



Knowledge Sharing Strategies between Coffee Farmers and Coffee Research Institute: A Case Study of Gitwe Farmers' Co-Operative Society

Elizabeth Kabita

*Coffee Research Institute
kabitaelizabeth@gmail.com*

Tom Kwanya

*The Technical University of Kenya
tkwanya@tukenya.ac.ke*

Tabitha Mbenge-Ndiku

*Coffee Research Institute
tabbmbenge68@gmail.com*

Purpose: This paper assesses the knowledge sharing strategies used by members of Gitwe Farmers' Cooperative Society and Coffee Research Institute in Kenya. The specific objectives of the study were to: establish the types of knowledge shared; examine the knowledge sharing methods; investigate the extent to which the knowledge shared is applied; analyse the factors that influence knowledge sharing between the farmers and the research institute; and to suggest measures to enhance knowledge sharing between them.

Study design/methodology/approach: Knowledge sharing involves the exchange of knowledge in the form of expertise or skills among groups, friends, families, communities or organisations. The population of the study was 2181 consisting of coffee farmers, officials of Gitwe Farmers' Co-operative Society and officers from the Coffee Research Institute. The study employed a mixed methods research approach. Qualitative data was collected through interviews while quantitative data was collected using questionnaires. Qualitative data was analysed thematically while quantitative data was analysed by descriptive statistics using Statistical Package for Social Studies (SPSS).

Findings: The findings have demonstrated that the farmers and the institute currently share knowledge through a mixed array of methods. However, several challenges hinder the effective use of these knowledge sharing strategies. It was also observed that currently, the symmetry of knowledge flow is lopsided since the Coffee Research Institute shares much more than it receives from the farmers. These challenges should be addressed if the farmers are to benefit optimally from the knowledge generated by the Coffee Research Institute.

Originality/value: The findings of this study if adopted are likely to improve the coffee farming methods by the farmers, improve coffee marketing strategies by the farmers and also manage coffee berry diseases, among others.

Keywords: Knowledge sharing, knowledge management, coffee research, coffee farmers, Gitwe, Kenya

Introduction

Knowledge is basically information possessed in the mind of individuals; the skills and expertise acquired by a person through education or experience. According to Alavi and Leidner (2001), knowledge is considered as information that is personalised and which relates to procedures, concepts, observations, facts, judgements and interpretations. Knowledge comprises developed skills, attitude and cumulative experiences which enables systematic, effective and reliable performance of functions by individuals. Knowledge can be categorised into two major categories. The first category is explicit knowledge which encompasses the rational, objective and technical materials like procedures, documents and software. Such knowledge can easily be documented, transferred, learned and taught. The second category is tacit knowledge which in its domain is learning that is usually experiential, subjective and

cognitive. This knowledge is strongly personal and thus is hard to transfer, formalise, learn, teach and document. Additionally, it involves a lot of human interpretation and resides in the mind of people (Kwanya et al., 2015a).

According to Mwang'ombe et al. (2008), knowledge is considered as particularly key within the sector of agriculture. Facilitating access to relevant knowledge for the farming community aids in enhancing productivity in addition to increased returns. Janus (2016) states that agricultural practice needs to be supported by information and knowledge from modern agriculture, failure to which households, which are agriculturally-reliant, are likely to be limited resulting to low productivity. In the Kenyan environment, generation of new information and knowledge on agriculture and availing it to be utilised by smallholder farmers is significant in the promotion of suitable incomes and reduction of poverty.

Agricultural knowledge is created from indigenous and modern sources. Universities and institutions of research create modern knowledge while tacit or indigenous knowledge is generated from the farming communities. The agricultural knowledge produced from such sources is deposited in different forms before being disseminated to users like rural farmers during exhibitions, trainings, field visits, publications and information communication technology (ICT) platforms (Janus, 2016). The value of this knowledge is fully realised when it is shared with the stakeholders (Davenport & Prusak, 1998; El Sawy et al., 2000).

Davenport and Prusak (1998) explain that productivity in agriculture depends on the generation and application of scientific knowledge and technologies and effectively applying them in the production system. The solution to increasing agricultural productivity relies upon the ability to generate, disseminate and share key information to communities involved in farming. For effective development and implementation of new techniques of production and new ways of working and thinking in agriculture, the sharing and application of agricultural knowledge from research in farming is essential. Knowledge recipients need to apply the newly acquired knowledge in their farming practice. It is on this basis that a need arises to establish the linkage between the users of agricultural knowledge, or the farmers, and the research institutions, such as the Coffee Research Institute (CRI), which are the sources of scientific agricultural knowledge. In fact, the CRI was established in Kenya in 1944 to support coffee farmers to deal with coffee farming challenges which require scientific knowledge and technology to resolve. Some of the challenges include diseases such as coffee berry diseases and coffee leaf rust; best methods of farming; and marketing of coffee produce (Clifford, 2012).

Most of the challenges facing coffee farmers in Kiambu County, particularly Gitwe Farmers' Cooperative Society members, may be attributed to not knowing the types of knowledge generated by CRI which can assist them to improve their agricultural practices. The other challenge is farmers not knowing the varieties to grow so as to reduce costs and improve their production. For instance, the majority of the farmers grow SL28 and SL34 which are not resistant to both coffee berry disease and coffee leaf rust. Methods used by coffee farmers to share knowledge effectively as well as the evaluation mechanisms of the knowledge might pose challenges too. Coffee farmers will be encouraged to make use of the knowledge disseminated by CRI and Gitwe if there was an interactive engagement mechanism for knowledge sharing and diffusion. To sum it all, the major challenge has been the inability to access and share the right knowledge by the coffee farmers and the CRI in a timely manner.

This paper assesses the knowledge sharing strategies used by members of Gitwe Farmers' Cooperative Society and the CRI in Kenya. Therefore, it is structured around the key themes of the topic. These themes include the contextual background of the cooperative, rationale of the study, review of relevant literature, research methodology, findings, discussion and interpretation of the findings, conclusions and recommendations.

