analyzed in SPSS computer package with results presented using tabulated frequencies and percentages. Chi-Square test was used to establish the nature of association that existed between social and organizational factors, and researchers' performance.

5.2 Conclusion

The study concluded that agricultural researchers' use of tacit knowledge transfer techniques enhances their ability to perform and empowers them to achieve the performance indicators of their organization. Cognitive Self-Motivation know-how is the most useful type of tacit knowledge in enhancing researchers' ability to perform (93.2%), followed by Collective know-how (89.5%), Local know-how (84.8%), Relational know-how (82.7%) and Global know-how (79.1%). Collaborative research, workshops and seminars are the most adequate techniques for

passing on the types of tacit knowledge and empowering agricultural researchers. The three performance indicators whose achievement by researchers is most enabled by tacit knowledge acquired through the use of tacit knowledge transfer techniques are, management of agricultural research projects (90.1%), writing research fund winning and proposals (86.9%), and Agricultural Technologies and Innovations Generation (84.8%). Furthermore, results indicated a significant positive association existing between transfer of tacit knowledge types (all with p-value of $p=0.000$) and researchers' performance.

Further, this study concludes that most of the social and organizational factors encourage tacit knowledge transfer among KALRO researchers. Mutual trust (83.2%), length of service (77.5%), highest level of education (77.3%), age (69.6%) and language (51.3%) are the social factors that support tacit knowledge transfer among KALRO researchers, while organizational factors are ICT (80.6%), space (75.9%), senior management commitment (59.7%), policy (57.1%), and job designation (52.4%). Notably, results showed that KALRO reward system lowly supported tacit knowledge transfer among researchers at 26.2%. The study further concludes that a positive significant association exists between social factors and researchers' performance at ($x^2=21.12$) with a p-value of ($p=0.05$) and organizational factors at ($x^2=27.58$) with a p-value of ($p=0.001$) respectively, hence these factors affect the manner in which the researchers perform.

5.3 Recommendations

a) Encourage More Use of Most Employed Tacit Knowledge Techniques

There is need to encourage more use of the most employed techniques in management of agricultural research projects and writing of research fund winning proposals through use of workshops and seminars. Since collaborative research, workshops and seminars are the top three most adequate techniques for passing on tacit knowledge to enhance researchers' ability to perform, agricultural research organizations would benefit from their use.

b) Inspiring Younger Researchers in Participatory Use of Tacit Knowledge

Younger researchers need to be inspired in participatory use of tacit knowledge in acquiring past technologies and innovations by use of collaborative research, workshops and seminars. When younger researchers are involved in this process, they can acquire tacit knowledge from their older colleagues during research.

c) Policy Implication

Knowledge on use of tacit knowledge transfer techniques in enhancing researchers' ability to achieve their agricultural research organizations' performance indicators is a key resource for policy makers. In this way, policy makers in these organizations can ensure researchers apply the most used and adequate techniques for transferring tacit knowledge, such as collaborative research, workshops and seminars.

d) Enhance further the social and organizational factors to optimize TK transfer

There is need to enhance further the social and organizational factors that encourage tacit knowledge transfer among KALRO researchers.

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APPENDICES

Appendix 1: Letter of Introduction

I am a student at the University of Nairobi taking a Master of Science degree in Agricultural Information and Communication Management. My research project is titled “An Analysis of Effect of Use of Tacit Knowledge Transfer Techniques on Organizational Performance of Kenya Agricultural and Livestock Research Organization Researchers”.

Agricultural research organizations facing dwindling researcher numbers amidst absence of optimal tacit knowledge transfer among their researchers, risk having less of the tacit knowledge they need to ensure continued performance improvement in their research efforts. KALRO is one such organization which although has done well with tacit to explicit knowledge transfer using documentation technique, was yet to know how use of transfer techniques has affected organizational performance of its researchers. KALRO therefore needs to know the extent to which so far, its researchers use these techniques in transferring tacit knowledge among themselves and how this affects their organizational performance. Furthermore, KALRO needs to know the extent to which social and organizational factors affect tacit knowledge transfer among its researchers. This will thus provide the missing information KALRO needs to ensure researchers effectively use these techniques to transfer tacit knowledge to each other to ultimately attain improved organizational performance.

