Hindrances to Adoption of Artificial Insemination in Smallholder Dairy Farms at Chepkorio Division, Keiyo/Marakwet County, Kenya

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Abstract

Kenya is an agricultural based economy with agricultural sector contributing about 25% of the gross domestic product (G.D.P). Dairy farming is an important part of this sector and contributes about 10% to the GDP. The industry has been growing at a rate of about 2.8 percent per annum which is double the rate of many African countries. The current study examined factors affecting the adoption of artificial insemination at Chepkorio Division and sought to determine the relationship between its adoption and milk yield. A questionnaire was developed and administered to forty five small scale dairy farmers in three villages using systematic sampling method. Results showed that the rate of adoption of artificial insemination (AI) was low at 12.5% while natural service was 47.5%, but 40% of the farmers practiced both AI and natural bull service on their farms. According to the findings of the current study, there was significant positive relationship between adoptions of AI technology and milk yield per animal. The study found that when all other factors are held constant, AI has a great impact on milk production where the F_2 generation cow sired from AI gave up to 10.6 liters of milk daily compared to the same generation sired from the bulls whose milk yields was 4.15liters/cow/day.The factors hindering farmers from adopting AI included; availability of cheap bulls either from neighbours or their own, level of education of farmer, purpose of cattle, availability of AI technicians which was influenced by distance and road condition, land size and types of breeds of cattle kept. Dairy productivity in general was found to be low due to late maturity age for heifers, poor genetic potential, long calving interval and high economic loss due to disease incidences.

Key Words: Artificial Insemination, Adoption, Milk Yield and Dairy Cattle

INTRODUCTION

The greatest proportions of the global population estimated at 80% live in the rural area and derive their livelihoods from agriculture. Africa is the only continent where food production has been declining for the last 40 years. The demand for milk is set to grow higher and higher due to the rise in human population which is expected to reach 9.15 billion by the year 2050 (UNDP, 2008). Food and Agriculture Organization (FAO) and International Dairy Federation (IDF) estimate an importation of 38.9 billion litres of milk in developing countries by 2030. According to KIPPRA (2012) annual consumption of

milk in developing countries is expected to increase significantly from approximately 168 to 391 million tonnes between 1993 to 2020. This increase will probably be as a result of urbanization, population growth and increased purchasing power. In East Africa, the dairy sector has reported a tremendous upward trend. FAO (2012) reported that the last two decades have recorded a very significant improvement in relation to milk production. Kenya alone, has experienced an increase of 65% in milk production representing 4.1 million tons, while in Uganda, reports indicated an increase of up to 270%, representing 1.2 million tons. These increases have been attributed to recent activities of East Africa Dairy Development (EADD) program whose mandate was to alleviate poverty through dairy farming.

The Kenyan dairy industry is the most successful agricultural enterprise in the country's economy. It commands a share of 14% of the agricultural gross domestic product (GDP) and 3.5% of the national compared to other livestock sectors (Muriuki, *et al.,* 2003). The dairy industry is characterized by well developed smallholder dairy system which supply over 80% of marketed raw milk. The country has an estimated dairy herd of 3 million heads most of which are crosses of Friesian-Holstein, Ayrshire and local Zebu (Thorpe *et al.*, 2000; Orodho, 2006). The dairy sector forms the bulk source of livelihood to most rural economies as it supports approximately 80% of Kenyan rural population (Muriuki, 2014; Bebe, 2002). The industry plays a major role in development agendas that are geared towards raising the standard of living, especially for the vulnerable communities. It creates employment both directly and indirectly, contributes to both balanced nutrition and food security efforts income generation and generally enhances living standards for participants of dairy value chain.

Slow economic growth, however, has continued to militate against the alleviation of poverty. Food security is achieved when all people, at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food reference for an active and healthy life (FAO, 1996). Kenya is an agricultural based economy with the sector contributing about 25% of the gross domestic product (GOK, 2007; KIPPRA, 2010 & 2012). Dairy farming is an important part of the agricultural sector and contributes about 8 - 14% to the GDP (G.O.K, 2007; Muriuki *et al.,* 2003). Mating system has an important impact on the adoption and sustainability of dairy production and the introduction of new technology is important for better yields.

The use of Artificial Insemination (AI) as a method of reproduction in the dairy sector has been of enormous economic benefit through the genetic improvement for milk production. AI is important for the control of venereal diseases and reduction of lethal genes (Vishwanath, 2003). It is now widely used in the dairy cattle production as opposed to beef industry because dairy cattle are observed everyday making it easier to detect oestrus. The real benefit is that it gives all farmers the possibility of gaining from genetic improvement created elsewhere (Chupin & Thiber, 1995). It has been found that the cost of semen and conception rates affect the probability of farmers adopting AI (Vishwanath, 2003).

Artificial insemination is a powerful tool mostly employed for livestock improvement. In artificial insemination the germplasm of the bulls of superior quality can be effectively utilized with the least regard for their location. By adoption of artificial insemination,

there would be considerable reduction in both genital and non-genital diseases in the farm stock (Lima *et al*., 2009).

There are several advantages by artificial insemination over natural mating including no keeping a breeding bull for the herd; therefore saving the cost for its maintenance, prevention of spread of certain diseases and sterility due to genital diseases., by regular examination of semen after collection and frequent checking on fertility make early detection of inferior males and better breeding efficiency is ensured. The progeny testing can be done at an early age; semen of a desired sire can be used even after its death. It makes possible the mating of animals with great differences in size without injury to the smaller one in size, helps in maintaining accurate breeding and cow records, and increases the rate of conception, old, heavy and injured sires can be used.

