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The means of access to agricultural information among famers in Samia sub-county, Kenya

[1] Pamphily Mulima, [2] Dr. Harrison Bii, [3] Dr. Emily Bosire
[1] Moi University, Management and Information Studies, Moi University, Kenya
[2] School of Information Science and Knowledge Management, University of Kabianga, Kenya
[3] Department of Library, Records, Management and Information Studies, Moi University, Kenya

Abstract
Small-scale agriculture provides livelihoods for over 70% of the Kenyan population. However, farmers face a number of challenges, including poor access to agricultural information. ICT is yet to be fully utilized in the provision of real time access to information by farmers. The aim of the study was to develop a web-based information system to enhance food security in Samia District. Informed by the study, this paper specific objectives of the study were to: determine ways through which farmers access agricultural information in Samia Sub-County; determine opportunities that ICT-based agricultural information systems present to farmers in Samia Sub-County; identify factors that influence access and utilization of agricultural information by small-scale farmers in Samia Sub-County; and, model and build a prototype web-based agricultural information system that supports access to agricultural information by farmers in Samia Sub-County. This was a case study research whose target population comprised of small scale farmers and technical staff. A sample of 30% of the agricultural officers serving in the study locations was computed. This yielded a sample of 7 agricultural officers who were randomly selected, one from each of the locations in the district. The Agricultural Officer was purposively sampled. The sample size of small scale farmers was computed by the use of the formula indicated by Reid and Boore yielding a proportionate random sample of 399 small scale farmers. The sampling was enhanced by the presence of a list of small scale farmers in the seven locations obtained from the District Agricultural Office. With the help of the agricultural officers serving in the respective locations, these small-scale farmers were identified and interviewed. The questionnaire tool was also administered to the farmers. Data collected were analysed using the cross case data analysis technique. It was established that a majority of the farmers accessed agricultural information through radio (68.3%) followed by traditional sources (47.7%) and mobile phones (34.9%). It was recommended that since majority of rural folks have access to mobile phones, agricultural officers should carry out sensitization seminars and workshops on how farmers can utilize their phones in accessing agricultural information.

Keywords: agricultural information, access, small-scale agriculture, food security

Introduction
According to World Food Summit (1996) [31], food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Hoffman (2000) [13] observes that the Internet is "the most important innovation since the development of the printing press" and that it will "radically transform not just the way individuals go about conducting their business with each other, but also the very essence of what it means to be a human being in society" (p. 152).
According to Chowdhury (2001) [7], Information and Communication Technologies (ICT) "store, process, share, display, protect, and manage information" (p. 12). ICT is one of the fastest growing industries in the world, and access to ICT can enable small farmers to participate in the global market, thus increasing food supply and access (Chowdhury, 2001, p. 70) [7]. Lashgarara, Mirdamadi, Hosseini and Chizari (2008) identify several ways in which ICT can be used to increase food security, including (a) increasing access to real-time market information, (b) fostering agricultural diversification, and (c) increasing the knowledge base of small agricultural businesses by improving access to global knowledge bases, including the world wide web (p. 70).
Farming activities in Kenya are very challenging, putting in mind that in rural Kenya, increasing numbers of environmental shocks (such as flooding and drought) and degradation of agricultural land are contributing to increasing pressures on small-holder farmers. Many need to intensify their food production even where productivity of land is already severely compromised (FAO, 2007) [11].

Overview of Samia District
The Samia speaking people as widely known by other tribes predominantly live in Samia districts (both in Kenya and Uganda) and speak Kisamia (African Press International, 2008). Samia district is in the larger Busia County in Western Kenya. It borders Uganda along Lake Victoria to the west, Bunyala district to the south, Siaya district to the south east and Busia district to the north. It occupies an area of 264.2Km^2 with a population density of 334 persons per square kilometre (KNBS, 2010) [15]. The district has only one division, Funyula, seven locations and twenty-nine sub locations.

