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A PATH TO PROSPERITY: OVERCOMING KNOWLEDGE BARRIERS IN EMBU'S AGRICULTURE

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Abstract

Knowledge, as defined by the Cambridge dictionary, encompasses the understanding and information acquired through experience or study. In the context of this study, we delve into the agricultural knowledge landscape in Embu County, Kenya, exploring the persistent gaps that challenge local farmers. These knowledge and information disparities not only affect Embu County but also resonate with broader implications for agricultural practices across various Kenyan counties. This research aims to identify these gaps and propose solutions to bridge the knowledge divide.

The agricultural sector holds a pivotal role in Kenya's economy, contributing directly and indirectly to the Gross Domestic Product (GDP). With a direct GDP contribution of 26% and an additional 27% through its linkages with manufacturing, distribution, and other service-related sectors, agriculture is a driving force of the nation's economic stability. Furthermore, agriculture accounts for a significant portion of government revenue, supplying over 75% of industrial raw materials and more than 50% of export earnings. Additionally, it is the largest employment sector in the country, employing 60% of the total workforce.

Notably, the majority of Kenya's population, especially those residing in rural areas, rely on agricultural-related activities for their livelihoods. With over 80% of the population participating in this sector, the importance of agriculture in national development cannot be overstated. Consequently, the Kenyan government has consistently prioritized agriculture as a key instrument for promoting national development.

This paper underscores the critical role of providing adequate agricultural information and implementing effective Knowledge Management (KM) practices to enhance the productivity of the agricultural sector. By addressing the knowledge gaps that hinder the efficiency and growth of the agricultural industry, this research

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aims to contribute to the broader goal of advancing national development and ensuring the well-being of the rural population.

1.0 Introduction

The Cambridge dictionary meaning of Knowledge is "understanding of or information about a subject that you get by experience or study, either known by one person or by peoplegenerally." It is "the state of knowing about or being familiar with something". This study investigated the agricultural knowledge and information transfer gaps that persistently beset the farmers in Embu County and suggested solutions that can help to close up the lacuna in the County as well as other Counties in Kenya.

Agricultural sector is the mainstay of the Kenya's economy as it directly contributes 26% of the Gross Domestic Product (GDP) and 27% of GDP indirectly through linkages with manufacturing, distribution and other service related sectors. Approximately 45% of Government revenue is derived from agriculture and the sector contributes over 75% of industrial raw materials and more than 50% of the export earnings. The sector is the largest employer in the economy, accounting for 60 per cent of the total employment. Over 80% of the population (which stands at 50,410,740based on the latest 2018 United Nations estimates) especially those living in rural areas, derive their livelihoods mainly from agricultural related activities. Due to these reasons the Government of Kenya has continued to give agriculture a high priority as an important tool for promoting national development. Adequate provision of agricultural information as well as apt Knowledge Management (KM) to enhance the sector's production is of great essence.

1.1 Embu County: Background Information

The study was conducted in Embu County which is divided into five Sub-Counties namely; Embu West with headquarters at Embu town, Embu North with headquarters at Manyatta, Embu East with headquarters at Runyenjes, Mbeere North with headquarters at Siakago and Mbeere South with headquarters at Kiritiri.

1.1.1 Demographic Characteristics

According to the 2009 Kenya Population and Housing Census (KPHC), the county's population was 543,221 persons comprising of 267,609 male and 275,612 female. With the estimated annual growth rate of 1.7%, the population is projected to 591,415 this year (2017). The rural population comprises of about 80.3% of the total population. The dependant population (below 15 years and above 64 years of age) constitutes 42.6% of the population. Agriculture is the mainstay of the County and livelihood of the people. The sector employs 70.1% of the population and 87.9% of the households are engaged in agricultural activities.

1.1.2 Land Availability and Use

Out of the total area of the County, 2,168 km^2 is arable land, 653.9 km^2 non-arable land and 596.1 km^2 comprises water mass. The largest proportion of arable land is used for agriculture with farms averaging 0.8 ha. (2 acres) forming the majority following land fragmentation over the years; large scale farms average 3 ha. (7.5 acres).

