DETERMINANTS OF SPATIAL VARIATION AND ADOPTION OF DAIRY GOAT FARMING IN NYERI COUNTY, KENYA

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ABSTRACT
The study was guided by the following specific objectives: to examine the spatial variations in adoption of dairy goat farming in Nyeri County and to determine the factors influencing the adoption of dairy goat farming in Nyeri County.The study adopted a descriptive household survey design. Three-stage systematic sampling technique was applied to select a representative sample of 215 households from a population of 248,050. Both primary and secondary data were used in the study. Secondary data was collected through a thorough review of available literature while primary data was collected through face to face interviews using a structured questionnaire. Data was analyzed using descriptive statistics and Chi-square test. The results of the study showed that there existed spatial differences in adoption of dairy goat farming in Nyeri County. Chi-square test revealed that traditional goat farming experience, gender, household head age, agro-ecological zone, education, farmers' group membership and access to extension services had significant impact on farmers' dairy goat farming adoption decision in the study area. Based on the results, the study recommends enhancement of dairy goat adoption through improving farmers' access to extension services. More extension service providers should be trained and deployed to farm level to facilitate timely provision of quality agricultural information on dairy goat farming. Policies geared towards empowering women also need to be promoted in order to increase their ability to engage in profitable dairy goat farming enterprises. In this regard, their access to financial resources and land should be improved. Farmers' associations should also be strengthened so as to better play their role of offering technological, financial and informational support to farmers. The ministry of finance should collaborate with financial institutions to make credit more accessible to farmers. Dairy goat farming promotional campaigns should be carried out in the entire county to reduce the spatial disparity in adoption of the technology among the sub-counties.
Keywords: Dairy goat farming, Spatial variation, Adoption determinants

INTRODUCTION

Adoption of technological innovations in agriculture has attracted considerable attention among development economists. Majority of the population in developing countries derive their livelihood from agricultural production. Adoption of agricultural technologies offers an opportunity to increase production substantially (Feder et al. 1985). The goat was probably the first animal to be domesticated around 9,000-7,000BC (Devendra and McLeroy 1987). This long association between man and the goat is an indication of the many benefits the goat can provide. Over the past 20years, a new and growing interest in goat products has emerged the world over. According to FAOSTAT (2013), the world population of goats stood at 1.011 billion. The largest population of goats is observed in Asia (59.4%) followed by Africa (35%) both accounting for 94.4% of the total world goat population (Kinyua 2011). In Africa, the largest concentrations are found in Nigeria, Ethiopia, Sudan and Somalia (FAOSTAT, 2013). Due to their high tolerance to heat stress, goats can survive in most marginal regions of the world. They are distributed in extreme climates: (0-35^{0}C) such as in the Thar, Sahel and Negev deserts; areas with insignificant rainfall and sparse vegetation; high altitude mountain areas of up to 2500m such as Hindu-kush Himalayan region; and the wet tropics with high temperatures, humidity, rainfall and abundant vegetative cover, such as those in many parts of south-east Asia (Kinyua 2011).

The two major reasons for goat rearing is meat and milk production. Goat milk represents only 2.5%, about 18.4 million metric tons of all the milk produced by the different dairy animals in the world (FAOSTAT 2013). Developing countries produce about 83% of the total amount. The largest amount is produced in India followed by Bangladesh, Pakistan and Sudan. In Europe, the highest producers are Spain, France and Greece (FAOSTAT, 2013). In the developed European nations, there are well organized goat milk dairy sectors. For instance, France has well organized programs for selection, processing and commercialization of goat milk. In developing countries, the dairy goat milk sector is not as well developed. Most of the milk is consumed in homes. Less than 5% of goat milk is marketed (Peacock 2005). The sector is not as well organized like the cows'.

There is still a great deal of prejudice and ignorance of importance of goats among farmers. The economic contribution of goats to the Gross National Product (GNP) is low (Kinyua, 2011). According to Peacock (2005), development of goat farming in Africa is constrained by political and cultural biases, ignorance of its importance, inadequate resources, and desperate lack of breeding stock, information, infrastructure, market linkage and skilled manpower.

