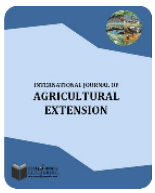

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INFLUENCE OF UTILIZING ANIMAL HUSBANDRY INFORMATION FROM MOBILE PHONES ON MILK YIELD AMONG SMALLHOLDER DAIRY FARMERS IN NJORO SUB-COUNTY, KENYA

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A B S T R A C T

Dairy cattle farming in Kenya contribute 3.5% of the national Gross Domestic Product (GDP); and provide income, employment and food to 1.6 million smallholder dairy farmers. The major constraint in the dairy industry in Njoro Sub-County is inadequate utilization of animal husbandry information by smallholder dairy farmers with one of the consequences being low milk yield. Over 80 per cent of the smallholder dairy farmers and all the livestock extension officers in Njoro Sub-County own mobile phones. This creates an opportunity for smallholder dairy farmers to utilize animal husbandry information from mobile phones which remains under-exploited. The purpose of this study therefore, was to determine the influence of utilizing animal husbandry information from mobile phones on milk yield among smallholder dairy farmers in Njoro Sub-County, Kenya. An ex post facto research was carried out to collect data from a sample of 106 smallholder dairy farmers selected by probability sampling from Njoro Division. A researcher administered questionnaire was used for data collection. Validity of the instruments was examined by supervisors and piloting was done in Mauche Division to determine the reliability of the tool. The null hypothesis was tested using Pearson's Correlation at 1% level of significance. The results revealed that there was a statistically significant correlation between utilizing animal husbandry information and milk yield among smallholder dairy farmers. The study therefore recommended that for increased milk production to be realized in Njoro Sub-County, deliberate efforts should be made to improve utilization of animal husbandry information from mobile phones.

Keywords: Influence, utilizing, animal husbandry information, mobile phones, smallholder dairy farmers, milk yield, cellular based extension services

INTRODUCTION

Livestock production is an integral component of rural development; contributing towards enhanced agricultural productivity, improved rural livelihoods and ecological services (Calpi, 2005). Globally, there are about 300 million rural and peri-urban people depending upon livestock for their livelihoods. It is estimated that from 300 million livestock dependent inhabitants 150 million are residing in developing countries (FAO, 2015). In Kenya the 1.6 million people are livestock dependent. The dairy sector accounts for about 3.8 percent of the national Gross Domestic Product (GDP) and 14 percent of agricultural GDP. It provides income, employment and food to over 22 million Kenyans (FAO, 2015).

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The country's dairy cow population is approximated to be 7.6 million, the biggest in sub-Saharan Africa (International Fund for Agricultural Development (IFAD), 2015). Kenya's membership to the regional trade blocks provides preferential market access for milk products within them. The regional milk markets include the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA) (Gichungu, 2009). Milk is a basic household commodity in Kenya and constitutes a big percentage of the breakfast budget for over 25 million Kenyans (Government of Kenya (GOK), 2014). The country produces 6.8 billion litres of milk per year valued at Kenya shillings (Kes) 110 billion against the annual potential milk production of 17.8 billion litres. The smallholder dairy farmers are the majority and produce over 80 percent of the milk (Ministry of Livestock Development, (MOLD), 2015c).

According to the Provincial Director of Livestock Production (PDLP), Rift Valley province, in year 2015 the province had a dairy herd population of about two million with an annual milk production of two billion litres. This amount fetched an income of Kes. 34.6 billion during the year. However, the province has a potential to produce five billion litres per year (MOLD, 2015b). Furthermore in the year 2015, the District Livestock Production Officer (DLPO), Njoro Sub-County revealed that dairy production was the most prominent livestock enterprise in the Sub-County. The report further indicated that the Sub-County had a population of 10,300 smallholder dairy farmers. The Sub-County total cattle population is estimated at 40,000; out of which 33,000 are pure breeds and their crosses while 7,000 are zebu. The current total milk yield in the Sub-County is approximately 18.5 million litres per year. However, the Sub-County has a potential of producing over 39 million litres of milk per year, which remains unexploited (MOLD, 2015a).

