IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 8, Issue 7 Ver. III (July. 2015), PP 06-10
www.iosrjournals.org

Assessing Benefits and Challenges Smallholder Dairy Farmers Experience in Using Ict Tools To Source Information on Insemination Services and Breeding Stock in Western Kenya

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Abstract: *This paper uses data from a survey of 245 smallholder dairy households in two divisional administrative zones in Western Kenya to establish the benefits and challenges smallholder dairy farmers experience in using ICT tools to source information on insemination services and breeding stock. The results show that websites, email, electronic identification system, video and CD was the least forms of ICT tools which farmers used when either sourcing information for insemination services or breeding stock with a mean <1. Results however shows that majority of the farmers at least uses radio as a tool for sourcing information for dairy insemination services with a mean of 2.44. The mobile phone/SMS facility was found to be the most widely used ICT tool when sourcing for information on insemination services for decision making with 76% of the respondents benefiting from it. 60% of the farmers believe that there is no incentive to use mobile phone/SMS facility when sourcing dairy insemination services, 39% also believe so when sourcing information on dairy breeding stock.*

Keywords: *Decision making, ICT, information sources, smallholder dairy farmer.*

I. Introduction

The dairy industry is the most advanced of the livestock subsectors dominated by smallholders with over 75% of the total output. However, the subsector faces challenges on financing, training, traceability, processing and oversupply (MOLD, 2006). These challenges can be addressed by integrating more partners and parameters with ICT innovations that aid automatic decision making. For a dairy industry to function effectively and efficiently, producers, market agents and consumers, need good information on a variety of subjects such as production, marketing and consumption. Facilitating the flow of such information presents a particular challenge in Kenya, where the dairy industry is a major source of livelihood and is predominantly based on small-scale production and marketing (SDP, 2004).Access to breeding information is a constraint for many actors in the smallholder dairy subsector, and uncertainty exists regarding the quality and reliability of the information that is available. Use of ICT in dairy or e- dairy refers to using Information and Communication Technologies (ICTs) in the sector to enhance sustainable agricultural development and food security and was officially endorsed at the World Summit on the Information Society (WSIS) 2003- 2005.

E-dairy promotes a multi-stakeholder, people-centric, cross-sectoral platform that brings together all stakeholders in dairy production, especially farmers and enable them to access timely and relevant information, exchange opinions, experiences, good practices and resources related to dairy breeding. Limited user awareness, adaptation and adoption of improved technology is generally known to affect milk yield (Ghobrial and Musa, 2006). Kinyili (2003) noted that access to information is a potential avenue for improving yield among the small holder dairy farmers. The farmer's access to information helps them to know about improved technologies and enhance the adoption of new innovations (Daberkow and McBride, 2003). Sudath (2008) noted that agricultural innovation diffusion is largely affected by information available on the innovation. These barriers may be alleviated by employing ICT tools to provide an information bridge between agricultural experts and farmers. For example, communication via mobile phones can reach farmers in distant areas where land line phones are limited. Research institutions have a responsibility of ensuring that the information they disseminate is packaged in a way that makes it easy for the end-users to understand and to use appropriate dissemination channels that would make the information accessible and beneficial to the end-users (Ghobrial and Musa, 2006).

II. Methology

2.1 Sample Size Determination: The sample size was derived from the formula:

$$n = 2[\frac{Zc}{d}]^2$$

Where n = desired sample size, z = 95% confidence level set at 1.96, c = the coefficient of variation given as the ratio of standard deviation to population mean and expressed as a percentage, d = the expected difference in variables defining dairy production between the study areas. Households keeping cattle had been