Contextual background

Gitwe Farmers' Cooperative Society is located in Gatundu South, Kiambu County on the slopes of the Aberdares with an altitude ranging between 1700m and 1900m, making the area suitable for Arabica coffee. It was registered in 1995 under the Cooperative Societies after splitting from the giant Gatundu Farmers' Cooperative Society. Initially, the society had two coffee factories, Karatu and Karinga. The society was originally registered with a membership of 560 but has grown to 2,674 members (Gitwe, 2020). Currently, it has three factories, namely, Karatu, Karinga and Kibiru. The head office of the society is situated at Karatu Coffee Factory. Ninety-nine percent (99%) of the coffee grown by the members is of SL 28 and SL 34 varieties. Nonetheless, lately, they have also started planting the disease-resistant Ruiru11 and Batian (Gitwe, 2020). In 2016, Karatu factory scooped the Global Foods Award of America for having the best quality coffee followed by Karinga factory (Lesak, 2016). It is noteworthy that both factories are owned by Gitwe Farmers' Cooperative Society. In the year 2017/2018, Gitwe had a cherry production of 722,946 kg and paid the farmers 80.40 Kenya shillings per kilo. They scooped an award for outstanding cooperative society from the Coffee Directorate. Gitwe was certified in 2013 by Common Code for Coffee Community (4Cs) in Kenya. This therefore gives it an opportunity to market its coffee directly (Gitwe, 2020).

The CRI is responsible for coffee research under the mandate of the Kenya Agricultural and Livestock Research Organisation (KALRO). The institute gives recommendations in relation to good agricultural practices and processes. The institute conducts research that ensures sustainability of production through value addition and climate mitigation. For instance, the institute developed two improved coffee varieties, namely, Ruiru 11 and Batian, through the research. These varieties are resistant to coffee berry and leaf rust diseases. These innovations, among others, need to get to the farmers in a timely and most appropriate way to help them to improve the quantity and quality of their produce thereby improving their livelihood.

Rationale of the study

The need for information on agriculture, particularly on coffee farming, is of necessity to farmers as it is pivotal in raising their level of knowledge and aids them in decision making on matters relevant to coffee farming, marketing and other related aspects. The knowledge from CRI, if strategically shared, will assist coffee farmers, such as the members of Gitwe Farmers' Cooperative Society, to adopt best practices in coffee production. This information will assist the coffee farmers in making informed decisions, devise better agricultural practices and make the right choices on the coffee varieties, among other issues. The knowledge shared will also come in handy on matters related to marketing strategies for their coffee, sources of finances, understanding government policies and how to control and manage coffee diseases. If the farmers receive the right information, adopt and implement it, they will remain in this agricultural activity and improve their livelihoods. Constraints on timely access to current and accurate information is a major hindrance to the coffee farmers and affects their operations.

It is the above challenges that motivated this study with a view to coming up with strategies of enhancing knowledge sharing between Gitwe coffee farmers and the CRI. The specific objectives of the study were to establish the types of knowledge shared; examine the knowledge sharing methods used; investigate the extent to which the knowledge shared is applied; analyse the factors that influence knowledge sharing between the farmers and the research institute; and to suggest measures to enhance knowledge sharing between the farmers and the CRI.

Literature review

According to Miller and Shamsie (1996), most organisations recognise knowledge as a valuable, yet intangible, asset for sustained competitive advantage. Kwanya and Wasinda (2019) assert that successful organisations thrive on their ability to identify, organise, share and perpetuate their unique knowledge. Thus, the value of knowledge held by an organisation lies in the extent to which it is shared and applied. According to Serban and Luan (2002), knowledge sharing is the transfer of skills or expertise amongst people in an organisation. Moturi et al. (2020) explain that knowledge sharing activities are generally supported by systems of knowledge management. It is through these knowledge management systems that knowledge can be transferred and disseminated from those who have it to those who need it.

Many factors influence knowledge sharing. Cabrera and Cabrera (2002) explain that infrastructure as well as intangible factors, such as trust and organisational culture, play a pivotal role in facilitating effective knowledge sharing. Kwanya et al. (2015b) explain that effective sharing of knowledge also requires an environment which is safe and encourages adventure, experimentation and learning. Fullwood et al. (2019) assert that knowledge sharing is a social exchange process which requires mutual trust between the parties involved so as to succeed. Other factors which influence knowledge sharing include teamwork culture (Al-Qadhi et al., 2015); presence or absence of incentives and rewards which motivate knowledge exposure (Razmerita et al., 2016); feeling of reciprocity in knowledge exchange (Ipe, 2003); and effective leadership (Kwanya & Wasinda, 2019). According to Obwaka et al. (2019), resistance by employees to share knowledge, fear of job losses, technophobia and inadequate sensitisation are some of the impediments to effective knowledge sharing.

Indigenous knowledge, practical experience as well as research conducted by institutes are the main sources of agricultural knowledge in Africa (Chepchirchir et al., 2019; Mwesigwa et al., 2016). This knowledge is the bedrock of innovation and sustainability amongst smallholder farmers in Africa. Indeed, Kamarudin et al. (2015) argue that indigenous knowledge as well as personal experiences of farmers are essential sources of original and contextual knowledge and should be shared widely for effective productivity. Chepchirchir et al. (2019) explain that indigenous knowledge plays a pivotal role in crop farming, pastoralism, fishing and environmental conservation. This knowledge contributes significantly to the wellbeing of farming communities, particularly, in rural settings. Although Kwanya (2020) argues that indigenous knowledge is stigmatised, it still remains the anchor for decision making on socioeconomic activities in rural communities.

The knowledge possessed by farmers is largely tacit. This makes it difficult to share. Indeed, research has proved that tacit knowledge is the most difficult knowledge to share since it is not documented (Murumba et al., 2020). Therefore, organisations need to employ diverse techniques to harvest tacit knowledge. Obwaka et al. (2019) suggest that apprenticeship programmes can be useful in managing tacit knowledge. They also add that in the digital world, websites and the applications related to them can enable the sharing of talents and information between people and/or teams. Mwesigwa et al. (2016) also suggest that mobile telephony offers great opportunities for knowledge sharing among farmers in Sub-Saharan Africa. The technology aids the sharing of knowledge by enabling connectivity and providing a platform where people meet and learn. Using these platforms, people with knowledge can be able to easily reach those who wish to learn and share their talent. This places technology in a critical place as an enabler of knowledge sharing. Indeed, several ICT-based projects have been launched in numerous countries in Africa to increase access to valuable knowledge by farmers. Some of these include e-soko which provides farmers in Kenya and Rwanda with crucial information on market prices of their produce (Bizimana et al., 2013); use of personal digital

assistants (PDAs) to access diverse agricultural information in Tanzania (Munyua et al., 2009); use of PDAs to share fishing information among fishermen in Senegal (Mwesigwa et al., 2016); and sharing of information on when to plant, harvest or sell farm produce by farmers in Uganda. Aker (2010) reports that the use of mobile phones by farmers has reduced grain price dispersion in Niger. In spite of the apparent readiness to adopt ICTs in agricultural knowledge sharing, these efforts are constricted by low ICT skills among farmers. Ramirez and Reyes (2013) suggest that farmers who are keen on ICTs should be trained and used as peer trainers to enhance the uptake of ICT-based solutions in sharing farming knowledge.