Kenya is reputed to have one of the most developed and thriving dairy industries in Africa. The country's livestock sub-sector accounts for 12% of Gross Domestic Product (GDP) and 40% of the agricultural GDP (GOK, 2009). The sector employs 50% of agricultural labor force and is dominated by small scale producers. Dairy is one of the agricultural sub-sectors experiencing high growth, estimated at 3-4% annually (Kinyua, 2011). Milk based enterprises are attractive in Kenya, supporting over 1.8 million smallholders engaged in dairy production (MoLFD, 2009). Kenya's goat herd is estimated at 27.7 million (GOK, 2009) and spread in all agro-ecological zones of Kenya (Mburu et al., 2014). Of these, the dairy goat flock constitutes 171,700 (MoLFD, 2009). These figures translate to a 0.62% of dairy goats among total goat population indicating a very low uptake of dairy goats farming in Kenya. Total goat milk yield in 2006 was estimated at 0.120 million tons (FAOSTAT, 2006).

Kenya has two indigenous breeds of goats; the East African goat found predominantly south of the Equator and the Galla which mainly occurs in Northern Kenya. Their performance in terms of growth rate and milk production is low. According to Mburu (2013), the average daily milk production for a local goat is 1 litre. Cross breeding of high performing exotic breeds with adapted indigenous breeds has been used to achieve high productivity. Exotic dairy goats have been imported into the country from the 1950s and more rigorously in the 1970s and 1980s though with limited success (Okeyo, 1997).

The main exotic breeds in Kenya are German Alpines, Toggenburg, Anglo-Nubian and Saanen. They are found mainly in the high and medium potential rainfall areas of Kenya. Dairy goats were first introduced to Kenya in 1955 by the white settlers from Europe (FARM-Africa, 2006). They were mainly kept in the Kenyan highlands whose climate was similar to that of their origin (Gichohi, 1997). During the 1970s and 1980s, dairy goats were introduced in government agricultural institutions. In 1990s they were promoted through development projects such as the Integrated Small Livestock Project (ISLP) and FARM-Africa's dairy goat and animal health- care project, which contributed to the growth of dairy goat population in the country (Republic of Kenya, 1998).

In 1992, ISLP introduced the German Alpine dairy goat breed in Nyeri and Meru Central with the aim of boosting the income and nutritional needs of the small holder farmers. Local goats were used in upgrading programs, where they were cross bred with exotic German Alpine breeds to develop new dairy goat strains which adapted well and performed better in terms of milk production and rate of twinning (Gichohi, 1997). Cross bred goats were then introduced in various parts of the country through ISLP and FARM-Africa development projects (Republic of Kenya, 2007).

The introduction of dairy goats in the Kenyan highlands in the 1990s was an initiative towards poverty alleviation among the smallholder farmers. According to KNBS (2016), 19 persons in every 100 live below the international poverty line in Nyeri. This means that 19% of Nyeri residents live on less than $1.9 a day and hence cannot meet their minimum nutritional, clothing and shelter needs. The dairy goat initiative was started by the German Technical Cooperation (GTZ) now GIZ, and FARM-Africa, in collaboration with local partners such as the Kenya Agricultural Research Institute (KARI) now KALRO, Ministry of Agriculture (MoA) and Ministry of Livestock and Fisheries Development (MoLFD) now Ministry of Agriculture, Livestock, Fisheries and Irrigation, (Mburu, 2013). The main aim was to improve the livelihoods of the poor farmers in the region through the introduction of pure exotic dairy goat breeds and crosses of German Alpine, Toggenburg, Anglo-Nubian and Saanen. This was done through establishment of dairy goat breeding units and buck stations (FARM-Africa, 2006).

In Nyeri, the work of promoting dairy goat farming was undertaken in 1990s by the German Technical Cooperation (GTZ) now GIZ, in partnership with local stakeholders (Mugavane et al., 2011). The main aim of this initiative was to improve the economic status of rural poor households in the area. Interested farmers had to organize themselves in formally recognized groups which would then register with the Dairy Goats Association of Kenya (DGAK) in order to access the dairy goat technology and market information. Breeding units and buck stations were established in different areas to provide the services needed by farmers for enhanced adoption (FARM-Africa, 2006).