1.1.3Social Economic Status

In its aspiration to meet the first and crucial Millennium Development Goal (MDG) on eradication of extreme poverty and hunger, the County has intensively invested in poverty reduction measures especially in reduction of food poverty. According to the Embu County Integrated Development Plan 2013-2018, this is being done through use of irrigation and diversification of crops. The plan also emphasises that, there is need to focus on the efforts that will increase food production and provide employment to majority of the population in the County (Republic of Kenya, 2014). Information, knowledge and innovations are critical resources for agricultural development.

2.0 Theoretical Framework

This study was mainly informed by Rogers' Diffusion of Innovations (DOI) theory which is the study of how, why, and at what rate new ideas and technology spread in certain communities, (Rogers, 2003). Rogers theorised that innovations would spread through society in S-curves (see figure 1 and 2 below) where the early adopters select the technology first, followed by the majority, until a technology or innovation becomes common. The study was also informed by Rural Knowledge Centre or Telecentres model (Roman, 2003) and Wilson's information seeking behaviour model (Wilson, 1981). It examined the diffusion of agricultural innovations and ideas (information) from, identification, critical evaluation and eventual adoption in Embu County. Factors which facilitate and conversely those that impede the adoption are equally considered and mitigation measures suggested where necessary.

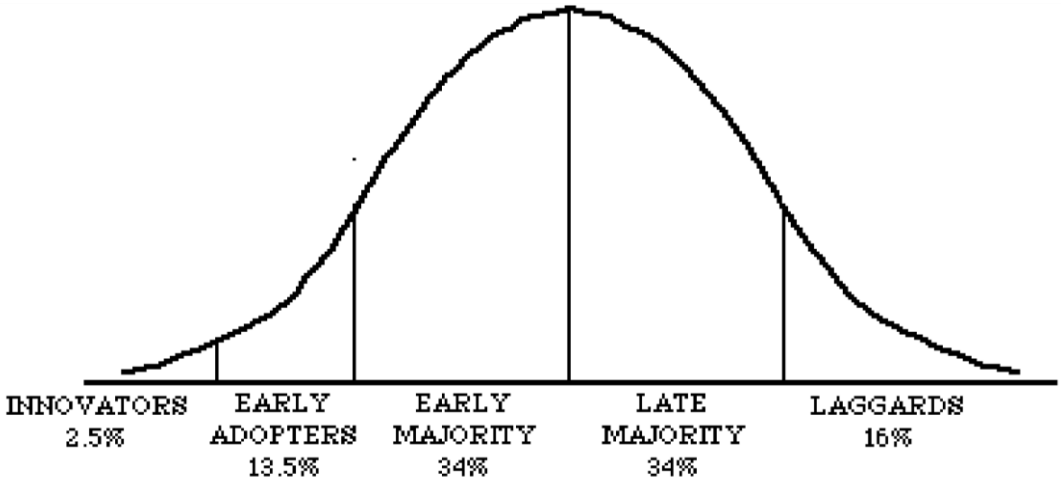

Figure 1: Categories of Individual Innovativeness Source: Surry, (1997)

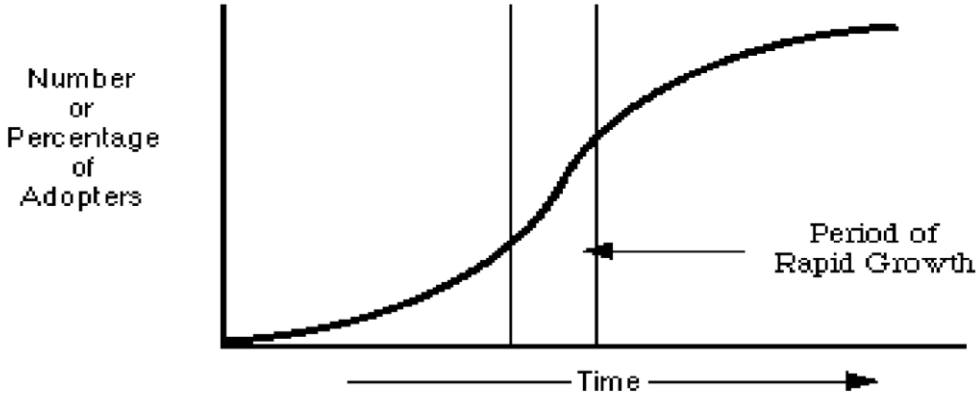

Figure 2: Rate of Adoption of an Innovation over Time Source: Surry, (1997*)*

3.0 Literature Review

Several information resources were reviewed so as to find out the current status of information and knowledge management (KM) in the Kenyan agricultural sector.