Traditionally, agriculturalists, they grow different crops depending on the locations they live in. Close to Lake Victoria, the Samia are mainly fishermen, with their other main agricultural economic activity being growing of cassava, millet, sweet potatoes, beans, maize and cotton, but also horticulture crops such Sukuma week and tomatoes. They also keep a few livestock such as goats, sheep and cows (Kenya Food Security Steering Group [KFSSG], 2012) [14]. Over the years, the government has been urged by leaders in the area to provide relief food to starving Samia District residents (Bwire, 2012). If the area such as Samia with a lot of resource needs food as per the request of the district leaders' then something is wrong and that needs research.

According to the area government officers, crops for farmers in the southern and northern parts of the District fail due to drought thus resulting poor harvest. At the same time erratic rainfall pattern in the area makes the situation quite unpleasant. Pests and diseases do not spare crops that try to resist the weather condition. Farmers in the area should diversify their farming activities by planting drought resistant crops using the improved seeds to ensure food security. The farmers are encouraged to cultivate drought-resistant crops that are certified and by taking advantage of the available agricultural experts to equip themselves with information that is vital for farming activities.

Samia District Development Plan Records District Factsheet (2008-2012) lists the main crops cultivated in the area as maize, sorghum, beans and finger millet. These comprise major food crops in Kenya. Therefore, it is appalling that Samia District still finds itself asking for food relief from the government in the 21st century, especially in the midst of rich resources available such as Lake Victoria.

Sources and access to agricultural information

Any system producing or containing information intended for transmission is an information source. Information sources are distinguished by the form of representation; textual (books, journals, manuscripts), graphic (graphs, diagrams, plans, charts), and audio visual (sound recordings, motion pictures, slides). The characteristics of a good information source are relevance, timelessness, accuracy, accessibility, cost effectiveness, reliability, usability, exhaustiveness and aggregation level (Feather & Sturges, 2014).

Oladele (2011) [21] stresses that the efficiency of technologies generated and disseminated depend on effective communication which is the key process of information dissemination. Therefore, it is expected that the message from the client should be passed back to the source or researchers for the communication process to be complete. Despite the attempts at technological innovation transfer, the wide gap between the levels of production which research contends is attainable and that which farmers achieve, suggests a missing link (Oladele, 2011) [21]. What is more, weak linkages between the farmer, extension workers, and researchers mean that the farmers are not included in the planning of the innovation hence; they do not know where to get information, despite the fact that they are the end users. Agricultural information disseminated by different information sources needs to be determined. It is imperative therefore to identify the sources of agricultural information utilized by farmers.

Opara (2008) [22] has investigated the overall sources of agricultural information available to farmers in Imo State (Nigeria), as well as the farmers' preferred sources. The study reveals that 88.1% of the farmers' source of agricultural information was through extension agents. Similarly, Ozowa (2008) [23] reports that among all the existing channels of communication, farmers in Nigeria ranked extension workers the highest in providing credible information and advice. The investigation was carried out among small-scale farmers in Imo state, Nigeria.

Mokotjo and Kalusopa (2010) [20] in their survey study found that print sources are among the sources of information to farmers in Lesotho. Their study reveals that, although most farmers have acquired primary education, the agricultural information delivered to them is written in local languages. This enables them to utilize the information effectively.

It also demonstrates the high literacy level in Lesotho and indeed according to the literacy rate in Africa, Lesotho occupies the seventh position with a literacy rate of 84.80% (Sani, Boadi, Oladokun & Kalusopa, 2012) [28]. However, only 13% out of 61.7% of the farmers in Lesotho are of the views that print media is one of the appropriate technologies to disseminate information. Lwoga, Stilwell and Ngulube (2011) [17] significantly differ from Mokotjo and Kalusopa (2010) [20]. For them, print materials have low usage due to their unavailability and illiteracy levels of most of the farmers in Tanzania.

The mass media also provides support for the growing involvement of farmers/producers and their organizations in the information dissemination arena. The rapid development of information technologies has profoundly changed the media landscape in African countries. Information and Communication Technology (ICT) is a term that combines computer and telecommunications technology in handling, acquiring, processing, storing and disseminating information (Chauhan, 2009; Malhan, 2007) [5, 18]. Information and Communication Technology is a general or an all-inclusive term that embraces all those technologies that are employed in collecting, storing, organizing and communicating information in various forms (Chisita, 2010) [6].