This therefore is to request you to fill the questionnaire that follows to enable me have data I need to use in this study. Your participation in this exercise is highly appreciated and the facts you provide will be used for academic purpose only and treated as absolutely confidential.

Thank you in advance for your time.

Yours faithfully,



Henry Wanyama Nderema

Appendix 2: Research Questionnaire

PART I: PERSONAL INFORMATION

1.1 Please indicate your gender/sex Male Female

1.2 Please tick your job designation:

Research Scientist Principal Research Scientist

Research Scientist II Senior Principal Research Scientist

Research Scientist 1 Chief Research Scientist

Senior Research Scientist

Other(Specify_____)

1.3 Indicate your highest level of education

BSc. Masters PhD

1.4 For how long have you been doing research? (Number of years) _____

PART II: USE OF TACIT KNOWLEDGE TRANSFER TECHNIQUES/AVENUES

Tacit knowledge is knowledge people accumulate in their minds over the years as they go about various activities and manifests in forms such as skills, technical know-how, expertise and experience. It is this knowledge that enables a person to give dynamic responses to context-specific issues in life and at the work place. Tacit knowledge is of various types which in agricultural research organizations can be transferred from researcher to researcher through techniques or avenues such as After Action Reviews, Collaborative Research, Communities of Practice, Job rotation during research, Knowledge Interviews, Mentorship, Peer Assist Meetings, Retrospective meetings, Seminars, Staff meetings, Storytelling and Workshops.

NB: PLEASE INDICATE YOUR RESPONSES IN CONTEXT OF KALRO

2.1 Indicate the extent to which you have found each of the techniques/avenues below to be adequate as you use them in giving to or receiving from fellow researchers the TACIT KNOWLEDGE ON HOW A RESEARCHER CAN MOTIVATE HIMSELF/HERSELF TO ATTAIN SUPERIOR PERFORMANCE IN RESEARCH.

1=Not Adequate, 2= Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate

NB: Please TICK in the corresponding square bracket for your choice below:

Tacit knowledge transfer techniques/avenues		Type in One				
		1	2	3	4	5
1	After Action Reviews (meetings where the course of research activities is adjusted)	[]	[]	[]	[]	[]
2	Collaborative Research	[]	[]	[]	[]	[]
3	Communities of Practice (forums for researchers to share knowledge)	[]	[]	[]	[]	[]
4	Job rotation during research	[]	[]	[]	[]	[]
5	Knowledge Interviews (sessions where researchers are interviewed for their tacit knowledge while still at work or at their exit)	[]	[]	[]	[]	[]
6	Mentorship	[]	[]	[]	[]	[]
7	Peer Assist Meetings (where researchers share their past research experiences to benefit new projects)	[]	[]	[]	[]	[]
8	Retrospective meetings (these include end of project gatherings where researchers share knowledge)	[]	[]	[]	[]	[]
9	Seminars	[]	[]	[]	[]	[]
10	Staff meetings	[]	[]	[]	[]	[]
11	Storytelling (informal sessions where researchers converse about their work)	[]	[]	[]	[]	[]
12	Workshops	[]	[]	[]	[]	[]

2.2 To what extent have you found each of the techniques/avenues below to be adequate as you use them in giving to or receiving from fellow researchers the TACIT KNOWLEDGE ON HOW WORK IN YOUR RESEARCH AREA OR DISCIPLINE IS DONE?