3.1Women and Sustainable Rural Development

A decade and a half ago, Kimenyi (2002) observed that sustainable poverty reduction must focus on improving the productive potential of women and this still applies today. In particular he suggests that there should be deliberate policies to increase women's access to land inputs, appropriate knowledge, information and

technology. Women contribute up to 60-80% of labour in household and productive activities and specifically agricultural production (Republic of Kenya, 2010).

The recent advent of vernacular radio transmissions in Kenya has enormously improved the accessibility and use of agricultural information by women in Kenya. The progress is evidenced by a report byMutua-Kombo (2001) who had noted that women had little or no contact with the media. However, Magambo (2010) reports that gender inequalities in Kenya undermine agricultural productivity as evidenced by the emerging empirical research that shows that gender inequalities impact negatively on families and the larger economy. The broad objectives of rural development are growth, poverty alleviation and improved management of the natural resource base**.** Technology development and its rapid adoption in agricultural production and processing systems are key elements in achieving these. In a study done by Wafula-Kwake and Ocholla (2007) on the feasibility of ICT diffusion amongst African rural women in South Africa and Kenya, it was discovered that in order for women to benefit most from ICTs, illiteracy in computer technology and in basic education need to be addressed.

3.2 Community Informatics (CI)

Community Informatics (CI) is an approach that begins with the perspective that access to ICTs can provide a set of resources and tools that communities and individuals can use to pursue their goals in such areas as local economic development, cultural affairs, civic activism, and community-based health and environmental initiatives (Gurstein, 2000). In their Paper on ICT in Africa, Ponelis and Holmner (2015) posit that, ICTs aid the electronic capture, processing, storage, and dissemination of information, while Petuchovaite and Lipeikaite (2014), acknowledge that access to information increasingly depends on access to ICTs, online resources and services. According to Aker (2010), the rapid spread of ICTs in developing countries over the past decade offers a unique opportunity to transfer knowledge via private and public information systems.

As reported by Maina, Leonhaeuser and Bauer (2010), Kenya Agricultural and Livestock Research Organisation (KALRO) developed a demand-driven approach called the Agricultural Technology Information Response Initiative (ATIRI) for technology facilitation and transfer in the year 2000, as a strategy to enable linkages with a wider range of stakeholders for a wider dissemination and catalysed uptake of research results. In addition, the Kenya Agricultural Productivity Project (KAPP) which addresses technology invention, repackaging, dissemination and adaptability has as a long-term objective to contribute to sustainable increase of Kenya's agricultural productivity and improvement of livelihoods of its rural communities through the improved performance of the agricultural technology demand and supply system (KARI, 2006).

According to Santhi, Senthil, Palanisamy and Radhakrishnan (2009), the mobile phone has found a place as a permanent companion of the poor and the rich. The use of this versatile gadget is commonplace amongst the rural farming communities in Kenya and has immensely enhanced the agricultural production process as an information communication tool. It is useful for communication of agricultural information via the set extension service system as well as marketing of farm produce. Duncombe (2014) further elucidates the use of mobile phones by noting that they are not restricted to agriculture, but include new forms of micro-financial service provision, micro-enterprise support, data gathering and dissemination for projects concerned with social development such as education, health, environment and humanitarian relief in response to disasters and emergencies.

A recent study in Kenya (Makueni and Machakos County) by Cai, Steinfield and Olsen, (2017) examined the effect of audio message reminders and participatory video in enhancing farmers' knowledge about the draught resistant (DT) maize and the practices and uptake of the same. The findings provide insights that can inform the design of ICT strategies aimed at communicating knowledge about DT maize and the complementary practices to farmers. This study finds that timely audio messages reinforced the video training content and reminded farmers about the management practices based on the maize growing stages. The multichannel treatment that included

both video and audio reminders is more effective than the video-only treatment in communicating relatively complex agricultural technologies with multiple steps.

3.2.1 Community Informatics (CI) and Telecentres

Gurstein (2000) posits that the most likely means by which the general population could have access to computer-mediated services would be through some type of public access facilities such as telecentres. These he notes would, in addition to being centres of communication and small business support in rural areas, may also become centres for delivery of rural development support services for their community catchment areas. This model of information communication channel is also further elucidated by Roman (2003) who defines a telecentre as a shared access facility equipped with telephones, computers, television and video, and other technological devices. The basic objective of such a centre is to provide demand-driven communication and information services for community development. In this regard, Esipisu (2013) clearly posits that Kenyan populace must embrace simple technology for the nation to be food secure. He affirms the fact that technology remains the main platform on which societies develop. Information as a key element in any modern, knowledge-based economy must therefore be availed to all because only a well-informed public can carry out its obligations to shape policy and effectively participate in nation building.