ICT can become a key enabler of the agricultural-food sector by making dynamic and real time global level exchange of data as stated by Rao (2007) [25]: "Effective deployment of ICT can lead to increase in agricultural competitiveness through cuts in production and transaction costs, raising production efficiencies and farm incomes, conserving natural resources, and by providing more information, choice and value to stakeholders" (p. 492). For successful use of ICT to support farmers and rural communities, the first step is to empower farming communities to define their own needs (Ballantyne, 2009, p. 356) [3]. With wider access to and use of ICT, the potentials of opening up of communication as well as sharing information would be enhanced, so as to assist farmers, researchers, extension workers and policy makers. It will also narrow the information gap that exists between the farmers and the researchers on the other hand because there will be a feedback (Ballantyne, 2009) [3].

In the same view, Renwick (2010) [27] points out that most of the small island nations are above the 100% and some are over 200% mobile phone penetration mark. This implies that many

people had more than one cell phone and over 100% of the farmers used cell phones to receive agricultural information. This indicates that ICT is a very useful tool in the dissemination of agricultural information to the farmers especially in rural areas where cell phones have been embraced by both literate and illiterate farmers. Therefore, ICT has become the most important tool that is crucial in processing and disseminating agricultural information. In the same line of thought, Bolarin and Ayanlade (2010) [4] maintain that mobile phones and computer systems are the most used and widely owned tools today by extension workers and their organizations in the North Central Zone of Nigeria.

This is because, about 75% of the respondents surveyed by Bolarin and Ayanlade (2010) [4] perceived themselves as frequent users of multimedia and other ICT tools. Other sources of information for farmers that are equally important, but less recognized are the traditional sources. The traditional system is the form of information emanating from colleagues, during weddings, naming ceremonies, burials, agricultural shows and festivals and in some cases through town criers (Aina, 1995). Demiryurek *et al*. (2008) [9] argue that dairy farmers in Turkey use four categories of information all of which are traditional sources of information relayed from family members. The four categories are: extension workers, posters and leaflets, family members, and the electronic media.

In the Caribbean, farmers rely heavily on traditional knowledge and informal meetings among themselves for farming (Renwick, 2010) [27]. Questions as to what to plant, what moon phase is best for sowing seeds and transplanting seedlings, and how often to rotate crops are answered through colleagues. This suggests that one of the sources of information to farmers in the Caribbean is the traditional source which is transmitted through oral channels by colleagues.

Similarly, Opara (2008) [22] reports that agricultural information in its broadest sense includes indigenous agricultural knowledge (IAK) which is transmitted orally from person to person. This is a very common practice among farmers in many countries and which is hugely relied on by old farmers as well as the illiterate and many others who favour oral dissemination of information. Oral tradition is an important method of disseminating agricultural information in many African cultures. This is because it recognizes existing traditional or indigenous channels of information dissemination.

Lwoga *et al*. (2011) [17], in their study on access and use of agricultural information and knowledge in Tanzania, report that the major sources of information for farmers are predominantly local (neighbours, friends and family) which implies that their major sources of information are traditional. Emphasizing the importance of traditional information in Africa, Aina (1995) states out that one of the sources of information of farmers in Nigeria is traditional. In other words, information is obtained not from official sources directly but through colleagues or family members.

Aina (1995) holds the view that, though the majority of the farmers in Africa are illiterate, it is possible to supply them with necessary information through the information gate-keepers for instance is popularly known in North Western Nigeria as *SARKIN NOMA* (Information gate keeper), who is a literate farmer among the farming community with a wealth of experience and vast land. The role of a *SARKIN NOMA* is to offer advice and information on a regular basis to other farmers for improvement. The contention by Ugboma (2010) buttresses the various studies cited. In a study conducted on access to agricultural information by fish farmers in the Niger Delta Region of Nigeria, Ugboma observes that 63% of the respondents indicate that, their source of information is through traditional, as well as personal experience.

Statement of the Problem

Achieving food security is the greatest challenge of humankind (Upreti, Bhattarai & Wagle, 2013). Information and Communication Technologies (ICT) as a tool of communication have a potential to contribute to achieving food security significantly. In the 21st century, speed, high performance and convenience of every activity have become common demand features of every system and sector, and agriculture is no exception. However, for most rural populations that predominantly rely on agriculture, ICTs are seen as an urban phenomena which have nothing to do with rural people. As agriculture continue to be a major income earner for small scale farmers, how to obtain a reliable, timely and relevant information source for their agricultural activities becomes a very important aspect (Diekmann, Loibl & Batte, as cited in Babu, Glendenning, Asenso-Okyere & Govindarajan, 2012) [2].