In 2015, there were 32,000 dairy goats in Nyeri (MoLFD, 2015). Despite three decades of concerted efforts by the Kenyan government, NGOs and foreign

donors to boost the uptake through training, provision of bucks and free agricultural extension services, population of dairy goat is still low. In addition, most farmers still keep local breeds mainly for meat. Historically, people in the study area have had a preference for dairy cattle. However, due to the ever increasing population and the subsequent sub-division of land into small sizes, dairy cattle enterprise has become unsustainable. (www.nafis.go.ke/livestock/dairygoats). Distribution of dairy goats across the sub-counties is uneven.

LITERATURE REVIEW

Factors Influencing Adoption of Agricultural Technologies

There is an array of factors that influence adoption of agricultural technologies. The different factors that drive the uptake of an innovation differ from place to place (Ghimire et al., 2015). To a greater extent, past studies have found that household demographic and socio-economic traits, institutional support services and environmental factors have profound influence on adoption and dissemination of new technology (Adesina, et al., 1993).

Results from past empirical studies on agricultural technology have indicated that demographic factors such as gender, age, education and family size, and economic factors such as farm size, presence or absence of off-farm employment and labour endowment of a household affected adoption. In addition, institutional factors like group membership, extension service and credit access, and agro-ecological factors had significant influence on technology adoption. These factors may have positive or negative effect. Some may however have no effect on technology adoption and level of uptake.

MATERIALS AND METHODS

Study Area

The study was conducted in Nyeri County. Nyeri County was purposively selected due to its dairy goat production potential. The site was also selected because there have been tremendous efforts to promote DGF for more than two decades now in the area. The history of DGF in the study site date back to the colonial era. According to Jaetzold et al. (2010), Nyeri County has fifteen agro-ecological zones. The main agro-ecological zones are: UM2 (Main coffee zone), LH4 (Cattle-sheep-barley zone) and LH5 (Ranching zone) Jaetzold et al. (2010).

Research Design

This study adopted a descriptive household survey design which involved assembling quantitative data. The survey was cross sectional. The quantitative research design involved gathering data from the sample through a survey using a structured questionnaire. This design was found suitable for this study because it sought to provide insights and deep understanding of the factors influencing adoption of dairy goat farming technology in Nyeri County. Survey research design was also considered appropriate for this study because the amount of quality information yielded is valid and it reduces interviewer bias since respondents complete identically worded questionnaires. Further, the design was preferred due to its flexibility in treatment of data. It allows the researcher to carry out several comparative and statistical analyses. The design also allows the possibility of repeating the same study in different contexts to verify the reliability and to support the generalization of the findings. The survey method has been extensively used for determining the factors influencing adoption of agricultural technologies. In addition to field data, the study made use of extensive documentary evidence which included government reports from the ministry of agriculture and livestock development, annual reports from the Dairy Goat Association of Kenya and past studies from various scholars.

Sampling Procedure and Sample Size

The study employed three-stage systematic sampling technique to draw a sample of 215 households for the study. Determination of the sample size was based on the proportionate to size sampling formula. According to Yamane (1967), the formula for determination of sample size is:

$n = \frac{N}{1+N(e)^2}$ Where n is the sample size required, N is the total population and e is the error

Instruments

The study used a structured questionnaire that was administered through personal face to face interviews. It contained structured questions. The questionnaire was administered with the help of three well-trained research assistants. The questions focused on farmers' socio-economic characteristics, credit access, extension services, group membership and agro-ecological conditions. An observation check list was used to collect data on the type and number of goats kept by households. ArcGIS version 2.14.1 Essen was used to create a choropleth map depicting the spatial variation in adoption of dairy goats in Nyeri County.

Data Collection

The data used in this study were collected from both primary and secondary sources. Primary data was collected from farmers through observations, counting

and interviews using a questionnaire. Field observations were used to verify whether a farmer was actually keeping dairy goats while counting was employed to establish the size of flock. The questionnaire contained structured questions to enable farmers to easily choose appropriate responses.

Data Analysis

In order to determine factors that influence adoption of DGF, Chi-square tests were carried out on the data to explore for any relationship between the variables in the data set. Chi-square test was applied because data was collected through random sampling technique and due to the dichotomous nature of the dependent variable (adoption). Each independent variable was tested for a relationship with adoption of DGF. To show the absence of relationship between the variables, the level of rejection was 0.05 or 5% significance level. The null hypothesis (H_0) was rejected and the alternative hypothesis (H1) accepted if the calculated p value was less than or equal to 0.05 ($p \leq 0.005$). The independent variables that were tested for a relationship with adoption of DGF included age, gender, education level, family size, farm size, local goat farming experience, off-farm income, labour type, extension contact, group membership, credit access and AEZ.