4.0 Methodology

Research planning requires a conceptualisation of the overall organisation of a project and a detailed specification of the steps to be carried out. In this study, Embu County agricultural information infrastructure has been studied with a view to investigating the accessibility and use of agricultural information for poverty alleviation and food security assurance.

4.1Research Design

The research design, or the structure of the research, helped to piece all the elements of the research project together so as address the key research questions. Mixed method approach was found to be the most appropriate methodology in this study. The study is mainly qualitative with minimal quantitative data for triangulation purposes. A total of 210 farmer household heads (male or female) were interviewed while the key informants included 50 extension personnel, 14 researchers, 13 information professionals (mainly librarians), 32 planners and policy makers. Five (5) Farmers' Focus Group Discussions (FGDs) also informed the study.

4.2 Sampling Technique

A systematic sampling procedure was used whereby two research assistants selected every third (3rd) homestead within the 23 villages and interviewed the household heads in either English or Embu language as was found appropriate. A total of 10 research assistants were given direction and paired so that each pair covered a minimum of 4 villages. The choice of language used during the interviewing process was dictated mainly by individual farmer's educational level.

4.3 Data Presentation, Analysis and Interpretation

Data is presented using tables and charts and SPSS statistical data analysis software was used for data coding.

4.4 The Farmers

Data collected from interviews with farmers is based on the 210 interview schedules. The tables and figures present data, n=210. However, despite holding face-to-face interviews, there were incidences of non-response.

4.4.1 Farmers' Gender

As far as gender is concerned, 52% (110) were male while 48% (100) were female respondents. The sample was very representative in terms of gender. Majority of the farmers interviewed were from the agriculturally prime Ward of Nembure (49%), followed by Central (31%) and lastly Manyatta Ward (20%). Nembure Ward represents

the Upper Midland Zone (UM), Central Ward represents Lower Midland (LM) and Manyatta Ward represents Upper Highlands (UH).

4.4.2 Farmers' Age Range

Out of the 210 farmers interviewed, the majority were aged from 50-59 (29.8%) followed by those aged 40-49 (26.8%), above 60(22.0%), 30-39 (16.1%) and 20-29 (5.4%)

4.4.3 Farmers' Educational Levels

8.6% are totally illiterate as indicated in figure 3 below. At least 47.4% of the farmers have had primary school education, 33% have attained O-levels, 4.8% have A-levels, 2.4% have certificate, 1.4 have diploma, 0.5% have university degree and 1.9% other qualifications.