Kamarudin et al. (2015) aver that effective knowledge sharing is a significant contributor to increased agricultural productivity. Therefore, farmers require both tacit and explicit knowledge. To share tacit knowledge, the use of informal networks is highly recommended (Murumba et al., 2020). Indeed, Mashavave et al. (2013) identify interactive social networks as one of the key methods through which knowledge can be shared among farmers. Mashavave et al. (2011) describe these networks as learning alliances which connect farmers to each other and to the other service providers in a way that facilitates the creation and sustainability of a seamless knowledge sharing system. Hagmann et al. (1999) explain that these networks can lead to group learning through interactive sessions such as field days, workshops, and exchange visits. Kommey (2020) explains that rice farmers in Ghana largely share knowledge through face-to-face interactions. In Cambodia, Heng et al. (2015) opine that knowledge, attitude, practice, communication and networking skills are essential for effective sharing of knowledge among farmers in rural communities.

Chen et al. (2015) emphasise that peer-to-peer interactions are the main method for sharing knowledge among rural farmers. Malabayabas (2015) explains that family units and meetings are also effective platforms for farming knowledge sharing, diffusion and perpetuation. The other strategies which farmers can use to share knowledge include farmers' field schools through which farmers are equipped with specific skills while in their farms (Mariyono, 2018; Muhammad et al., 2014); farmers field days and field visits (Belyaev et al., 2020; Kamau et al., 2018); demonstration farms (Hailu et al., 2018; Ingram et al., 2018); extension workshops (Groves et al., 2018; Hashemi et al., 2009); agricultural shows and exhibitions (Demiryurek et al., 2008; Opara, 2008); publications such as pamphlets, bulletins or brochures (Demiryurek et al., 2008); and field advisory visits (Raj, 2013; Svensson et al., 2019). Ndegwa et al. (2015) emphasise that farming knowledge can also be shared through routines and processes. Serban and Luan (2002) suggested that knowledge sharing among farmers should involve a deliberate integration of knowledge systems, processes and routines.

According to Mashavave et al. (2013), smallholder farmers in Sub-Saharan Africa have limited access to timely knowledge resources. Thus, farmers' information needs in meeting production and sustainability challenges, are not met all the time due to varying factors that lead to poor information transfer to farmers. Considering the fact that the world is in the information age, opportunities should be plenty for farmers to harness and utilise knowledge in order to enhance production (Lwoga et al., 2010a). On a negative note, lack of resources among the poor farmers has greatly affected their ability to effectively access or share relevant knowledge. Farmers in the rural areas are also marginalised thereby limiting their ability to access information on agriculture. According to Lwoga et al. (2010b), most information services in Africa are focused within urban regions, leaving behind the rural localities where the majority of smallholder farmers live. Kommey (2020) reports that rice farmers in Ghana experience a problematic flow of knowledge among them. He explains further that this constitutes one of the greatest challenges to rice farming in the country. On the supply side, Ramirez and Reyes (2013) explain that research scientists encounter several challenges in packaging their research output into knowledge which can be understood and adopted by farmers. They suggest that practical

approaches such as demonstration farms, which provide opportunities for effective sharing of scientific knowledge with farmers, should be embraced.

From the foregoing, it is evident that many scholars underscore the role of knowledge in human endeavour, including socioeconomic activities. Many scholars also emphasise that the value of knowledge is only unleashed through sharing. It is also clear from the literature reviewed above that knowledge sharing is one of the most challenging knowledge processes. Most of the literature on knowledge sharing have focused on the corporate sector. Agriculture, which is the bedrock of the economies of developing countries such as Kenya, is largely ignored. Even within these countries, the plight of rural farmers, in terms of knowledge, is covered less. Coffee farming being one of the important foreign exchange earners in Kenya needs to be cushioned against myriad challenges. One way of doing this is through effective access to and use of scientific knowledge. Using the case of Gitwe Farmers' Cooperative Society, this study focuses attention on the mobilisation and uptake of scientific knowledge from CRI by coffee farmers in Kiambu County, Kenya.

Methodology

The study adopted a pragmatic paradigm and mixed methods research approach to collect both qualitative and quantitative data. The study also applied a case study research design. A case study design was considered suitable because it enabled the authors to get in-depth information about the relationship between the Gitwe Coffee Farmers' Cooperative Society and the CRI as far as knowledge sharing is concerned. Quantitative data was collected through questionnaires while qualitative data was collected using interviews.

The study was undertaken at the CRI and Gitwe Farmers' Cooperative Society in Kiambu County, Kenya. The area covers approximately 1252.4 acres consisting of Karatu which has an area coverage of 663.3 acres, Karinga (478.2 acres) and Kiburu (90.9 acres). It is important to note that majority of the coffee farmers in Kenya are situated in Kiambu County. Gitwe and CRI are also situated in the same county. The population of this study was 2,181 respondents who comprised of farmers from Gitwe and CRI staff. Gitwe comprises of three village factories. For each village 10% of the population of farmers was selected and simple random technique used to select the actual respondents to whom questionnaires were administered. Table 1 summarises how the respondents were sampled from the factories. Ten (10) CRI staff also participated in the study as key informants. Qualitative data was analysed thematically while quantitative data was analysed by descriptive statistics using Statistical Package for Social Studies (SPSS).

Table 1: Samples of farmers by factory and village

Karatu Factory		
<i>Village</i>	<i>Population</i>	<i>Sample size</i>
Kwamucheru	320	32
Gitwe	405	41
Karatu	210	21
Karinga Factory		
<i>Village</i>	<i>Population</i>	<i>Sample size</i>
Kiogera	250	25
Wachuha	200	20
Gikure	210	21
Gati iguru	172	17
Kimaruri	180	18
Kiburu Factory		
<i>Village</i>	<i>Population</i>	<i>Sample size</i>
Wagonda	72	7
Roi	52	5

Gacakai	30	3
Macanga	80	8
Total	2181	218

Findings of the study

A total of 218 questionnaires were administered. From these, 188 were dully filled and returned while 30 were not returned. This yielded a response rate of 86.2% which was considered excellent according to Kothari and Garg (2014). The findings indicated that the majority of the coffee farmers forming Gitwe Farmers’ Cooperative Society 100 (53. 2%) were male while 88 (46.8%) were female. This might be because farm lands are basically owned by men. In terms of age, the findings, as presented in Figure 1, showed that 27(14.4%) of the respondents were between 18 and 30 years; 23(12.2%) between 31 to 40 years; 18(9.6%) representing those between 41 to 50 years; 90(47.9%) between 51 to 60 years; and 30 (16.0%) were above 60 years. These findings indicate that most Gitwe coffee farmers were 50 years and above.