Agricultural information systems play a key role in disseminating knowledge, technologies and agricultural information, and in linking farmers with other actors in the economy. An information system is one of the critical change agents required in transforming subsistence farming to a modern and commercial agriculture to promote household food security, improve income and reduce poverty in an area such as Samia District. However, there is limited access to agricultural information in Samia District leading to a perpetual food insecurity scenario in the district. This situation has hindered most farmers from keeping pace with changing technological advances in the district.

Modern ICTs could play a major role in communicating information and knowledge to rural agricultural communities, delivering education modules, accessing inputs, planting methods, conducting business, facilitating networking and strengthening partnerships, scaling up inter-linkages of development interventions and increasing agricultural productivity. Inadequate agricultural information-research-extension-farmer linkages to facilitate demand-driven research and increased use of improved technologies continue to constrain efforts to increase agricultural productivity in Samia District as farmers continue to use outdated and ineffective technologies.

As Golan *et al*. (2004) [12] notes, food safety is an important aspect of food security and can be better administered through information systems that manage food traceability and aid in making "informed decisions about agricultural productivity". This then begs the question, 'what kinds of agricultural knowledge management systems could be effectively implemented to increase food safety and security'? This then brings to the fore the need to develop agricultural information

systems that can link research and the farmers and hence enhance food security in the region.

Materials and Methods

The study was conducted in the seven locations namely Bwiri, Agenga, Nanguba, Nangosia, Namboboto, Nambuku and Odiado of Funyula division, Samia District, in Busia County. The District has a population of about 124,952. Samia District was chosen because, according to Kenya National Bureau of Statistics (2010), it has continued to register poor performance in farming productivity. Despite farming being the main economic activity, it was identified as a sector that was performing poorly in the district. The formidable problem facing farming in the district was the need to improve farming practices through accessing agricultural information. Farmers in the area face many problems that range from very high transport costs, high transactional costs, low agricultural productivity, low levels of irrigation, erratic rainfall, vulnerability to high seasonal and inter-annual fluctuations, high rates of evapo-transpiration and very slow adoption of technology. The dominant mode of communication was conventional and this called for the need to explore the potential of a web-based information management system in Samia Kenya (ITU, 2010).

The study adopted the case study approach. specifically, the study applied one of agile methodologies known as Feature Driven Development (FDD) model for system development as advanced by Jeff DeLuca and Peter Coad in (1999), Palmer and Felsing (2002) [24] and Sensors (2011). Other agile methodologies include scrum, extreme programming, crystal, Dynamic Systems Development Methods and Lean Software Development. FDD was chosen because it describes specific, short phases of tasks which are to be accomplished separately per feature and also it is a client-centric, architecture-centric, and pragmatic software process.

The sample population was taken from target population which comprised the agricultural officers and farmers. The population of Samia District is 124,952 people. The target population comprised of small scale farmers and technical staff (1 District Agricultural Officer and 21 agricultural officers serving in locations) working in the agricultural sector who are ever in contact with farmers providing information on how to improve their agricultural activities. A sample of 30% of the agricultural officers serving in the study locations was computed. This yielded a sample of 7 agricultural officers who were randomly selected, one from each of the locations in the district. The District Agricultural Officer of Samia District was purposively sampled. The sample size of small scale farmers was computed by the use of the formula indicated by Reid & Boore (1991) [26] (since the population is greater than 10,000). The formula used was as follows:

$n = N / [1+N (e)^2]$

Where:

n- Sample

N- Population size

e- Accepted level of error taking alpha as 0.05

Therefore:

$n=124,952/ (1+124,952x.05^2)$

$n= 399$

A total of 407 respondents were sampled in this study. Data for the study were collected using a questionnaire, interview schedule guide and content analysis. The collected data were analysed using the cross case data analysis technique). The comparison is done against predefined categories to deduce similarities and differences, or in another strategy, classify the data by their data source (Eisenhardt, 1989). The author selected pairs of cases listing the similarities and differences which led to deeper understanding of the problem that was under investigation. The author derived insights from the questionnaire, document analysis and interviews separately. Eisenhardt (1989) further states that when a pattern from one data source is corroborated by evidence from other source, the finding becomes stronger.