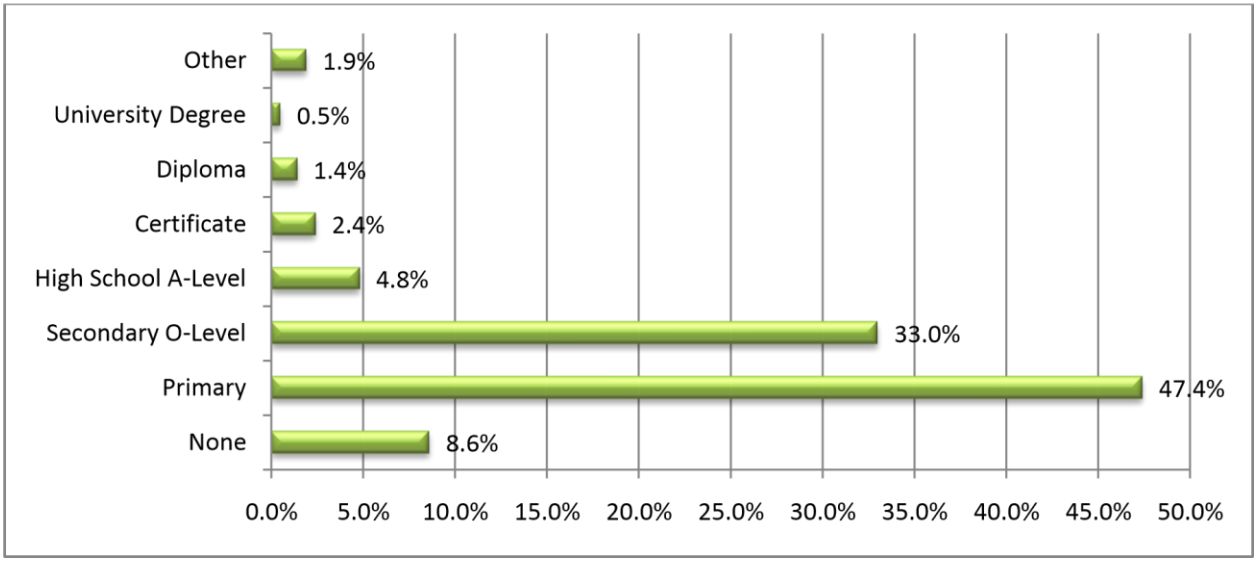

Figure 3: The Farmers' Educational Levels

4.4.4 Farmers' Occupation

3.5% of the farming community are actively engaged in other occupations such as carpentry, teaching and Sub-County administration. 96.5% concentrate on farming activities.

4.5 Sources from Where Farmers Seek Agricultural Information

(77.1%) get information from extension personnel. Other sources include 11% from other farmers, 3.3% from agricultural field days, 1% from input stores and 1% from local NGOs (see table 1 below).

Table 1: Where Farmers Seek Agricultural Information N=210

Item	**Frequency**	**Percentage**
Extension Officers	162	77.1
Do not Seek	7	3.3
Input Stores	2	1.0
Attending Agricultural Field days	7	3.3
Local NGOs	2	1.0
Other Farmers	23	11.0
Non-response	7	3.3
Totals	**210**	**100**

4.6 Kind of Agricultural Information Sought by Farmers

63.8% seek general farming advice, 16.2% planting of crops, 6.7% disease control, 5.2% inputs, that is, type of seeds, 1.4% none, 1% marketing, and finally 0.5% climatic conditions.

4.7 Reasons why Farmers Seek Information

52.9% of the farmers seek information when in need, 24.8% when planting new crops, 6.7% always, 3.8% land preparation time, 2.9% when in problems, 2.4% when buying inputs, 2 (1%) none, 1 (0.5%) when plant and animal diseases attack.

4.8 Sources from which Farmers Seek Information From

The farmers were asked whether they seek agricultural information from a list of diverse sources shown in figure 4 below so as to affirm their respective understanding on information sources.