estimated between 69.4% and 71% in Vihiga district and between 84% and 85% in Nandi district (Waithaka et al., 2002; KNBS, 2010) with Bos taurus cattle breeds reported to make 50% (with a standard deviation of 47%,) of the cattle (Waithaka et al. (2002) in Vihiga and Nandi districts. On the basis of this information, the coefficient of variation (c) was computed (0.47/0.5) as 0.94. Considering the percentage difference in livestock population as an indicator of the expected difference between Nandi and Vihiga Districts, the expected difference was computed (d = (0.84 – 0.71)/0.71) as 0.183 (Waithaka et al. 2002) and (d = (0.85 – 0.694)/0.694) as 0.223 (KNBS, 2010) giving a mean value of 20%. The sample size determined with these parameters fitted in the formula above ($n = 2[(1.96 \times 0.94 / 0.2)^2]$) was 170 households which was distributed equally (n=85) to the two districts. This sample size was adjusted upwards to 245 based on the percentage of non-dairying households (Waithaka et al., 2002).

2.2 Collection of Data

2.2.1 Preparation/pretesting of interview schedule: For the collection of data from the respondents, a comprehensive interview schedule was developed covering all the objectives of the said study. The interview schedule was pretested on 20 farmers other than the research sample. As a result of pretesting necessary changes were made to make it more effective.

2.3 Analysis of Data: The data was analyzed by the computer software SPSS (Statistical Package for Social Sciences). Interpretation of data was made by using descriptive statistics such as frequencies, means, percentage and standard deviation.

III. Results and Discussion

3.1: The Frequency of Use of ICT Tools in Sourcing Information for Dairy Insemination Services and Breeding Stock

Frequency of use of mobile phone when sourcing information for dairy insemination shows that farmers use in some cases as compared to use of mobile when sourcing information for dairy breeding stock. Websites, email, electronic identification system, video and CD was the least forms of ICT tools which farmers used when either sourcing dairy for insemination services or breeding stock with a mean <1. Radio however shows that majority of the farmers at least uses radio as a tool for sourcing information for dairy insemination services with a mean of 2.44. TV also was another form of ICT tool farmers are using when sourcing for information on insemination services with a mean 1.58 but some are not aware if information on the breeding stock is available on TV. The results are in agreement with of Irfan et al. (2007) findings that farmers ranked TV as the first ICTs in terms of effectiveness in disseminating breeding information.

Table 1: Frequency of use of ICT on dairy insemination and breeding stock

	Mean
Frequency of use of mobile phone when sourcing information for dairy insemination services	2.49
Frequency of use of mobile phone when sourcing information for dairy breeding stock	1.62
Frequency of use of websites when sourcing information for dairy insemination services	.34
Frequency of use of websites when sourcing information for dairy breeding stock	.02
Frequency of use of email services when sourcing information for dairy insemination services	.36
Frequency of use of email services when sourcing information for dairy breeding stock	.04
Frequency of use of electronic identification system when sourcing information for dairy insemination services	.16
Frequency of use of electronic identification system when sourcing information for dairy breeding stock	.01
Frequency of use of video when sourcing information for dairy insemination services	.63
Frequency of use of video when sourcing information for dairy breeding stock	.08
Frequency of use of CD when sourcing information for dairy insemination services	.58
Frequency of use of CD when sourcing information for dairy breeding stock	.08
Frequency of use of radio when sourcing information for dairy insemination services	2.44
Frequency of use of radio when sourcing information for dairy breeding stock	1.01
Frequency of use of TV when sourcing information for dairy insemination services	1.58
Frequency of use of TV when sourcing information for dairy breeding stock	.59

3.2 Benefits experienced with the use of ICT tools in sourcing information for Dairy Insemination services and Breeding Stock

The benefit of using mobile phone/SMS facility was found to be the most widely used ICT tool when sourcing for information on insemination services for decision making with 76% of the respondents benefiting from it. Radio even though being a good form of information sharing tool does not have much benefit on timely dairy insemination services for decision making. This can be argued that majority of the farmers' posses' handheld mobile phone which enable them to communicate more easily and frequently with other farmers. This in agreement with Ilahiane (2008) findings that mobile phones have revolutionalised the way in which farmers access, exchange and manipulate information because they have changed the way farmers interact with markets and cities and they enable farmers to extract current and relevant information critical for decision making. Furthermore the results contradict the findings of Shepherd (2001) who found that in Africa, radio is still the most appropriate communications technology that is available to the majority of Africans, particularly the disenfranchised rural communities, women and the youth.