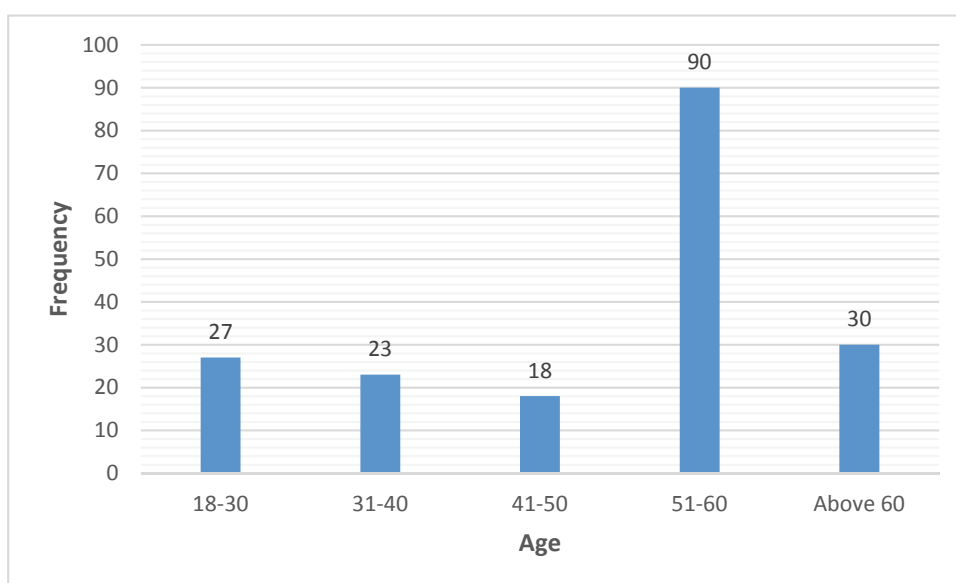


Figure 1: Age distribution of the farmers

The respondents were also asked to indicate their level of education. On this, the findings showed that 18 (9.6%) of the respondents did not have any formal education; 39 (20.7%) had attained primary level education; 119 (63.3%) had attained secondary education; and 12 (6.4%) had tertiary level of education.

Types of knowledge shared

Most 107 (56.9%) of the farmers reported that they had some knowledge on coffee farming while 81(43.1%) of them either had little or no knowledge on coffee farming. It is evident, therefore, that the majority of the farmers need more knowledge on coffee farming. The farmers indicated that one of the techniques that the CRI popularly uses to share knowledge with them is training. Therefore, the respondents were asked to indicate whether they had attended any training on coffee farming. The findings showed that most 114 (60.6%) of the respondents had participated in training events while 74 (39.4%) of them had not. The respondents who had been trained were requested to indicate the type of training they had attended. It was found out that 10 (8.8%) of them had attended seminars while 52 (45.6%) had participated in workshops. This was followed by 36 (31.6%) of the respondents who attended conferences and another 16 (14.0%) who had gone through formal training. Figure 2 summarises these findings. When asked to respond to issues concerning the personnel conducting the trainings, 143 (76.1%) of

them indicated that most of the training was offered by CRI officers. Another 36 (19.1%) of the respondents noted that these trainings were conducted by the farmers themselves while 9 (4.8%) did not respond to this question.

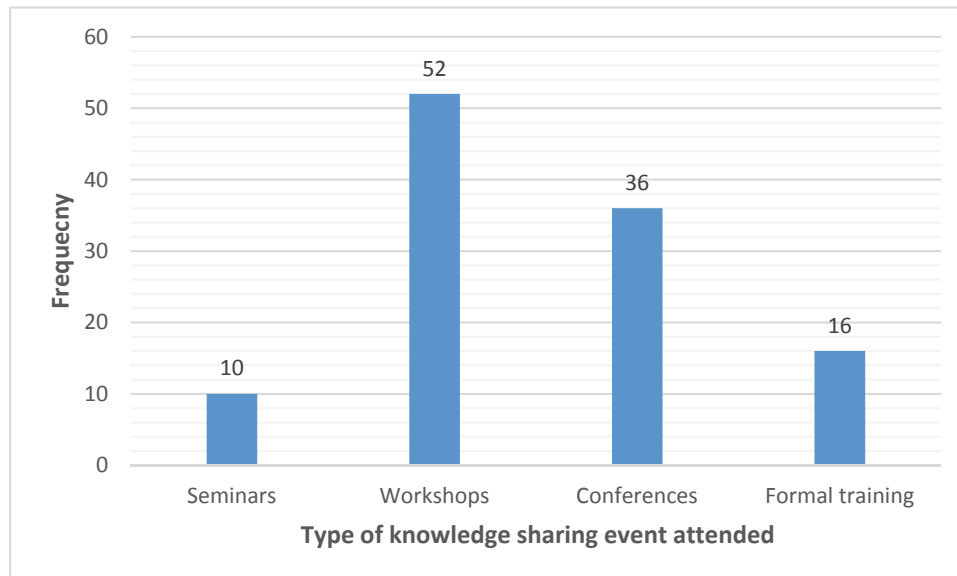


Figure 2: Participation in knowledge sharing events

Ten (10) managers of the Gitwe Farmers' Cooperative Society, acting as key informants, were asked to state whether they regularly organised trainings for the farmers. They all confirmed and indicated that they had conducted three trainings within the last one year. Indeed, one respondent stated:

"We share knowledge with the farmers on a regular basis." **GRI**

On the knowledge areas covered by the trainings, 18(33.3%) indicated coffee nutrition as their topic of discussion; 15 (27.8%) indicated control of coffee diseases and insect pests; and 7 (13.0%) stated canopy management. Three (5.6%) of the respondents noted that they discussed varieties of coffee and their establishment whereas 4(7.4%) discussed certification programmes and standards. All these topics were to ensure that the farmers obtained the knowledge they required to productively far, coffee.

When requested to indicate whether they shared coffee farming knowledge, the majority 113 (60.1%) of the farmers agreed while 75 (39.9%) said they did not. Sharing of coffee knowledge by the farmers is important as it ensures assimilation of practical knowledge emerging from the experiences of the farmers. For those who shared their knowledge, 90 (79.6%) shared knowledge with other coffee farmers whereas 23 (20.4%) of the respondents shared knowledge with the CRI. This is unfortunate because it indicates that there exists a unidirectional flow of knowledge from the CRI to the farmers with little coming from the farmers. Nonetheless, it is encouraging that the farmers do share knowledge among themselves as a means of improving their own skills.