RESULTS AND DISCUSSION

Spatial variation in Adoption of Dairy Goat Farming

The study sought to establish the spatial variations in adoption of DGF in the three sub-counties of Mukurwe-ini, Nyeri Central and Kieni West. The survey found that 52.6% of respondents in Mukurwe-ini, 30.7% in Nyeri Central and 16.7% in Kieni west kept dairy goats (Table 1). The study also established that there were 309 dairy goats in the sampled households in the three sub-counties. Mukurwe-ini had 139 (45%), Nyeri central 102 (33%) while 68 (22%) were found in Kieni West. The results revealed presence of spatial disparity in number of adopters per sub-county as well as in the number of dairy goats reared. Adoption of dairy goat farming was higher in Mukurwe-ini and Nyeri Central sub-counties.

Table 1 Spatial variation in Adoption of Dairy Goat Farming

Sub-county	Adopters N=78		Number of dairy goats		Total respondents N=215	
	Frequency	%	Frequency	%	Frequency	%
Mukurwe-ini	41	52.6	139	45.0	56	26.0
Nyeri central	25	30.7	102	33.0	57	26.5
Kieni west	12	16.7	68	22.0	102	47.5
Total	78	100	309	100	215	100

Agro-climatic conditions in the two sub-counties were favourable for exotic dairy goat breeds. The two areas fell in the upper midland AEZ which experienced relatively high rainfall and moderate temperatures (Jazetzold et al., 2010). These conditions, coupled with the deep, well drained and fertile soils were suitable for production of fodder crops for feeding the flocks. The humid and warm climatic conditions experienced in Mukurwe-ini and Nyeri central sub-counties were suitable for dairy goats. Kieni West on the other hand lied in the low highland AEZ which experienced low and unreliable rainfall and relatively high temperatures. These semi-arid climatic conditions didn't support production of fodder and were not conducive for dairy goats. Many farmers in Kieni West had taken to beef cattle and sheep farming which were more tolerant to heat and aridity.

Provision of agricultural extension services was also varied among the sampled sub-counties. Nyeri central and Mukurwe-ini were better serviced due to their proximity to Nyeri town where county agricultural offices and NGOs offices were situated. Farmers in the two areas therefore had an advantage of being able to easily get extension services from government or NGOs. Road infrastructure in the two sub-counties was better developed than in Kieni West. Extension officers could therefore reach most parts of these areas. Kieni west on the other hand was served by poorly maintained dry weather feeder roads which became impassable during wet seasons due to the clay type of soil.

Nyeri central and Mukurwe-ini are tea, coffee and dairy cattle zones. As a result, there were producer co-operative societies for farmers which arranged meetings for members particularly to sensitize them on strategies to improve production. During such forums, farmers shared information not only on tea and coffee but also on other agricultural innovations such as DGF. Kieni West lacked as many co-operatives because the area didn't support production of crops which are marketed through cooperatives.

The sub-counties were unequally serviced by financial institutions. Nyeri Central was well served by banks and micro-finance institutions. Mukurwe-ini had its share of financial institutions which included Kenya commercial bank (KCB), Equity Bank, Co-operative bank, Savings and Credit Co-operatives (SACCOs) and Wakulima dairy co-operative. These two sub-counties supported many commercial and agricultural activities which had attracted the financial institutions. Producer co-operatives extended financial credit to farmers using the tea and coffee bonuses as security. The money advanced was recovered at the end of the year from the bonus. Kieni West on the other hand was poorly served by financial service providers because the semi-arid conditions did not support many commercial activities. Farmers in Kieni west had low access to agricultural credit which affected their financial ability to meet the costs involved in adoption of new agricultural technologies such as DGF.

Figure 1 shows a choropleth map depicting spatial variation in DGF adoption in the study area. Data for dairy goat population per sub-county was obtained from the field during the survey. Sub-county geographical land size was then obtained from the 2019 Census and Housing Report (KNBS, 2019).