Timely dairy breeding stock information shows that few of the farmers 3% are using website as the main source for information on breeding stock. The results disagree with findings of Dey et al. (2008) who found that many farmers do not know how to operate a laptop or how to access the Internet also computers and Internet do not make sense to the farmers unless they generate substantial benefits for them. Even if an application is extremely innovative from a designer's perspective, it will not be adopted if the target users find it hard to use and the benefits generated are outweighed by the difficulties of access. Up to date information on dairy insemination services shows that 55% of the farmers has benefitted from using mobile/SMS facility while 38% uses radio. Up to date dairy breeding stock information shows that 70% of the farmers have benefitted from radio while 25% have used mobile phones. The findings agree with the study carried out by Shepherd (2001) who noted that in Africa, radio is still the most appropriate communications technology that is available to the majority of Africans, particularly the disenfranchised rural communities, women and the youth. Detailed information on dairy breeding stock is usually delivered through website as represented by 98% while information in insemination services is received through radio with 46% and 45% mobile. Quick link with appropriate information source shows that 71% of the farmers are mostly using mobile phone on dairy breeding stock while 98% are using website for quick insemination services. Open source information on breeding stock and insemination services shows that website is very important with 98%.

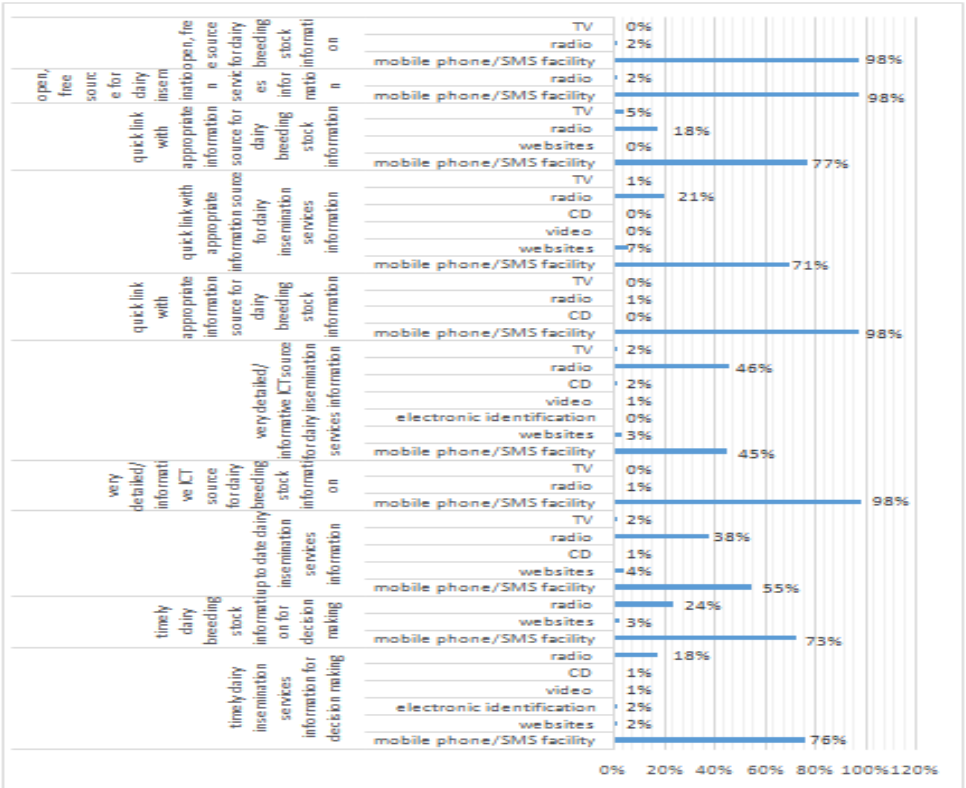

Figure 1: Benefits experienced with the use of ICT tools in sourcing information For Dairy Insemination services and Breeding Stock