Mobile phone services are increasing faster than fixed-line networks. In 2004 for example, there were over 940 million mobile phone users compared to 900 million fixed telephone lines around the world. Today the world has over 6 billion while East Africa has over 75 million mobile phones in use (International Telecommunications Union (ITU), 2014). In 2004, there were 240,000 fixed telephone line subscribers and 2.8 million cellular mobile subscribers in Kenya. Today Kenya has about 29.2 million mobile phone subscribers compared to only 70,000 fixed lines. There are four mobile phone operators in Kenya namely; Safaricom, Airtel, Orange and Yu (Communications Commission of Kenya (CCK), 2014). The percentage of smallholder famers using mobile phones in Kenya stands at 65 percent (Kenya National Bureau of Statistics (KNBS), 2009). Over 8,240 (80 percent) of the 10,300 smallholder dairy farmers in Njoro Sub-County own mobile phones (MOLD, 2015a). The mobile phone may be a powerful tool in dairy farming business. The smallholder dairy farmers can interact with experts and systems via calls or short messages (sms) made through mobile phones to access animal husbandry information hence improving livestock system. Mobile phones link producers and consumers; and producers and marketing outlets. They enable producers and market outlets obtain critical information rapidly. By linking these groups directly and at low costs mobile phones may help to reduce animal husbandry information gaps between producers and consumers. Access to rapid and low cost information help smallholder dairy farmers make better production and marketing decisions which influence milk output (National Farmers Information Service (NAFIS), 2015).

Despite the development of dairy farming, expanding markets and commercializing of the dairy farm business in Njoro Sub-County; smallholder dairy farmers still face many constraints. The major problem is inadequate utilization of dairy animal husbandry information with one of the envisaged consequences being low milk yield. Milk production in Njoro Sub-County is estimated at 18.5 million against the potential of 39 million litres per year, which remains unexploited. The Livestock officer to farmer ratio is low, at 1:5,940 and the transport situation in the study area is also poor. The result is low utilization of animal husbandry information possibly due to poor access. This might contribute to low milk yield among smallholder dairy farmers in Njoro Sub-County. Utilization of animal husbandry information could be improved by mobile phone technology use since over 80 percent of the smallholder dairy farmers in Njoro Sub-County own mobile phones. Mobile phones have been considered due to their wide network, affordability, timeliness and ease of use by over 8,240 smallholder dairy farmers in the study area (MOLD, 2015a). The smallholder dairy farmers need essential information that would help them improve their farming techniques and engage in more profitable milk production (Staal, 2008). The information should be easily, timely and conveniently accessible to all the dairy farmers (Ombati, 2006). Mobile phones could act as a channel used to access animal husbandry information by the smallholder dairy farmers who may utilize the same to influence milk production in Njoro Sub-County. Hence, the need for the study to determine the influence of utilizing animal husbandry information from mobile phones on milk yield among smallholder dairy farmers in Njoro Sub-County.

METHODOLOGY

Research Design: The study employed an ex post facto research design and was conducted in Njoro Sub-County, Nakuru County in Kenya. An ex post facto research serves to indicate that the research in question is conducted after variations in the independent variable have already been determined in the natural course of events (Ary, Jacobs & Razavieh, 1978).

Study Area: The Sub-County occupies an area of 779.7 km2 and was divided into Njoro, Mauche, Mau Narok and Lare divisions. Njoro Sub-County stands at an altitude of

1,800M above sea level with temperatures ranging between 17-22oC while the average annual rainfall is 1,270mm (Walubengo, 2007).The Sub-County's population was estimated at 287,647 persons (Kenya National Bureau of Statistics (KNBS), 2009) and 10,300 smallholder dairy farmers by 2011. Eighty per cent (80%) of the population in the Sub-County depends on smallholder dairy production for their livelihood and dairy farming contributes over 85 per cent of the household income.

Population: The study's target population was the 2,800 smallholder dairy farmers in Njoro division that was purposively selected. This population owned mobile phones and used the devices to access animal husbandry information from livestock extension staff.

Sampling procedure/Sample Selection: Njoro division was purposively chosen for sampling out of the four divisions in Njoro Sub-County because it has the largest number of smallholder dairy farmers. The four locations of Njoro, Nessuit, Mukungugu and Kihingo in Njoro division were proportionately represented in the sample as in the divisional accessible population. Probability sampling technique was then used to select a sample of 106 respondents to be involved in the study from a sample frame of smallholder dairy farmers who use mobile phones to get dairy information from extension staff in Njoro division.

Sample size calculation: The following formula was used to determine the sample size where the population is known, (Nassiuma, 2000).

$$n = \frac{NC2}{C2 = (N-1)e2}$$

Where;

n= sample size; N= population size

e= margin of error which is fixed between 2-5%

C= Coefficient of variation which is ≤ 30%

$$n = \frac{2{,}800\ (0.21)2}{(0.21)2 + (2{,}800-1)(0.02)2}$$

n= 106; Sample size (n) = 106 respondents

Data Collection: Structured questionnaires used in the study were developed by the researcher with input from experts from the Department of Applied Community Development Studies at Egerton University. The researcher administered questionnaires were used to collect data from the sampled smallholder dairy farmers. The questionnaires were used by the researcher to ask each respondent the same questions in the same way and ensure collection of high quality data (Mugenda & Mugenda 2003).