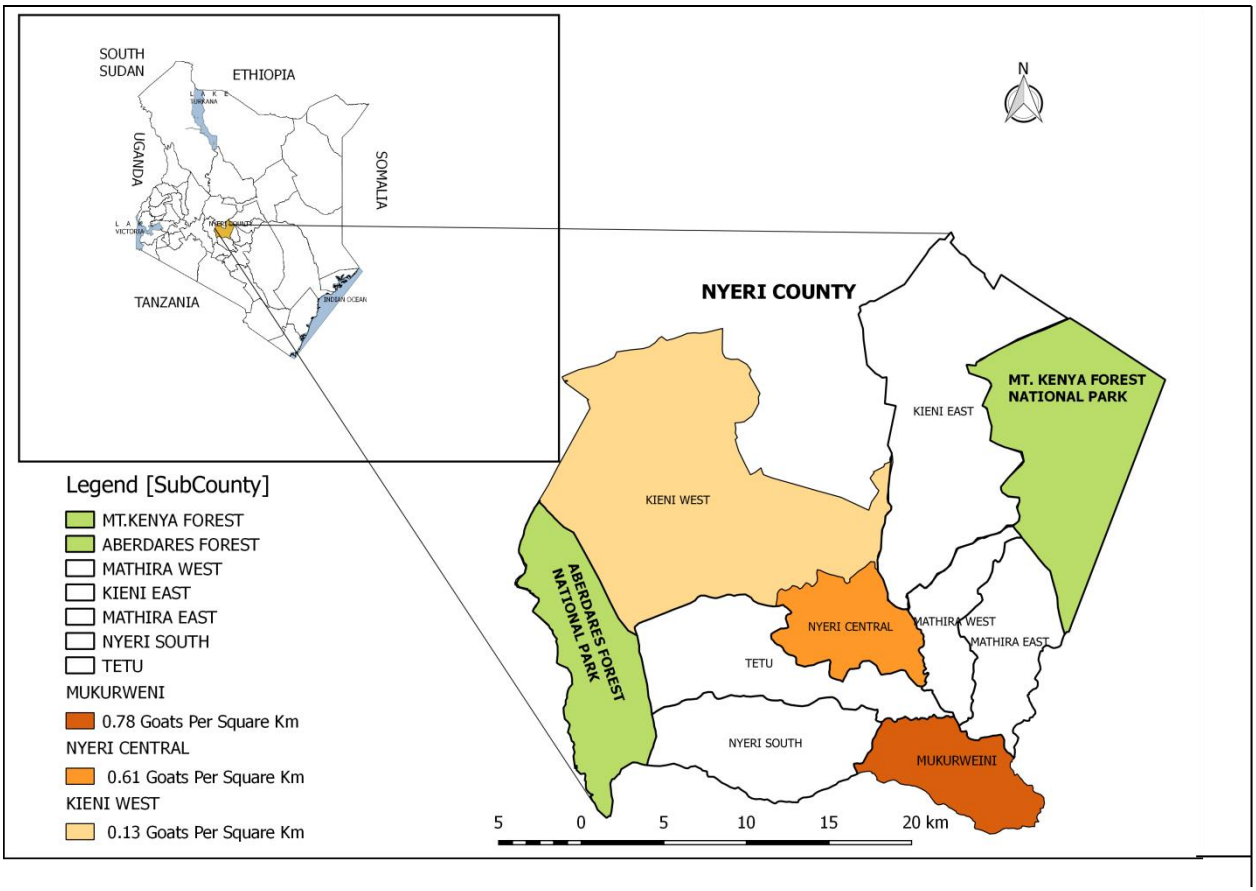

Fig 1 Choropleth Map Showing Spatial Variation in Adoption of Dairy Goat Farming

To create the choropleth map, population of dairy goats in each of the three sub-counties was divided by the respective sub-county land area. Dairy goat population density was created as an attribute field. The population density was mapped using the goat density field in the QGIS Version 2.141 Essen. The result was a colour-shaded map showing spatial variation in dairy goat adoption in Nyeri County (Figure 1).

Factors Influencing Adoption of Dairy Goat Farming

Age: Age of the farmers had a strong effect on adoption of dairy goat farming. The level of adoption increased with age. Majority of the adopters (30.8%) were above 60 years of age. This is because older farmers were more experienced after many years of goat keeping. This trend was also due to availability of financial resources among the older farmers which enabled them to meet the costs involved in adoption of

the technology. Older farmers were endowed with resources such as land which enabled them to have better access to financial resources. The calculated P-value of 0.0355 (Table 2) shows a strong and significant relationship between farmers' age and adoption of dairy goats at 5% level of significance. This result was congruent to Adesina and Forsan (1995).