1=Not Adequate, 2= Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate

NB: Please TICK in the corresponding square bracket for your choice below:

Tacit knowledge transfer techniques/avenues		Type in One				
		1	2	3	4	5
1	After Action Reviews (meetings where the course of research activities is adjusted)	[]	[]	[]	[]	[]
2	Collaborative Research	[]	[]	[]	[]	[]
3	Communities of Practice (forums for researchers to share knowledge)	[]	[]	[]	[]	[]
4	Job rotation during research	[]	[]	[]	[]	[]
5	Knowledge Interviews (sessions where researchers are interviewed for their tacit knowledge while still at work or at their exit)	[]	[]	[]	[]	[]
6	Mentorship	[]	[]	[]	[]	[]
7	Peer Assist Meetings (where researchers share their past research experiences to benefit new projects)	[]	[]	[]	[]	[]
8	Retrospective meetings (these include end of project gatherings where researchers share knowledge)	[]	[]	[]	[]	[]
9	Seminars	[]	[]	[]	[]	[]
10	Staff meetings	[]	[]	[]	[]	[]
11	Storytelling (informal sessions where researchers converse about their work)	[]	[]	[]	[]	[]
12	Workshops	[]	[]	[]	[]	[]

2.3 Kindly indicate the extent to which you have found each of the techniques/avenues below to be adequate as you use them in giving to or receiving from fellow researchers the TACIT KNOWLEDGE ON HOW TO ALIGN LONG RANGE OBJECTIVES OF RESEARCH PROJECTS WITH THE BIGGER PICTURE OF KALRO.

1=Not Adequate, 2= Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate

NB: Please TICK in the corresponding square bracket for your choice below:

Tacit knowledge transfer techniques/avenues		Type in One				
		1	2	3	4	5
1	After Action Reviews (meetings where the course of research activities is adjusted)	[]	[]	[]	[]	[]
2	Collaborative Research	[]	[]	[]	[]	[]
3	Communities of Practice (forums for researchers to share knowledge)	[]	[]	[]	[]	[]
4	Job rotation during research	[]	[]	[]	[]	[]
5	Knowledge Interviews (sessions where researchers are interviewed for their tacit knowledge while still at work or at their exit)	[]	[]	[]	[]	[]
6	Mentorship	[]	[]	[]	[]	[]
7	Peer Assist Meetings (where researchers share their past research experiences to benefit new projects)	[]	[]	[]	[]	[]
8	Retrospective meetings (these include end of project gatherings where researchers share knowledge)	[]	[]	[]	[]	[]
9	Seminars	[]	[]	[]	[]	[]
10	Staff meetings	[]	[]	[]	[]	[]
11	Storytelling (informal sessions where researchers converse about their work)	[]	[]	[]	[]	[]
12	Workshops	[]	[]	[]	[]	[]

2.4 To what extent have you found each of the techniques/avenues below to be adequate as you use them in giving to or receiving from fellow researchers the TACIT KNOWLEDGE ON HOW TO ACCOMPLISH ASSIGNED SHORT-TERM TASKS SUCH AS SPECIFIC OBJECTIVES OF RESEARCH PROJECTS?

1=Not Adequate, 2= Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate

NB: Please TICK in the corresponding square bracket for your choice below:

Tacit knowledge transfer techniques/avenues		Type in One				
		1	2	3	4	5
1	After Action Reviews (meetings where the course of research activities is adjusted)	[]	[]	[]	[]	[]
2	Collaborative Research	[]	[]	[]	[]	[]
3	Communities of Practice (forums for researchers to share knowledge)	[]	[]	[]	[]	[]
4	Job rotation during research	[]	[]	[]	[]	[]
5	Knowledge Interviews (sessions where researchers are interviewed for their tacit knowledge while still at work or at their exit)	[]	[]	[]	[]	[]
6	Mentorship	[]	[]	[]	[]	[]
7	Peer Assist Meetings (where researchers share their past research experiences to benefit new projects)	[]	[]	[]	[]	[]
8	Retrospective meetings (these include end of project gatherings where researchers share knowledge)	[]	[]	[]	[]	[]
9	Seminars	[]	[]	[]	[]	[]
10	Staff meetings	[]	[]	[]	[]	[]
11	Storytelling (informal sessions where researchers converse about their work)	[]	[]	[]	[]	[]
12	Workshops	[]	[]	[]	[]	[]

2.5 Indicate the extent to which you have found each of the techniques/avenues below to be adequate as you use them in giving to or receiving from fellow researchers the TACIT KNOWLEDGE BEHIND SCIENTIFIC SECRETS OR DISCOVERIES SUCH AS AGRICULTURAL TECHNOLOGIES AND INNOVATIONS.