A pilot test of the questionnaires was administered to measure the pertinence of the tool; validate it; measure the approach and the understanding of the questions and verify the conformity of the answers with the expected results as recommended by Kathuri & Pals (1993). A reliability coefficient of 0.90 was realiszed after analysis which was above the 0.7 recommended by Borg and Galls (1989). The data collection tools were administered by the researcher to smallholder dairy farmers. The interviews were conducted with the help of a trained interpreter since some respondents were illiterate. Data was analysed by descriptive statistics and the hypothesis tested using Pearson's Correlation; and inference made at 1% level of significance.

RESULTS AND DISCUSSION

Experience in Dairy Farming of the Respondents: Table 1 shows experience in dairy farming of the respondents. Most respondents, 35.8 percent (about one third) had 1-5 years of experience in dairy farming. Other findings were, 26.4 percent had between 6-10 years of experience in dairy farming, 17.0 percent 15 and above years, 14.2 percent had 11-15 years and 6.6 percent had below 1 year of experience in dairy farming. The results of the findings indicate that majority 68.8 percent of the respondents had 10 years and below of experience in dairy farming.

Table 1. Experience in Dairy Farming of the Respondents.

Experience in dairy farming	Frequency	Valid Percent	Cumulative Percent
Below 1 year	7	6.6	6.6
1-5 years	38	35.8	42.5
6-10 years	28	26.4	68.9
11-15 years	15	14.2	83.0
Above 15 years	18	17.0	100.0
Total	106	100.0	-

Breed of dairy cow kept on farm: Results in table 2 show analysis of the breed of dairy cow kept on farms by the respondents. The results indicate that 33.0 percent and 31.1 percent kept crosses and Ayrshire cows respectively. Friesian keepers came third at 25.5 percent and 4.7 percent of the respondents kept zebus. Jerseys and Guernsey were reared by 3.8 and 1.9 percent of the respondents respectively. Most of the respondents (33.0 percent) preferred keeping crosses on farms possibly due to their average management demands and milk production; and relatively high resistance to diseases compared to pure breeds.

Table 2. Breed of cow kept on farm.

Breed of cow	Frequency	Valid Percent	Cumulative Percent
Friesian	27	25.5	25.5
Ayrshire	33	31.1	56.6
Guer+-nsey	2	1.9	58.5
Jersey	4	3.8	62.3
Zebus	5	4.7	67.0
Crosses	35	33.0	100.0
Total	106	100.0	-

Number of years of utilizing management information from mobile phone: Table 3 shows analysis of the number of years the respondents have utilized management information from mobile phones. The results indicate that 57.5% (more than half) had utilized this information for between 1-5 years, 18.9 percent for between 6-10 years, 14.2% of the respondents had utilized management information from their mobile phones for below 1 year, 7.5% for between 11-15 years and 1.9% had utilized management information from their phones for over 15 years. This follows that majority 57.5% of the population had utilized management information from mobile phones for between 1-5 years. These results agree with Keyser (2009), who found out that access to extension services increases the likelihood of adoption of interventions among small-scale farmers.

Table 3. Number of years of utilizing management information from mobile phones.

Years of utilizing information	Frequency	Valid Percent	Cumulative Percent
Below 1 year	15	14.2	14.2
1-5 years	61	57.5	71.7
6-10 years	20	18.9	90.6
11-15 years	8	7.5	98.1
Above 15 years	2	1.9	100.0
Total	106	100.0	-

Management information providers from mobile phones: The main animal husbandry information providers from mobile phones are shown in table 4. The results indicate that 64.2 percent of the respondents got animal husbandry information from government extension service providers via their mobile phones and 15.1 percent from private companies. Radio stations came third at 7.5 percent, 4.7 percent from NGOs/FBOs, 3.8 percent from milk co-operative societies, 3.8 percent from research stations and 0.9 percent were provided animal husbandry information from mobile phones by others who included neighbours. The implication is that government extension service providers were the most popular source of animal husbandry information from mobile phones. Therefore government service providers can effectively be used to convey animal husbandry information to the farmers via their mobile phones in order to enhance dairy production.

Utilizing various animal husbandry information from mobile phones: Table 5 shows analysis of utilizing various animal husbandry information from mobile phones among the smallholder dairy farmers. The results revealed that about a third of the smallholder dairy farmers, 34.0 percent and 33.0 percent, in Njoro Sub-County utilized pest and disease; and animal nutrition as preferred animal husbandry information respectively from their mobile phones. Another 30.2 percent utilized breeding management, 1.9 percent record keeping and

only 0.9 percent utilized dairy cattle registration as preferred animal husbandry information from their mobile phones. The findings of the study are in agreement with the work by IFAD (2006), which found out that smallholder dairy farmers need essential information on access to artificial insemination (AI) services, quality livestock nutrition, effective control of livestock pests and diseases; clean milk production, handling and processing; and various cross-cutting issues that impact positively on dairy production. This information is likely to help farmers improve on their farming techniques and enhance milk yield.