Gender: The study established that female farmers favoured DGF more than their male counterparts (Table 2). Among the adopters, 70.5% were female while 29.5% were male. The rationale for this result was that women did most of the farm work unlike men and as such, were more likely to try new agricultural technologies. Farming formed the main economic enterprise for most females in the study area. Women were also responsible for putting food on the table for their families. Most men on the other hand, preferred off-farm jobs. With a P- value of 0.00404, gender was found to have a significant influence on adoption of dairy goats at 5% level of significance ($p<0.05$)

Family Size: The size of the family was found to have no significant effect on adoption of dairy goats. The calculated p-value of 0.404 shows an insignificant relationship between family size and dairy goat adoption.

Experience: Experience in keeping local goats had a negative and significant influence on farmers' decision to adopt dairy goats. The propensity to adopt DGF reduced with years of experience in traditional goat farming because experienced farmers were less willing to try new farm technologies. Experienced farmers had become resistant to change after having reared the traditional goats for long. With a P-value of 0.01905, local goat farming experience was significant at 5% significance level.

Farm size: With a p-value of 0.717 (Table 2), farm size had insignificant influence on farmers' decision to adopt dairy goats. The study found that majority of dairy goat farmers (92.3%) were producing on less than 2 hectares of land. Population pressure had led to sub-division of land among family members. There was no significant difference in landholding between adopters and non- adopters because DGF is less land intensive.

Education: The p-value of 0.0147 revealed a significant relationship between education level and adoption of dairy goats at 5% level of significance. This means that more educated farmers were more likely to adopt DGF in the study area. Education has been noted to improve ability to acquire and process information on new innovations. Literacy enables people to decode information in print and electronic forms and hence facilitate them to reach and acquire new knowledge faster than the illiterate. Hence, people with higher education level had better access to information and knowledge that was beneficial to embracing new technologies. Farmers with higher levels of education were better placed to understand and apply new technologies on their farms compared to those with low education level. These findings concurred with Bwire (2008) which found that the level of education had significant influence on adoption of the boar goats in Uganda.

Off-farm employment: There was no significant difference between adopters and non-adopters concerning off-farm occupation. This stemmed from the fact that only a small number of respondents (33.3%) had off-farm income while 66.7% of total respondents had no off the farm employment. A p-value of 0.124 shows lack of significant influence of off-farm employment on adoption of dairy goat farming (Table 2). These results contradicted those of Kiiti (2019) who noted that farmers with off-farm employment were in a position to earn much more than those without hence investing in farm technology adoption.

Credit access: The survey revealed that 5.1% of adopters had accessed credit during the previous two years. Chi-square analysis returned a statistically insignificant relationship between credit access and adoption of DGF. The P-value of 0.0670 indicates that access to agricultural loan had insignificant influence on farmers' decision to adopt dairy goats at 5% significant level (Table 2). This was attributed to the fact that much of the agricultural credit was not invested in the technology under study but was directed towards improving production of tea, coffee and cattle sub-sectors. These results were contrary to Kanamu (2016) who found a significant positive relationship between agricultural credit and adoption of smallholder goat farming in southern Malawi.

Group membership: The study observed that farmers who were members of farmer-based associations, groups or organizations, were better placed to adopt DGF technology than those who did not belong to such organizations. Being a member of an agricultural related group boosted adoption by exposing farmers to a wide range of ideas and information on new technologies. Among the adopters, 48.7% were members of various farmers' groups. Group membership was significantly high among the adopters of dairy goats. Group membership was a reliable way of achieving social capital and ensuring dissemination of technology. Farmers groups had helped to change

farmers' attitude towards DGF technology. The constant interaction and contact with fellow farmers had also helped most farmers to become aware of the DGF technology. A P-value of 0.0160 indicated presence of a significant relationship between group membership and adoption of dairy goats (Table 2). This result was in agreement with Tariku (2012) which reported a significant relationship between social participation and adoption of improved wheat varieties in Ethiopia.