1=Not Adequate, 2= Neutral, 3= Adequate, 4=Very Adequate, 5=Extremely Adequate

NB: Please TICK in the corresponding square bracket for your choice below:

Tacit knowledge transfer techniques/avenues		Type in One				
		1	2	3	4	5
1	After Action Reviews (meetings where the course of research activities is adjusted)	[]	[]	[]	[]	[]
2	Collaborative Research	[]	[]	[]	[]	[]
3	Communities of Practice (forums for researchers to share knowledge)	[]	[]	[]	[]	[]
4	Job rotation during research	[]	[]	[]	[]	[]
5	Knowledge Interviews (sessions where researchers are interviewed for their tacit knowledge while still at work or at their exit)	[]	[]	[]	[]	[]
6	Mentorship	[]	[]	[]	[]	[]
7	Peer Assist Meetings (where researchers share their past research experiences to benefit new projects)	[]	[]	[]	[]	[]
8	Retrospective meetings (these include end of project gatherings where researchers share knowledge)	[]	[]	[]	[]	[]
9	Seminars	[]	[]	[]	[]	[]
10	Staff meetings	[]	[]	[]	[]	[]
11	Storytelling (informal sessions where researchers converse about their work)	[]	[]	[]	[]	[]
12	Workshops	[]	[]	[]	[]	[]

PART III: EFFECT OF USE OF TACIT KNOWLEDGE TRANSFER TECHNIQUES ON KALRO'S PERFORMANCE INDICATORS

3. Indicate the extent your use of tacit knowledge transfer techniques adequately enables you to deliver KALRO's performance indicators below:

1=Not Adequate, 2=Neutral, 3= Adequate, 4=Strongly Adequate, 5=Extremely Adequate

NB: Please TICK in the corresponding square bracket for your choice below:

KALRO's performance indicators		Tick in One				
		1	2	3	4	5
3.1	Generation of Agricultural Technologies and Innovations	[]	[]	[]	[]	[]
3.2	Provision of Technical Services such as soil testing and others	[]	[]	[]	[]	[]
3.3	Packaging and provision of Knowledge, Information and Technologies (KIT) on Agricultural Products	[]	[]	[]	[]	[]
3.4	Writing proposals which win donor funding for research	[]	[]	[]	[]	[]
3.5	Efficient management of agricultural research projects	[]	[]	[]	[]	[]

PART IV: SOCIAL FACTORS

4.0 With respect to the effect of social factors on transfer of tacit knowledge from researcher to researcher at KALRO, indicate the extent to which you agree with the following statements

NB: PLEASE KEEP YOUR RESPONSES TO TACIT KNOWLEDGE TRANSFER BETWEEN KALRO RESEARCHERS AND NOT BETWEEN KALRO RESEARCHERS AND OUTSIDERS

NB: Please TICK in the corresponding square bracket for your choice below:

4.1 **Older** researchers in KALRO transfer tacit knowledge more than their younger colleagues

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
 [] [] [] [] []

4.1.1 Give your brief view on how age affects transfer of tacit knowledge from researcher to researcher at KALRO

4.2 KALRO researchers with higher education qualifications transfer tacit knowledge more than those with lower qualifications

1 = Not agreed [] 2 = Neutral [] 3 = Agree [] 4 = Strongly agree [] 5 = Extremely agree []

4.2.1 Give your brief view on how education level affects transfer of tacit knowledge from researcher to researcher at KALRO