Results and Discussion

Ways through which Farmers Access Agricultural Information

The study sought to examine the ways through which farmers in Samia District gained access to important agricultural information. Data for this objective were sourced from both farmers and the District Agricultural Officer. Farmers were asked to indicate ways through which they obtain agricultural information that informs their cultivation, planting, harvesting and the final marketing of their products. Eight sources through which farmers access agricultural information were identified by the farmer respondents albeit at varying frequencies. Table 1 below presents a summary of the findings.

Table 1: Sources of agricultural information

Source of agricultural information	Frequency	Percentage
Mobile phones	122	34.9
Print media	21	6.0
Agricultural extension officers	76	21.7
Traditional sources (via colleagues, veteran farmers, ceremonies and agricultural shows)	167	47.7
Electronic media (internet)	15	4.3
Radio	239	68.3
Leaflets and newsletters	23	6.6
Posters	31	8.9

***Source*:** Researcher (2017)

It can be noted from Table 1 above that majority of the farmer accessed agricultural information through radio (68.3%) followed by traditional sources (47.7%) and mobile phones (34.9%). Of significance in this finding is the proportion of

farmers who rely on traditional sources to obtain agricultural information and yet these sources do not in any way constitute ICT based information. Apart from agricultural information sourced from agricultural shows which are only organized once a year, information sourced from other traditional ways may not be authentic or scientific and hence unreliable. This perhaps explains why Samia District is slowly creeping into a food insecure region.

Of concern in this finding also is the low proportion of farmers who receive agricultural information from agricultural extension officers. Ordinarily, agricultural extension officers should be on the fore front of ensuring that as many farmers as possible obtain reliable agricultural information. This is in contrast with studies carried out in other parts of Africa which report that majority of small scale farmers obtain agricultural information from agricultural extension officers. For instance, Opara (2008) [22] investigated the overall sources of agricultural information available to farmers in Imo State (Nigeria), as well as the farmers' preferred sources. The study reveals that 88.1% of the farmers' source of agricultural information was through extension agents. Similarly, Ozowa (2008) [23] shows that among all the existing channels of communication, farmers in Nigeria ranked extension workers the highest in providing credible information and advice. The investigation was carried out on small farmers in Imo state, Nigeria.

The disparity with the scenario in Samia District could be attributed to a number of factors such as the state of roads, availability of vehicles to transport the agricultural officers considering that Samia is vast in coverage and the adequacy in terms of capacity of the agricultural officers. When asked to indicate how the he disseminates agricultural information to the farmers, the District Agricultural Officers indicated as follows:

…majorly I hold talk shows in radio stations whose wavelengths get to this region…at least majority of the small scale farmers own radios…I also use the agricultural officers in the various locations to meet farmers in their respective localities and disseminate required information…. (Personal Communication, Agricultural Officer, Samia District, 2017).

The research also sought to establish the extent to which the farmers access agricultural information. A four-point Likert scale was used to categorize the responses. The Likert scale constituted the following items: 1-No Access; 2-Low Access; 3-Medium Access; and 4-High Access. The results of this analysis were as presented in Figure 1 below.

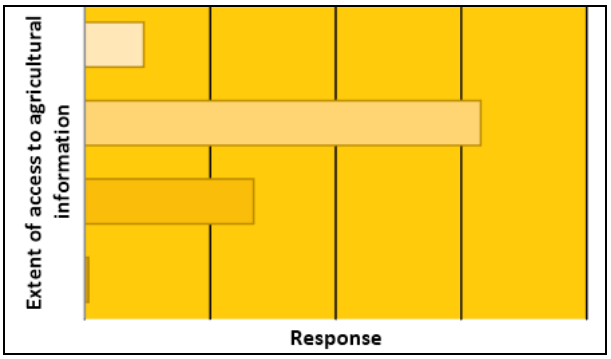

Fig 1: Extent of access to agricultural information

From Figure 1 above, it can be observed that majority (221; 63.1%) of the respondents indicated that their extent of access to agricultural information was medium. They were followed by those whose access to agricultural information was low (94; 26.9%). Those whose access to agricultural information was high accounted for only 33(9.4%) while a negligible proportion (2; 0.6%) indicated that they had no access to agricultural information. Clearly, dissemination of agricultural information among farmers in Samia District is still wanting.