On the type of knowledge shared by the respondents, 70 (61.9%) indicated that they shared tacit knowledge; 20 (17.7%) shared explicit knowledge; and 23 (20.4%) shared indigenous knowledge. On the same issue, of the ten CRI officers who participated in the study, 7 (70%) indicated tacit knowledge; while 3 (30%) used a combination of tacit, explicit and indigenous knowledge. The large percentage of the CRI respondents and farmers who indicated that they shared tacit knowledge affirms the significance of this type of knowledge to the coffee farmers.

Gitwe managers were asked to report on the content of the knowledge they shared with the farmers. Twelve (27.9%) stated that they shared knowledge on the proper chemical use and the associated precautions. The other areas of focus identified by the managers were control of weeds 10 (23.3%); crop nutrition and canopy management 9 (20.9%); establishment and varieties of coffee 1(2.3%); and grafting of old coffee varieties to Batian and Ruiru 11 varieties 2(4.7%). Figure 3 presents these findings. When these key informants were requested to respond to a question on the feedback emanating from the farmers with regard to the knowledge shared, 16.7% noted that the feedback was very good while a majority (88.3%) were of the opinion that the feedback was generally good.

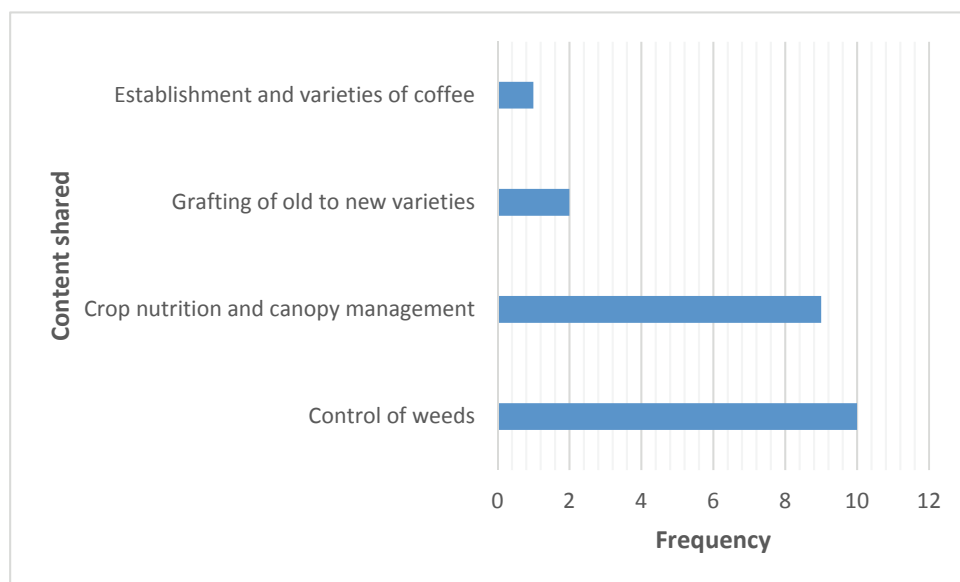


Figure 3: Content of knowledge shared by Gitwe managers

Knowledge sharing methods

An inquiry was made on the methods used to disseminate and share knowledge by the farmers. The respondents had various options of multiple choices. The majority 159 (41.8%) of them indicated the use of field days. Other methods identified were workshops 116 (30.5%); Farmers Field School (FFS) 31 (8.2%); and conferences 74(19.5%). It can therefore be concluded that the most common form of sharing coffee farming knowledge is the use of field days. When the key informants from Gitwe were asked about the methods they used to share knowledge with farmers, 17(58.6%) indicated the use of demonstration plots, 11(37.9%) chose field visits, and 1(3.4%) selected the use of pictures. The verbatim statement hereunder summarises the opinion of the respondents on the knowledge sharing techniques applied:

“We do have a number of methods at our disposal and we can apply any of them at any one given time depending on the circumstances and the needs of the farmers” GR2

All the key informants were of the opinion that farmers applied the knowledge they got from them. On the issue of effectiveness of the methods, 140 (74.5%) of the respondents asserted that the methods were effective while 48 (25.5%) stated that the methods were not effective. On methods of sharing knowledge, the key informants from the CRI responded as follows: 6 (24.0%) stated the use of field days and farmer field schools (FFS); 5 (20%) used workshops; 2 (8%) used seminars; and 6 (24.0%) used other methods which included publications, Agricultural Society of Kenya (ASK) shows, advisory visits, farm visits, pamphlets, phone interactions, books and residential training. Figure 4 presents these findings. One respondent stated:

“For knowledge sharing to be effective, we employ quite a number of methods so that we can achieve our objective” CR3