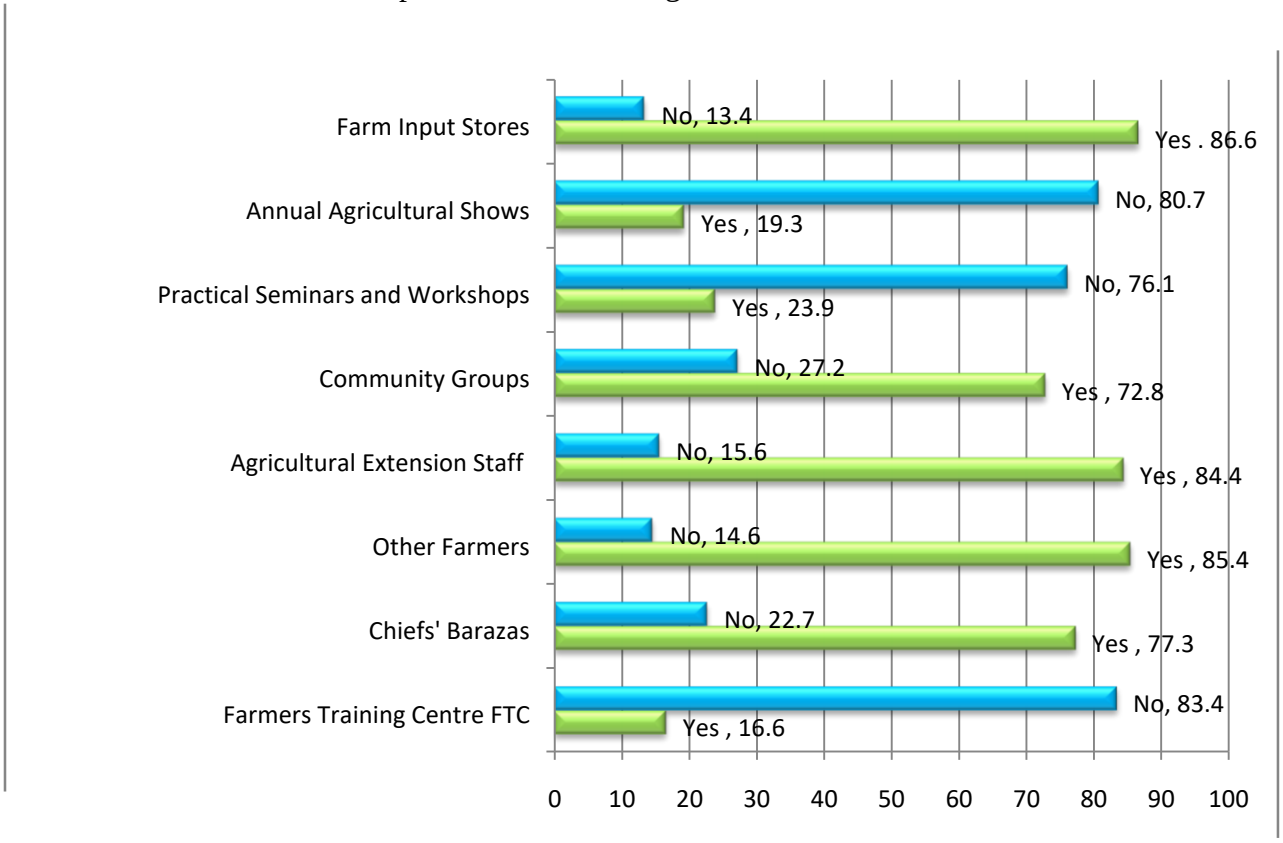

Figure 4: If Farmers Seek Agricultural Information From?

Farm input stores

Unprecedented results were shown from the analysis of input stores as sources of agricultural information. From table 1above, only 1% of the farmer respondents indicated that they seek information from input stores. However, when prompted and asked from a list of sources whether they seek information from input stores, the findings indicate that 86.6% of the farmers use input stores regularly to get information, 8.6% visit the stores on weekly basis, 18.1% on monthly basis, 20.5% twice a year, 1.0% yearly, 1.4% during planting season, 31.4%. 31 farmers did not respond.

Table 2 below shows that, 28.1% seek information on usage of farm inputs, 22.9% on farming methods, 17.1% on improving their farm yields, 4.3% on relevant inputs, 8.1% never visit while 38 famers did not respond.

Table 2: Information Farmers get From Farm Input Stores N=210

Item	Frequency	Percentage
Usage of Inputs	59	28.1
Farming Methods	48	22.9
Relevant Inputs	9	4.3
Improve Farming	36	17.1
Market of Products	3	1.4
None	17	8.1
Non-response	38	18.1
Total	**210**	**100**

 Agricultural extension officers

In figure 4 above, 84.4% of the farmers affirmed that they seek advice from extension personnel.

Table 3: Particular Information Sought from Agricultural Extension Personnel by Farmers. N=210

Item	Frequency	Percentage
General Farming	41	19.5
Farming Methods	96	45.7
Relevant Inputs	10	4.8
Farm Improvement	31	14.8
Non-response	32	15.2
Total	**210**	**100.0**

In table 3 above, 19.5% seek information on general farming, 45.7% farming methods, 4.8% relevant inputs and 14.8% farm improvementwhile 32 of the farmers did not respond.

4.9 Various Formats of Farmers' Agricultural Information Communication Channels/Media

The study sought to find out the farmers' preference in regard to the available information channels and or media including their respective formats.

 Word of Mouth as a Channel of Information Communication

61.4% of the farmers found it easy to communicate using direct chat because; it facilitated clarification (14.3%), one gets information directly from the original information source (12.9%), and that it encourages discussion (2.9%). 18 farmers did not respond.

 Field Demonstrations as a Mode of Information Communication to Farmers

54.3% of the farmers prefer demonstrations because they are practical 34.8% because they provide visual learning. 23 farmers did not respond to the question.

 Print Resources as a form of Information Communication to the Farmers

8.1% read books to identify best farming methods, 13.3% to gather best knowledge and 9 % read for pure reference.