Maru (2008) [19] notes that having adequate and well-presented scientific, legal and commercial agricultural information will improve the efficiency of rural development, policies, projects and programmes. Agricultural information provision should be the basic component of rural development programmes. Oladele (2011) [21] observes that lack of agricultural information is a key factor that has greatly limited agricultural advancement in developing countries. Therefore, agricultural information interacts with, and influences, agricultural activities in a variety of ways. This tends to imply that agricultural information can help inform decision-making regarding land, labour, livestock, capital and management.

The research further sought to find out the extent of utilization of agricultural information by small scale farmers in Samia District. A four-point Likert scale with the following items was used to categorize the responses: 1-No Utilization; 2-Low Utilization; 3-Medium Utilization; 4-High Utilization. Table 2 below summarizes the research findings.

Table 2: Extent of Utilization of Agricultural Information

Extent of utilization	Frequency	Percentage
No utilization	2	0.6
Low utilization	98	28.0
Medium utilization	237	67.7
High utilization	33	9.4
Total	350	100.0

Like the findings on access to agricultural information, those who reported to be utilizing the information averagely were almost the same proportion of the farmers who indicated that they were accessing agricultural information averagely. Access and utilization of agricultural information needs to go hand in hand; otherwise, the objective of disseminating such information may never be achieved.

Agreeing with the need to not only access but utilize agricultural information, Ballantyne (2009) [3] opines that "Effective deployment of ICT-based agricultural information can lead to increase in agricultural competitiveness through cuts in production and transaction costs, raising production efficiencies and farm incomes, conserving natural resources, and by providing more information, choice and value to stakeholders" (p. 356). In using ICT-based agricultural information successfully to support farmers and rural communities, the first step is to empower farming communities to define their own needs. With wider access to and use of ICT-based agricultural information, the potentials of opening up of communication as well as sharing information would be enhanced, so as to assist farmers, researchers, extension workers and policy makers. It will also narrow the information gap that exists between the farmers

and the researchers on the other hand because there will be a feedback.

Conclusion and recommendations

Increased usage of web-based and related technologies opens up great opportunities to those who are ready to undertake them. Samia District population is growing every year and adopting new farming technology would assist much the district in food security and in the county and for the much needed certification of its population. The study findings indicated that a larger proportion of the farmers rely on radios to receive agricultural information. Since majority of rural folks have access to mobile phones, agricultural officers should carry out sensitization seminars and workshops on how farmers can utilize their phones in accessing agricultural information.