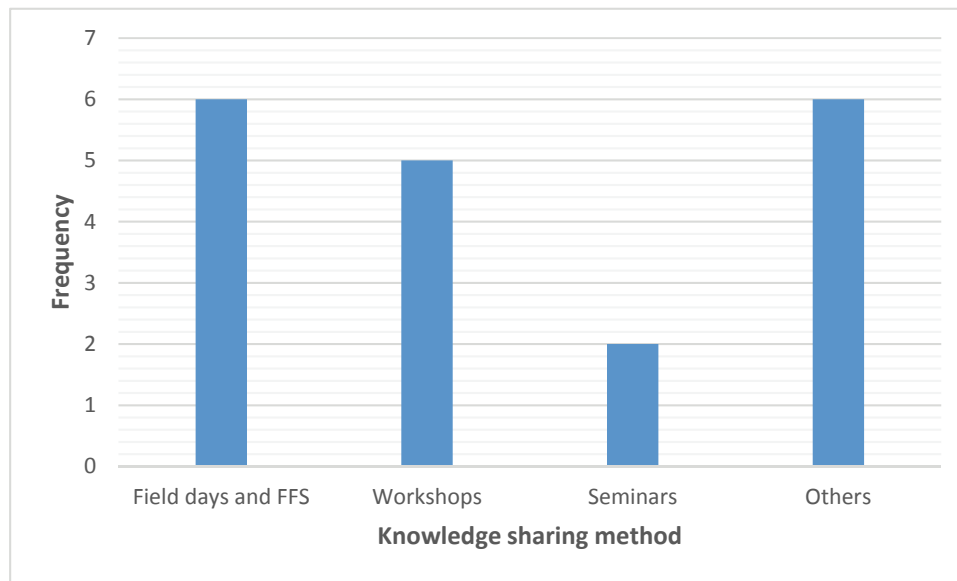


Figure 4: Knowledge sharing methods used by the CRI

On the issue of the mode of delivery the trainers used, 100 (53.2%) of the respondents stated that the trainers used demonstrations. This was followed by pictorial presentation 40 (21.3%), PowerPoint slides 39 (20.7%), and visual identification 9 (4.8%). Thus, demonstration was the most common delivery method used to share knowledge with the farmers. All the respondents concurred that coffee productivity could be improved if the farmers were to put to use the knowledge shared. Enhanced production would subsequently improve the economy and living standards of the farmers. Nonetheless, all of them acknowledged challenges in the knowledge sharing process. Some of these challenges include language barriers, difficult terrain, weak linkage between Ministry of Agriculture and the farmers, and failure on the part of farmers to utilise the recommendations. Additionally, inadequate resources to execute knowledge sharing initiatives, financial constraints which limits monitoring and evaluation, and the issue of laggard farmers who take long to adopt new technologies of farming, were also highlighted.

“We are doing everything in our capacity to address these issues. For example, on the technical language challenges, we have employed agronomists to translate and simplify the scientific knowledge from the CRI to what can easily be understood by the farmers.”

CR5

“We have engaged the government to provide more funding to support research dissemination. Increased funding has enabled us to maximise the use of field days, open days, demonstrations, FFS, advisory visits and training on the economics of coffee production. These strategies have helped to address most of their concerns and ensured that their trainings yielded the intended results” CR3

On whether the knowledge sharing initiatives were monitored and evaluated to assess whether the farmers had adopted the knowledge shared, 7 (71.4%) of the key informants were assertive whereas 3(28.6%) indicated that they did not have such mechanisms. Those who had monitoring and evaluation mechanisms indicated that they used follow-ups on groups to assess impact, evaluations after every training, as well as field visits and questionnaires in order to assess progress and adoption. Additionally, they noted the use of a baseline survey on coffee production in selected areas. On the effectiveness of the mechanisms, 7(71.4%) of the respondents were assertive whereas 3(28.6%) of them noted that they were not. Those who

indicated in the affirmative acknowledged the effectiveness of the mechanisms pointed to the fact that field visits helped in beefing up the farmers' hands-on skills.

“We only get feedback on the effectiveness of trainings; not on adoption. It is deemed that our duty is to train/disseminate; adoption is for the farmer to decide. Wide coverage is hampered by little resources; resources can't allow that level of evaluation” CR5

Essence of shared knowledge

The respondents were asked whether the shared knowledge was useful to them. Asked to respond to this question, 145(77.1%) of the farmers were positive and indicated that the knowledge had critically helped them in their coffee farming activities. The rest, 43 (22.9%), noted that the knowledge had not in any way assisted them on matters pertaining to coffee farming. When asked the same question, 13 (46.4%) of the key informants from Gitwe were of the opinion that the knowledge assisted farmers. They pointed out that the farmers were able to change their pruning methods and were also able to feed their trees as per the cropping. Additionally, 2 (7.1%) of the key informants noted that the knowledge helped the farmers to improve their methods of fertilizer or chemical application. According to them, everything they shared with the farmers was pertinent to coffee production if properly implemented by the farmers.

On how they used the knowledge shared, 70 (48.3%) of the farmers asserted that they applied the knowledge in the production of coffee; 43 (29.7%) of them noted that the shared knowledge assisted them in the prevention of coffee berry disease and leaf rust; 18 (12.4%) of the respondents indicated they used the knowledge in canopy management; while 14 (9.7%) of them noted that the sharing of knowledge aided them to know the best coffee varieties and their establishment. Figure 5 presents these findings. However, there were those respondents who stated that the knowledge shared was not essential to them. Of these, 11(25.6%) stated that they had not observed any improvement in their coffee farms; 20 (46.5%) indicated that there was no economic improvement for farmers; 7 (16.3%) noted that the knowledge that was shared was not in any way helpful; while 5 (11.6%) of them did not have any idea of the change the shared knowledge brought. Nonetheless, it can be deduced from these responses that the sharing of coffee farming knowledge was of great essence to most farmers.

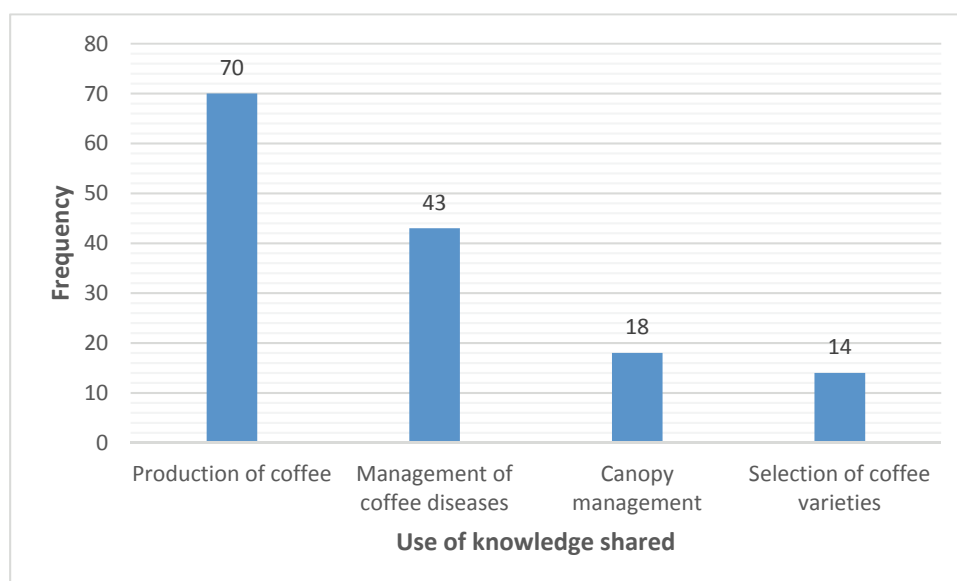


Figure 5: How farmers applied the knowledge shared with them

Challenges in coffee farming knowledge sharing

The respondents were asked to indicate whether they had experienced any challenges in knowledge sharing between them and the CRI. The majority 170 (90.4%) of the farmers were assertive that there were challenges whereas 18 (9.6%) did not cite any challenges. This response was an indication that there were challenges hindering the sharing of knowledge between farmers and the CRI. When asked to state the type of challenges they had experienced, 39 (20.7%) stated that the low level of farmers’ education hindered their understanding of technical issues on coffee farming; 61 (32.4%) of them noted that there was a challenge of bringing together the scattered farmers for knowledge sharing events; 69 (36.7%) of the respondents indicated that they were busy hence could not find time to attend the knowledge sharing sessions; while 19(10.1%) of them were of the opinion that there was no culture of knowledge sharing among the coffee famers. Figure 6 presents the findings. One verbatim response is also provided hereunder.