Extension services: This survey revealed that 29.5% of adopters had extension contact at least once in the previous two years. During the same duration, 57% of the total respondents did not have contact with extension officers. The p-value of 0.0054 showed that extension contact had a significant influence on farmers' decision to adopt dairy goat farming technology. Adoption of DGF was to a large extent influenced by sensitization, mentoring and demonstration by extension agents. The effective linkage between extension officers and farmers gave farmers access to vital information, inputs and their usage and management practices of dairy goat enterprise. Extension service providers in the study area had catalyzed awareness and promotion of the DGF technology among individuals. Contact with extension service providers enabled farmers to have practical skills in management of dairy goat flocks. This result was consistent with Mwaura (2014) which reported a positive and significant influence of availability of extension workers and adoption of dairy goats in some selected districts of Kenya.

Agro-ecological zone: There was a discernable and significant relationship between agro-ecological zone and adoption of DGF technology. Adoption levels differed significantly among the three AEZs where the study was conducted. The study revealed that 52.6%, 32.0% and 15.4% of respondents had adopted dairy goat farming in UM2, UM3 and LH 3-4 agro-ecological zones respectively. The reason for this result was that climatic and pedological factors influenced production of fodder crops which form an important part of diet for dairy goats. UM2 and UM3 receive moderate to high amount of rainfall, experience moderate temperatures and have deep, well drained soils which favoured growth of high protein fodder crops required by dairy goats for maximum milk yield. The fodder crops included sweet potato veins, lucerne and calliandra. On the other hand, LH3-4 is predominantly semi-arid with low and unreliable rainfall, high temperatures and shallow poorly drained soils. These conditions supported growth of poor quality grass and shrubs.

In addition, dairy goats thrive well in areas of moderate temperature because they are less tolerant to heat unlike traditional goats. Dairy goat breeds are sensitive to strong sunlight which could cause skin cancer. A p-value of 0.00001 indicated a strong relationship between AEZ and adoption of dairy goats (Table 2). This result was congruent with Mugivane (2011) which also found a significant relationship between AEZ and adoption of dairy goats in Meru Central.

Table 2: Factors influencing adoption of Dairy goat farming.

Explanatory variables	X^2	P-Value
Age	10.310	0.0355*
Gender	8.265	0.0040*
Family size	2.046	0.3947
Goat keeping experience	9.943	0.0190*
Farm size	0.665	0.7170
Education	10.502	0.0147*
Off-farm employment	2.369	0.1240
Labour type	0.0579	0.8098
Credit access	0.182	0.0670
Group membership	5.806	0.0160*
Extension service	7.756	0.0054*
AEZ	22.540	0.00001*

* Significant at 5% significant level

CONCLUSION

The study concludes that a sizeable number of households (36.3%) had embraced dairy goat farming although the vast majority (63.7%) was still keeping the traditional breeds. An assessment of the level of adoption established that the general level of adoption was low at 36.3% despite more than two decades of promotion of the technology in the area.

The study further concludes that adoption of dairy goat farming is noticeably spatially varied with Mukurwe-ini and Nyeri central having higher adoption levels (52.6% and 30.7% respectively) than Kieni West (16.7%). The two leading sub-counties were endowed with favourable agro-ecological conditions suitable for production of fodder and survival of flocks. They were also better serviced by financial institutions and extension agents

RECOMMENDATIONS

Based on these results, the study recommends enhancement of dairy goat adoption and its intensity through improving farmers' access to extension services. In this regard, the study recommends training of more extension service providers and their subsequent deployment to farm level.

Secondly, policies geared towards empowering women and youths also need to be promoted in order to increase their ability to engage in profitable dairy goat farming enterprises. To this end, deliberate strategies should be formulated to improve their access to production resources such as capital and land. The ministry of gender and youth affairs should craft strategies of ensuring more participation of the youths in DGF for instance by making the youth fund more accessible and affordable.

The Ministry of Finance should collaborate with financial institutions to make credit more accessible to smallholder farmers. Financial institutions should be urged to develop loan products specially tailored for farmers. This would assist farmers overcome their financial constraints.

There should be a more aggressive and better coordinated campaign to promote DGF in the area to boost its uptake. Sensitization programmes should be planned to increase awareness of DGF. To this end, chief barazzas and religious groups could be used to reach more people at the grass root.

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