4.10 Use of ICTs in Agricultural Information Dissemination to Farmers

This study sought to find out the use of ICTs such as radios, TVs, mobile phones and internet among others in disseminating agricultural information to farmers. The findings are as follows:

Farmers' Use of Mobile Phones for Agricultural Information Communication

- 76.2% of the farmers own mobile phones. However, those who do not own mobile phones are likely to have access to a phone owned by either their children or siblings. Only 31.9% use mobile phones to access agricultural information.
- Farmers are not familiar with other forms of ICTs, such as, audio-tapes, slides, video cassettes, computer files, lists of computer files and the internet. Although the Agricultural Information Research Centre (AIRC) in Kabete for instance, always shows agricultural-related films and videos during the Annual agricultural shows, the farmers are not aware of them. As noted earlier, only 19.3% of farmers find time to attend the shows (see figure 4 above).

Farmers' Use of the Local Radio as a Source of Agricultural Information

Mass media (i.e. radio and TV) teaches new skills, attitudes and behaviours, Tuurosong (2014). 88.1% of the farmers own a radio. Out of those who own radios, 68.6% listen to get news and other information while 21.4% do not regularly listen to the radio.

Farmers' Use of Television as a Source of Agricultural Information

At least 26.9% of the farmers own a TV set but unfortunately only 18.2% watch programmes that feature farming activities.

4.11 Prospects of Initiating ICT driven Community Information Centres

At least 35.3% of the farmers are aware of ICT based Community Information Centres (telecentres), although there is none in the county under this study. Individual farmers as well as those in the focus groups were excited about havingICT based community information centres established in their respective villages.

5.0 Results Discussions and Summary of Research Findings

1 # Characteristics of farmers *(a) The youth in farming*

Most of the farmers are in the middle age and very few youths are farmers. Kenyan youth constitute over 36% of the Kenyan population (Aseda, 2014). They should be encouraged to take up farming as a trade so as to curb unemployment.

(b)Poverty amongst farmers

Most farmers depend on farm income. Other sources of income are limited, yet they barely get enough for their needs. The study recommends that the County government seriously considers subsidising the prices of farm inputs such as seeds and fertiliser. It should also coordinate and or fund farmers to sink water boreholes for irrigation.

(c)Low literacy levels

Low literacy levels impede the way farmers search, access and use information. As suggested by farmers, education can be achieved through frequent farmer educational forums. *(d)Farming activities*

Farmers need to be encouraged to engage in Entrepreneurial or commercial farming. In this regard therefore, agricultural products need to be processed and the finished goods put out in the local and global market. **2# Information needs of the farming community**

(a) Information needs of farmers

Farmers need information on general farming advice as well as credit facilities other than those offered by Coffee and Tea co-operatives.

(b) Information literacy

Farmers need skills to locate information and evaluate it for use. Techno-savvy farmers, who mainly comprise the youth, need to be encouraged and motivated to provide leadership in information search strategies.

3 # Information seeking behavior of the farming community

Farmers to be encouraged to keep abreast of information as opposed to seeking information only when faced with a problem.

4# Information sources, services and systems available to farmers and the extent to which they meet their needs

Farmers seek information mainly from the extension personnel who visit farmers' groups and also set up information desks during market days. Farmers feel that libraries and *cyber cafes* are not within their social realm. Aggressive publicity and marketing of these services is vital.

5# Communication channels used by farmers to access information

The farming community depends not only on government extension service but also on the information gatekeepers comprising progressive farmer(s) and common interest groups for information. The communication channels frequently used by farmers include the word of mouth (face-to-face and use of mobile phones), field demonstrations, some print materials (charts, pamphlets and posters among others) and radio.

6# Challenges farmers experience in accessing and using information

(a) *Costly travel expenses to access information from Sub-County Agricultural Offices*
(b) *Low extension personnel: farmer ratio*
(c) *Scanty and out-dated agricultural information resources in the libraries.*
(d) *Invaluable but undocumented tacit indigenous knowledge from the farmers.*
(e) *The farmers as well as majority of the extension personnel are not techno-savvy.*
(f) *A high level of information illiteracy hinders Information transfer.*

7# Telecentres: Proposed framework for improving access and use of agricultural information

Sub-Saharan Africa and South Asia have the lowest access to ICTs resources(Pigato, 2001). ICTs except the mobile phones are hardly used for information communication. Farmers support the idea of establishing village telecentres to be run by agricultural subject information specialists.