“There are many occasions when farmers do not turn up well for scheduled knowledge sharing events. They give many excuses. Some of these are genuine while others are flimsy. Low turnout compromises the effectiveness of the events.” CR2

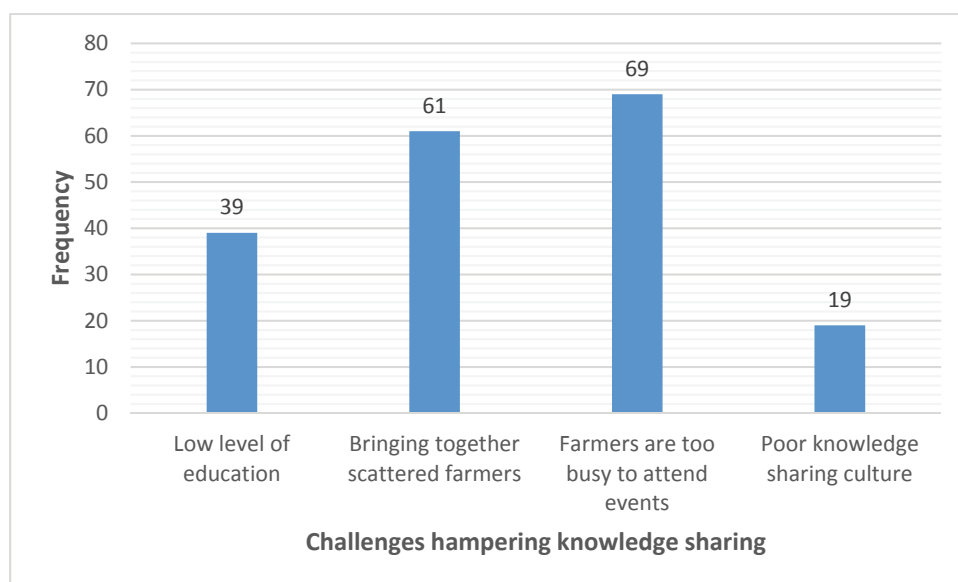


Figure 6: Challenges affecting knowledge sharing between coffee farmers and the CRI

The managers from Gitwe were also asked about the challenges they faced as a society when it came to sharing of knowledge with farmers and the CRI. The majority 9 (93.8%) of the respondents indicated that the farmers were reluctant to attend knowledge sharing sessions while 1(6.3%) of them indicated that farmers were ignorant of knowledge sharing events. On how to deal with the challenges, 30 (20.7%) were of the view that there was need to increase the frequency of monitoring and evaluation exercises in order to assess the effectiveness of coffee knowledge sharing initiatives; 20 (13.8%) indicated that there was need for standardisation and subsidy of the cost of coffee farm inputs; 45 (31.0%) of the respondents noted that there was need for more knowledge sharing events at the local level; 40 (27.6%) indicated that there was need to increase the number of extension officers; and 10 (6.9%) suggested that there ought to be an increase in the number of technical offices which can be accessed easily by coffee farmers at their convenience.

“Many challenges hamper the effectiveness of our knowledge sharing initiatives but we cannot relent. We continue to pursue knowledge sharing strategies which are popular with the farmers or which experience least challenges.” GR4

When Gitwe managers were asked the same question, the majority 6(59.3%) proposed issuance of an annual calendar of coffee farming activities to all coffee farmers. The calendar could indicate the appropriate time for pruning, weeding, spraying against coffee diseases, and coffee nutrition. Four (40.7%) respondents stated that there was need for increased regular field events and knowledge sharing forums to empower coffee farmers. If these measures are adopted, 45(31.0%) of the respondents indicated that this would improve crop yield/production; 20 (13.8%) indicated that the living standards of farmers would improve; 35 (24.1%) stated that the measures would improve farming skills that would lead to quality production; while 25 (17.2%) of them noted that the measures would enhance quick and efficient response to the concerns of the farmers which would subsequently help them to avoid losses.

Discussion of the findings

The findings indicated that the majority of the farmers are male. This can be attributed to land ownership being mostly male. Also, most of these farmers fall in the 50 years and above age bracket. It is rare to find young coffee farmers because most of the youth migrate to urban areas searching for jobs. Similarly, young people do not own land and most parents are unwilling to surrender any to them. This is not to mention young people's negative attitude towards farming. In terms of education, a majority (69.6%) of the farmers had attained either secondary or tertiary level of education. This level of education is fairly high and put them in a good position to understand and apply the scientific knowledge shared by the CRI (Nyangaka et al., 2010). It is noteworthy, however, that a sizable proportion (30.4%) of the farmers either had low (primary level) or no formal education. This implies that nearly one-third of the farmers lacked the capacity to engage meaningfully with scientific knowledge generated from the CRI. These findings concur with Ngeywo et al. (2015) who studied the influence of gender, marital status, age and farm size on coffee production in Kisii County in Kenya. They found that the average age of coffee farmers in the county was 57 and that 74.3% of them were married. They recommended that agricultural extension officers and the community at large should encourage females and the youth to be more active in coffee farming. This can be done, for instance, by creating social and legal environments which enable the youth to take up coffee farming gainfully. This can be achieved by instituting affirmative action such as redefining gender roles, reviewing land ownership regimes, increasing access to financial services, and revising the traditional inheritance structure. Other studies in Kenya yielded similar results. In Kirinyaga County, Kenya, Minai et al. (2014) found that the average age of smallholder farmers is 52 years. In Mukurweini, Nyeri County in Kenya, Theuri (2012) found that most coffee farmers are males aged over 51 years. Similar findings were obtained in Ethiopia by Hassen et al. (2016) who also confirmed the influence of age, gender and access to financial services on cash crop farming, including coffee, in developing countries. In Burundi, Gerard et al. (2020) found that coffee farming is dominated by males who have large farms. Therefore, efforts to enhance coffee production need to address these demographic issues. On the level of education, the findings of this study concur with Nyagaka et al. (2010) who argued that good education enhances the farmers' technical ability to understand and apply advanced farming techniques. They explained that educated farmers are able to perceive, interpret and respond to new information, technologies and innovations positively thereby enhancing their productivity. Similarly, educated farmers are able to make better decisions about farm inputs and management than those with low level of education. This paper, therefore, concludes that coffee farming in Kenya is dominated by mature and fairly educated males. Coffee is a knowledge-intensive cash crop whose farmers are able, or should be enabled, to access and apply knowledge generated through scientific research by institutes such as the CRI.