4.3 Researchers of the same **gender/sex** at KALRO, transfer tacit knowledge more to each other

1 = Not agree [] 2 = Neutral [] 3 = Agree [] 4 = Strongly agree [] 5 = Extremely agree []

4.3.1 Give your brief view on how **gender/sex** affects transfer of tacit knowledge from researcher to researcher at KALRO:

4.4 KALRO researchers who use the same **language** (technical or community) transfer tacit knowledge more among themselves than they do with other researchers

1 = Not agree [] 2 = Neutral [] 3 = Agree [] 4 = Strongly agree [] 5 = Extremely agree []

4.4.1 Give your brief view on how the issue of researchers who use the same **language** (technical and community language) affects transfer of tacit knowledge from researcher to researcher at KALRO:

4.5 KALRO researchers with long service transfer tacit knowledge more than those with short service periods

1 = Not agree [] 2 = Neutral [] 3 = Agree [] 4 = Strongly agree [] 5 = Extremely agree []

4.5.1 Give your brief view on how a researcher's **length of service** affects transfer of tacit knowledge from researcher to researcher at KALRO:

4.6 KALRO researchers transfer tacit knowledge among themselves based on **mutual trust**

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

4.6.1 Give your brief view on how **mutual trust** affects transfer of tacit knowledge from researcher to researcher at KALRO

4.7 KALRO researchers of the same **religion** transfer tacit knowledge more to each other than they do to the others

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

4.7.1 Give your brief view on how **religion** affects transfer of tacit knowledge from researcher to researcher at KALRO.

PART V: ORGANIZATIONAL FACTORS

With respect to the effect of organizational factors on transfer of tacit knowledge from researcher to researcher in KALRO, indicate the extent to which you agree with the following statements:

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree

PLEASE KEEP YOUR RESPONSES TO TACIT KNOWLEDGE TRANSFER OR SHARING BETWEEN KALRO RESEARCHERS AND NOT BETWEEN KALRO RESEARCHERS AND OUTSIDERS

NB: Please TICK in the corresponding square bracket for your choice below:

5.1 Distance between KALRO research centers does not favor transfer of tacit knowledge transfer from research to researcher.

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

5.1.1 Give your view on how the **distance** between KALRO research centers affects the transfer of tacit knowledge among researchers

5.2 KALRO's reward system motivates researchers to transfer tacit knowledge among themselves

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

5.2.1 Give your view on how KALRO's **reward system** affects tacit knowledge transfer among its researchers:

5.3 KALRO's organizational ICT including the email, network and internet connection facilitates researchers to transfer tacit knowledge to each other.

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

5.3.1 Give your brief view on how KALRO's **organizational ICT** affects tacit knowledge transfer among KALRO researchers

5.4 Job designation encourages the transfer of tacit knowledge among KALRO researchers

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

5.4.1 Give your brief view on how **job designation** affects tacit knowledge transfer among KALRO researchers

5.5 KALRO's knowledge management **policy or strategy** calls on researchers to transfer tacit knowledge among themselves and connects this process with the organizational goal and communicates the benefits thereof to researchers and the entire organization.

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

5.5.1 Give your brief view on how KALRO's Knowledge Management **Policy or Strategy** affects tacit knowledge transfer among its researchers

5.6 KALRO **senior management** is committed to ensuring researchers transfer tacit knowledge among themselves

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

5.6.1 Give your brief view on how commitment by KALRO **senior management** towards tacit knowledge transfer among researchers affects this process

5.7 KALRO provides **space** including rooms and other venues from where researchers can transfer tacit knowledge among themselves

1 = Not agree 2 = Neutral 3 = Agree 4 = Strongly agree 5 = Extremely agree
[] [] [] [] []

5.7.1 Give your view on how **space** including rooms and other venues provided by KALRO affects tacit knowledge transfer among its researchers

Questionnaire completed on (date) _____

THANK YOU FOR YOUR PARTICIPATION