3.3 Challenges with the Use of ICT Tools in Sourcing Information

Challenges of using mobile phone/SMS facility when sourcing dairy insemination services shows that 60% of the farmers believe that there is no incentive to use such an ICT tool, 39% also believe so when sourcing information on dairy breeding stock. Use of websites to source information shows that it is sophisticated for farmers to use when sourcing information for both insemination and breeding stock with 33% and 38% respectively. Email services as a means of information shows that the tool is not available for farmers. Electronic identification system is a sophisticated ICT tool for farmers to use when sourcing for information for both insemination and breeding stock. Use of video and CD as a means of information to farmers the tools are not available. Use of radio as a source for information shows that there is no incentives for farmers to motivate them to source for information through this media.

Table 2: Challenges with the Use of ICT Tools in Sourcing Information for Dairy Insemination Services and Breeding Stock

	No incentive	Unaffordable	Sophisticated	No infrastructure	ICT tool unavailable	Need assistance
Using mobile phone/ SMS facility when sourcing dairy insemination services information	60%	5%	2%	16%	11%	6%
Using mobile phone/ SMS facility when sourcing dairy breeding stock information	39%	6%	2%	36%	11%	6%
Using websites when sourcing dairy insemination services information	15%	10%	33%	13%	25%	30%
Using websites when sourcing dairy breeding stock information	10%	11%	38%	14%	24%	3%
Using email services when sourcing dairy insemination services information	12%	9%	27%	17%	33%	2%
Using email services when sourcing dairy breeding stock information	8%	9%	32%	17%	32%	2%
Using electronic identification system when sourcing dairy insemination services information	14%	9%	32%	11%	32%	2%
Using electronic identification system when sourcing dairy breeding stock information	11%	9%	39%	9%	30%	2%
Using video when sourcing dairy insemination services information	18%	12%	12%	23%	33%	10%
Using video when sourcing dairy breeding stock information	13%	11%	14%	25%	35%	1%
Using CD when sourcing dairy insemination services information	18%	8%	8%	24%	40%	2%
Challenges of using CD when sourcing dairy breeding stock information	12%	8%	11%	27%	40%	2%
Using radio when sourcing dairy insemination services information	63%	5%	6%	10%	15%	0%
Using radio when sourcing dairy breeding stock information	43%	5%	5%	10%	36%	0%
Using TV when sourcing dairy insemination services information	23%	25%	6%	29%	16%	1%
Using TV when sourcing dairy breeding stock information	19%	25%	5%	32%	18%	1%

IV. Conclusion and Recommendations

Based on the findings of this research work, it can be concluded that radio and mobile phone, followed by television were the most accessed and utilized ICTs among the SHDF. This enabled the farmers to get information freely, get timely information for decision making and acquire most current breeding information especially information on individual performance of bull/AI. However, the use ICTs available was still low, due to poor infrastructure, most of ICT tools were not available and that there was no incentives to use them, hence intensive effort should be made in creating and promoting favourable environment that will speed up the full utilization of the potentials of ICTs in breeding operations in the area. This is predicated on the fact that ICTs are essential for sourcing and disseminating information on extension service delivery for dairy production. Illiteracy is a fundamental barrier to participation in knowledge societies. A large proportion of the rural population in the study area, majority of who are women, is illiterate and most pictographic and audio-visual information usually has some text that goes with it. This means that these individuals are disadvantaged and lack the basic skills required to harness the benefits of ICTs. The assistance of intermediaries may thus be required. Thus, improved productivity by farmers can only be achieved through communication of the results of research findings to the largest numbers of people in the shortest possible time. Electronic and print media are the channel which can be utilized for such purpose.

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