The findings revealed that tacit, explicit and indigenous knowledge was being shared among the farmers. The indigenous knowledge encompassed traditional farming techniques passed from generation to generation by coffee farming families and communities. The tacit knowledge shared included skills in pruning and grafting of coffee varieties, among others. The explicit knowledge included coffee diseases, coffee nutrition, coffee pests and diseases, control of weeds, certification and standards, and canopy management, among others. Thus, we conclude that coffee farming requires specialised knowledge which can be in the form of tacit, explicit or indigenous knowledge. Coffee farmers need to acquire this knowledge from other farmers as well as scientific research institutions such as the CRI. Kumela et al. (2019) echo the findings of this study and assert that coffee farming needs knowledge on effective management of coffee diseases and pests. This knowledge needs to come from credible sources such as research institutions. Dumont et al. (2019) also suggest that coffee farmers need knowledge on how to maximise their produce by selecting the best varieties for their locale. Similar views were proposed by Cerdán et al. (2012) who emphasised that productive coffee farming is anchored on the availability and sharing of credible scientific knowledge. The findings revealed an asymmetrical flow of knowledge. Thus, a low flow of knowledge from the farmers to the CRI was observed. This is unfortunate because the farmers also generate valuable knowledge based on their practice and experience. These findings echo other studies (Cahyono et al., 2020; Concu et al., 2020; Ingram, 2008; Percy, 2005) who argue that farmers' knowledge is not adequately or directly harnessed by research institutions, technocrats and other agencies. Thus, the voice of farmers is hardly heard in policy making, innovation and general development agenda. Similarly, there was no structure for farmers to effectively codify and diffuse their knowledge with the research institute. This limited the diversity and relevance of the knowledge available to coffee farmers in Kenya.

Knowledge is mainly shared through field days and visits, farmer field schools, workshops, demonstration plots, ASK shows and other exhibitions, and residential training. Of these, the farmers appreciated the interactive and practical approaches as opposed to the rigid and theoretical techniques. Kuguru (2016) echoed this view and emphasised that coffee farmers gained greatly from practical knowledge sharing initiatives delivered in real life environments. Maina (2014) also emphasised that the mode used to share knowledge with coffee farmers greatly influenced the uptake and application of the skills. He also suggested that knowledge sharing mechanisms should integrate farmer participation and engagement. Luusa et al. (2018) recommended that coffee farmers should be encouraged to belong to farmer field schools to enhance the outcome of training initiatives in the sector.

Most of the farmers in the current study acknowledged that they applied the knowledge CRI shared with them. They also reported that this knowledge has helped them to increase their produce and improve their lives. It is, however, noteworthy that some (22.9%) farmers expressed the opinion that the knowledge shared did not benefit them. They did not find the knowledge appropriate in terms of content, format and timeliness. This is because the CRI uses a "one size fits all" approach which "broadcasts" the same knowledge products to all the farmers. Feder et al. (2004) argue that there is often a disconnect between the knowledge farmers' need and what is supplied through scientific research. They explain that farmers need contextualised knowledge which can be applied in the local setting. Similarly, they argue that scientific knowledge is generated in controlled and experimental conditions which are different from the reality of the farmers. It is also important to emphasise that although the farmers are all engaged in coffee production, their needs are not exactly the same. There is need to customise the knowledge sharing approaches and content to the specific needs of farmers. The need to customise scientific knowledge to the needs of the farmers has been discussed by many scholars (Castellanos et al., 2013; Eshuis & Stuver, 2005; Hoffmann et al., 2007; Stuver et

al., 2004). Hoffmann et al. (2007) recommend a close collaboration between researchers and farmers not only during knowledge sharing but right from the conception of the research projects. Advocating for what is described as “on-farm research”, Thompson et al. (2019) explain that this research approach facilitates effective generation, application, validation and diffusion of relevant knowledge.

There are challenges which hinder the effective sharing and application of crucial knowledge. Some of these include language barriers, time constraints among the farmers, inappropriate packaging of knowledge products, and an inadequate number of extension officers. There are also a number of farmers who think that they have all the knowledge they need and are resistant to new knowledge. It is important that these challenges be addressed as a means of enhancing sharing and application of scientific coffee farming knowledge.

Recommendations

The following recommendations can help CRI and farmers to exchange knowledge effectively and thereby increase the production of quality coffee:

1. Develop a performance management framework which is complete with a monitoring and evaluation plan to keep an eye on the knowledge sharing initiatives as a means of strengthening their implementation and outcomes.
2. Document and share a coffee farming calendar which details the time and procedure of performing the core activities in the annual farming cycle to ensure better preparedness and boost the outcomes.
3. Utilise interactive, participatory and customised knowledge sharing approaches which are practical and executed in the real-life environment. This will increase the relevance and impact of the knowledge shared.
4. Involve farmers who are fast-adopters as knowledge ambassadors and peer educators. These ambassadors can step down or customise the available knowledge for their peers. This will not only reduce the cost of sharing knowledge but also increase its uptake.
5. Increase the frequency and regularity of knowledge sharing events such as workshops, seminars, demonstrations and exhibitions. These should also be held closest to the farmers so as to minimise travel costs and other inconveniences.
6. Stimulate the creation of communities of practice on various elements of coffee farming. These communities could bring together farmers and scientific researchers to share and validate relevant knowledge.

Conclusion

Coffee farming requires specialised knowledge. The success of the venture in terms of quantity and quality of yields depends on the availability and access of relevant knowledge. Some of this knowledge can only be obtained from scientific research institutions. This study investigated how coffee farmers in Kiambu County, Kenya share knowledge with the Coffee Research Institute. The findings have demonstrated that the farmers and the institute currently share knowledge through a mixed array of methods. However, several challenges hinder the effective use of these knowledge sharing strategies. It was also observed that currently, the symmetry of knowledge flow is lopsided since the Coffee Research Institute shares much more than it receives from the farmers. These challenges should be addressed if the farmers are to benefit optimally from the knowledge generated by the Coffee Research Institute.

Proposals for future research

This study did not investigate the correlations between the demographical profile of the farmers and their participation in knowledge sharing with the CRI. Therefore, there is need for a

quantitative study to statistically test the relationship between diverse variables and their influence on effective sharing and application of coffee farming knowledge in Kenya.

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