References

1. Aina LO. Information and agriculture in Africa IN, Aina LO, Kaniki AM, Ojiambo JB, (Eds.), Agricultural Information in Africa, Ibadan, Nigeria: Third World Information Services, 1-11.
2. Babu SC, Glendenning CJ, Asenso-Okyere K, Govindarajan SK. Farmers' information needs and search behaviors: Case study in Tamil Nadu, India. Washington DC: International Food Policy Research Institute, 2012.
3. Ballantyne P. Accessing, sharing and communicating agricultural information for development: an emerging trends and issues. Information Development. 2009; 25(4):260-271.
4. Bolarin O, Ayanlade A. Utilization of satellite imaging and information communication technology in agricultural information dissemination in Nigeria. Journal of Agricultural and Food Information. 2010; 11(4):351-357.
5. Chauhan AV. Use of ICT Information and Communication Technology in Technology Libraries. Journal of Library Philosophy and Practice, 2009.
6. Chisita CT. An investigation in to the use of ICT in the provision of agricultural information to small scale farmers in Harare. World Library and Information Congress: Proceedings of the 76th IFLA General Conference and Assembly, Gothenburg Sweden, 2010, 1-14.
7. Chowdhury N. Information and communications technologies. Appropriate technology for sustainable food security. Retrieved, 2001-2017 from http://www.ifpri.org/sites/default/files/publications/focus07.pdf
8. DeLuca J, Coad P. Java modelling in Color with UML. Upper Saddle River, NJ: Prentice Hall PTR, 1999.
9. Demiryurek K, Erdem H, Ceyhan V, Atasar S, Uysal O. Agricultural information systems and communication network: the case of dairy farmers in the Samsun province of Turkey. Information Research. 2008; 13(2):1320.
10. Eisenhardt KM. Building theories from case study research. Academy of Management Review. 1989; 14(4):532-50.
11. Food and Agricultural Organization, FAO, International Conference on Organic Agriculture and Food Security, FAO, Italy, 2007.
12. Golan E, Krissoff B, Kuchler F, Calvin L, Nelson K, Price G. Traceability in the U.S. food supply: Economic theory and industry studies (Report No. 830). Economic Research Service, US. Department of Agriculture, Agricultural Economic Report No. 2004, 830.
13. Hoffman DL. The Revolution Will Not Be Televised: Introduction to the Special Issue on Marketing Science and the Internet. Marketing Science. 2000; 19(1):1-3.
14. Kenya Food Security Steering Group (KFSSG). The 2011 Long Rains Season Assessment Report. Nairobi: Government Printers, 2012.
15. Kenya National Bureau of Statistics (KNBS). National Census Report. Nairobi: KNBS, 2010.
16. Lashgarara F, Mirdamadi SM, Hosseini SJF, Chizari M. The Role of Food-Security Solutions in the Protection of Natural Resources, and Environment of Developing Countries. Ann. N.Y. Acad. Sci., 2008; 1140, 68-72.
17. Lwoga ET, Stilwell C, Ngulube P. Access and use of agricultural information andknowledge in Tanzania. Agricultural information and knowledge. Library Review. 2011; 60(5):383-395.
18. Malhan IV. Agricultural knowledge transfer in India: a survey of prevailing communication channels. Journal of Library Philosophy and Practice, 2007, 1-12.
19. Maru A. A Normative model for agricultural research information system, 2008, 19-25.
20. Mokotjo W, Kalusopa T. Evaluation of the agricultural information service (AIS) in Lesotho. International Journal of Information Management. 2010; 30:350-356.
21. Oladele OI. Effect of Information Communication Technology on agricultural information access among researchers, extension agents and farmers in South Western Nigeria. Journal of Agriculture and Food Information. 2011; 12:167-176.
22. Opara UN. Agricultural information sources used by farmers in Imo State, Nigeria. Information Development. 2008; 24(4):289-292.
23. Ozowa VN. Information needs of small scale farmers in Africa the Nigerian example. Quarterly Bulleting of the International Association of Agricultural Information Specialist. 2008; 40(1):1-6.
24. Palmer SR, Felsing JM. Practical Guide to Feature-Driven Development. Prentice Hall, 2002.
25. Rao NH. A frame work for implementing information and communication technologies in agricultural development in India. Journal of technological forecasting and social change. 2007; 74:491-518.
26. Reid NG, Boore JRP. Research Method and Statistics in Health Care. London: Edward Arnold, 1991.
27. Renwick S. Current trends in agricultural information services for farmers in Trinidad and Tobago Caribbean. Proceedings of the 76th IFLA, General conference and assembly, Gothenburg Swede, 2010, 1-12.
28. Sani L, Boadi BY, Oladokun O, Kalusopa T. The Generation and Dissemination of Agricultural Information to Farmers in Nigeria: A Review. Journal of Agriculture and Veterinary Science (IOSR-JAVS). 2012; 7(2):102-111.

29. Ugboma MU. Access to Agricultural Information by Fish Farmers in Niger Delta Region of Nigeria. Library Philosophy and Practice (e-journal). University of Nebraska, Lincoln, 2010, 424.
30. Upreti BR, Bhattarai R, Wagle GS. Human Security in Nepal: Concepts, Issues and Challenges. Nepal Institute for Policy Studies and South Asia Regional Coordination Office of NCCR (North-South) Kathmandu, 2013.
31. World Food Summit. Food Security. Information presented at the meeting of the World Health Organization. Retrieved, 1996-2017 from http://www.who.int/trade/glossary/story028/en/