Table 4. Management information providers from mobile phones.

Information providers from mobile phones	Frequency	Valid Percent	Cumulative Percent
Government extension	68	64.2	64.2
Milk cooperative society	4	3.8	67.9
Private companies	16	15.1	83.0
NGOs/FBOs	5	4.7	87.7
Radio station	8	7.5	95.3
Research stations	4	3.8	99.1
Other (specify)	1	.9	100.0
Total	106	100.0	-

Table 5. Utilizing various management information from mobile phones.

Variable	Labels	Frequency	Percent
Animal husbandry information utilized from mobile phones	Pest and disease control	36	34.0
	Animal nutrition	35	33.0
	Breeding management	32	30.2
	Keeping records	2	1.9
	Dairy cattle registration	1	0.9
	Total	106	100

Whether utilizing animal husbandry information from mobile phones could increase milk yield: Table 6 shows analysis of opinion on whether utilizing animal husbandry from mobile phones could increase milk yield among the smallholder dairy farmers. The results revealed that majority, 91.5 percent said "Yes" implying that utilizing animal husbandry information from mobile phones could increase milk yield, 5.7 percent said "No" while 2.8 percent did not know whether utilizing animal husbandry information from mobile phones could increase milk yield. This implies that smallholder dairy farmers who accessed animal husbandry information from their mobile phones were more likely to utilize the same leading to better dairy cow management hence increased milk production. The findings are in line with a study done by Owuor & Ouma, (2009), which indicated that adequate access and utilization of information on superior technologies and better farm management practices had positive impact on milk production in Kenya.

Table 6. Opinion on whether utilizing animal husbandry information from mobile phones could increase milk yield.

Variable	Labels	Frequency	Percent
Opinion on whether utilizing animal husbandry information from mobile phone could increase milk yield	Yes	97	91.5
	No	6	5.7
	Do not know	3	2.8
	Total	106	100

Hypothesis: Utilizing animal husbandry information from mobile phones has no statistically significant influence on milk yield among smallholder dairy farmers in Njoro Sub-County.

Pearson's correlation was used to test the influence of utilizing animal husbandry information from mobile phones on milk yield as summarized in table 7. The correlation was used because the study has only one independent variable (milk yield). The results showed that the Sig. (2-Tailed) value of 0.001 is less than 0.05 at the 0.01 (1%) significance level. The Pearson Correlation value (+0.436) is significant at 0.01 ($p<0.05$), implying

that there is a significant strong positive correlation between utilizing animal husbandry information from mobile phones and milk yield (r =0.436; p<0.05). Smallholder dairy farmers who utilized animal husbandry information from their mobile phones had moderate increase in milk yield. Based on the data, the study rejected the null hypothesis and concludes that there is a positive correlation between utilizing animal husbandry information from mobile phones and milk yield among smallholder dairy farmers in Njoro Sub-County. The findings about the influence of utilizing animal husbandry information from mobile phones on milk yield among smallholder dairy farmers are in line with the work of FAO (2007); Staal (2008); and Wambua (2012). FAO (2007) for example, found out that smallholder dairy farmers raised their output of milk by 50 percent, from each cow per day after they acquired animal husbandry information through mobile phones.

Table 7. Pearson Correlation Tests for Influence of Utilizing Animal Husbandry Information on Milk yield.

		Animal husbandry information utilized from mobile phone per day	Milk yield per cow per day after utilizing animal husbandry information
Animal husbandry information utilized from mobile phone per day	Pearson Correlation	1	.436**
	Sig. (2-tailed)		.000
	N	106	106
Milk yield per cow per day after utilizing animal husbandry information	Pearson Correlation	.436**	1
	Sig. (2-tailed)	.000	
	N	106	106

**. Correlation is significant at the 0.01 level (2-tailed).

CONCLUSIONS AND RECOMMENDATIONS

Results from this study revealed that utilizing animal husbandry information from mobile phones by smallholder dairy farmers was found to have a positive and significant influence on milk yield (r= 0.436; p<0.001). Utilizing animal husbandry information from mobile phones by smallholder dairy farmers had a statistically significant correlation with milk yield since the Sig. (2-Tailed) value (0.001) is less than 0.05. Based on the data, the study rejected the null hypothesis and concludes that there is a positive correlation between utilizing animal husbandry information from mobile phones and milk yield among smallholder dairy farmers in Njoro Sub-County. In summary, this study has shown that utilizing animal husbandry information from mobile phones in Njoro Sub-County had an influence on milk yield. From the findings it is recommended that efforts should be made in Njoro Sub-County to encourage smallholder dairy farmers to utilize animal husbandry information from mobile phones in order to improve their milk yield. The government should also consider the cost effectiveness of future extension design models in order to lower the cost of extension service delivery to smallholder dairy farmers.

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