ICT Based Telecentres for Farming Communities in Kenya

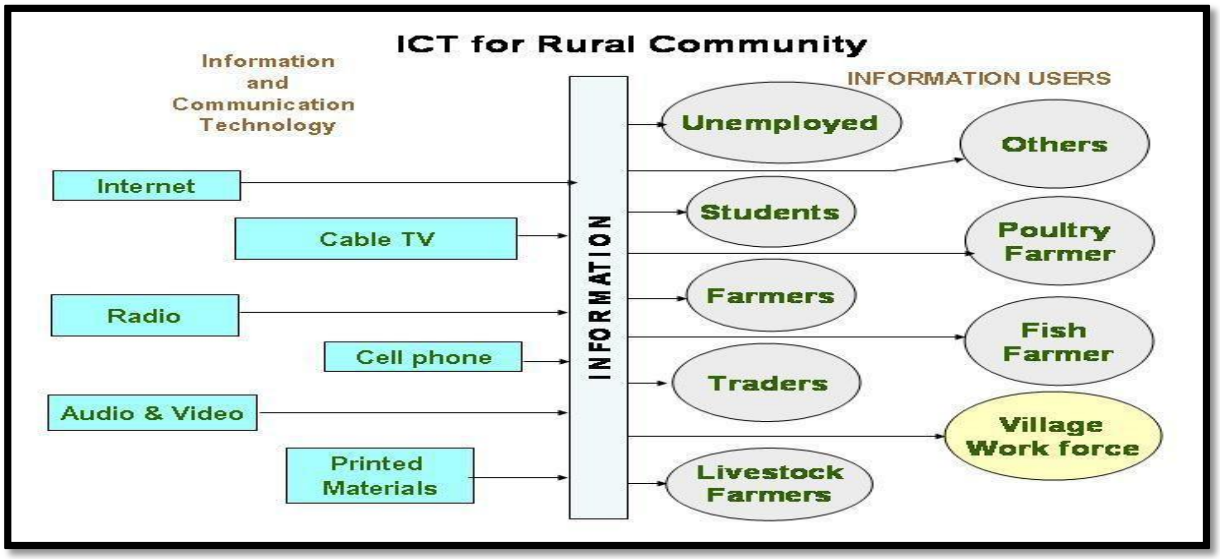

Figure 5: Proposed Framework for ICT Based Telecentres for Farming Communities in Kenya .*Adopted from (Zaman,2008).*

6.0 Recommendations

There is need for;

- More vigorous documenting and re-packaging of information in simple non-technical language for farmers in appropriate print and non- print formats.
- More focus on the farmer as the key element in agricultural production.
- Establishment of an Agricultural Knowledge and Innovation System (AKIS) to enhance the efficiency and effectiveness of the current agricultural information infrastructure.
- Frequent SWOT (strengths, weaknesses, opportunities and threats analysis) analysis of the national agricultural information and knowledge systems for continuous improvement.

7.0 Conclusion

Kenyan agricultural sector continues to play a pivotal role in the rural economy. It also forms a strong springboard from where Kenya as a country can emerge victorious in its unswerving efforts to attain the UN Sustainable Development Goals (SDGs) as well as the national Vision 2030 development goals-(Kenya's national long-term development blue-print aiming to transform *Kenya*into an industrializing, middle-income country providing high quality of life to all its citizens by *2030).*In this regard, Kenya government has fully devolved the agricultural sector function of service provision to the County governments in an effort to ensure food security and therefore Embu County is no exception. The following key areas, therefore, need to be put in place as prerequisites to the national transformative production in the agricultural sector;

- Farmers' information services must be carefully tailor-made to meet their diverse information needs for improved farm production.
- Adoption of ICTs and improvement of the farmers' information literacy skills is inevitable in this information age. Agriculture needs to be transformed from being a labour-intensive venture into an information-intensive model which relies on the ICTs.
- Effective Information Management System (IMS) which involves conversion of data to information and similarly, effective Knowledge Management System (KMS) to facilitate agricultural innovations adoption.

8.0 Further Research

- Development of Web-Based Learning (WBL) for farmers' lifelong Learning as suggested by Misra (2010).
- Use of Computer-Assisted Instruction (CAI) for Agricultural Extension Personnel through Expert Systems (ES) as recommended by McKinion and Lemmon (1985).

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