The disadvantages of A.I include the need for a well-trained knowledgeable technician on the structure and function of the reproductive system and operation of specialized equipment. A.I requires more time than natural service; this is because it involves cleaning of instruments on the part of operator as low sanitary conditions may lead to lower fertility. If the bull is not properly tested, the spreading of genital diseases will be increased and Market for bulls will be reduced, while that for superior bulls will be increased.

Artificial Insemination is not widely used by dairy farmers at Chepkorio Division despite the availability of the service at the local public and private service providers. Milk production is also low despite the favourable prevailing environmental condition. The objective of the current study was to determine the specific factors affecting rate of adoption of artificial insemination and their influence on milk production and food security in the area.

MATERIALS AND METHODS

Study Site

The current study took place at Chepkorio Division, Elgeiyo/Marakwet County with a population of 67,062, from which the study sample was obtained. The main activity is small scale crop farming for both food and income generation, though dairy farming is the main activity for those practicing mixed crop/livestock farming.

Ecology

The altitude of the study site ranged from 1000 to 3000 meters above sea level in the valley and highland areas, respectively. Temperature range between 10^0C and 30^0C with rainfall of 1600 and 1000 mm, respectively. The Highland was characterized by hills and ridges and high bamboo forest cover.

Description of Subjects

The study was undertaken between 18th December, 2013 to 18th January 2014, three different ecological zones were identified, hilly highlands (Cherota), semi-urban

(Chepkorio) and semi lowland (Simit). Three villages were selected from every zone where a total of forty five farmers (15 from each zone) were selected.

Sampling Designs

Descriptive survey was used where individual dairy cattle farmers were selected by systematic sampling method and interviewed by administration of both close ended and open ended structured questionnaires. Interviews were also used to check results of each method against the other, facilitating a check against sample biases, hoax answers or data problems.

Data Analysis

The data collected was organized, coded and entered into a computer program (Microsoft Excel) spread sheet and a statistical package for social science was used for analysis and results presented in form of tables and graphs.

RESULTS AND DISSCUSION

The respondents were either adult men or women. The study revealed the type of service preferred by farmers in the division which was 40 % natural service using bulls, 12.5% used AI and 47.5% for a combination of natural/AI service. This agreed with the findings of Lima *et al*. (2009) who observed that the majority of farmers prefer natural service to the extent that up to 35% of calves born in United States of America are out of direct use of bulls. The same authors found higher calving percentage of 84% for natural service as compared to 74.8% for AI.

The region had a large potential for dairy production due to its favourable climate. It supported the use of improved high yielding cattle breeds that demanded better management and a relatively disease free environment.

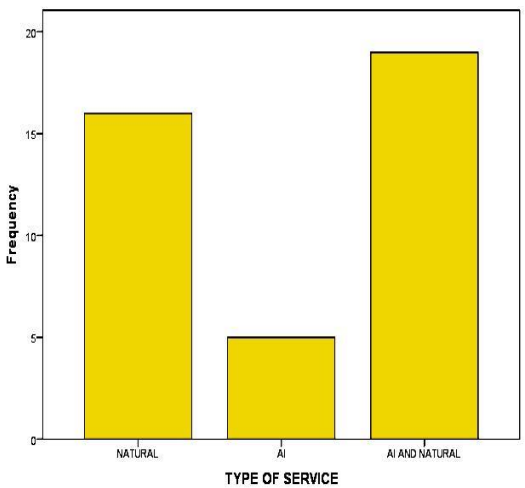

Figure 1. Level of adoption of natural, AI and AI/natural combination among farmers

The farmers who practiced a combination of Artificial Insemination and natural service were the majority. These farmers selected their prime cows for AI and left the rest of the herd to be served by a bull. From the results, the proportion of dairy farmers using natural service was significant as compared to those practicing AI. This was an indicator that the farmers were slow in adopting the technology for improving their cattle.The reasons behind this were infrastructure, inefficiency of AI technicians, unavailability of timely AI services and poor communication, among others (Batz *et al.*, 1999). Most of the bull users were aware of the consequences of using them for mating purposes with regard to disease transmission but had no options as AI services were not reliable. This implied that the genotype in the division was not improving thus lowering the rate of growth of the sector.

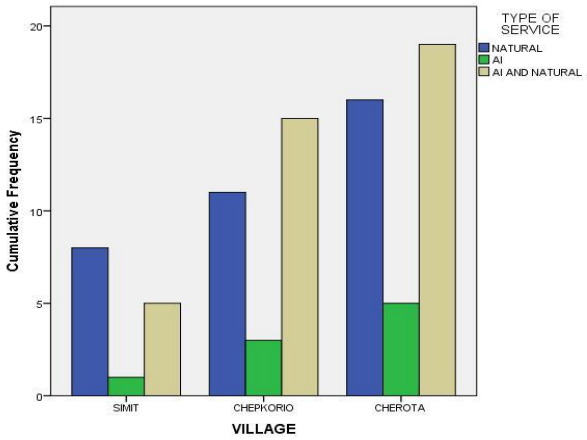

Figure 2. Rate of use of natural and AI services in the three villages

Figure 2 showed that Cherota had the highest rate of adoption of AI. This could be because the region has a high production potential as an highland therefore farmers wish to exploit the good resource.

Under the natural breeding activity, data was summarized based on the source of bulls; 17.5% of the farmers owned their own bulls while 52.5% got them from their neighbors and the rest used AI. Despite the availability of AI, many dairy men still prefered using natural services due to the perception that a bull is easy to manage and therefore provide cheaper service than AI. Little has been done though, to estimate the explicit and implicit costs including the probable loss of genetic progress associated with the use of natural sires in the dairy sector. A study carried out in the US; however, showed that the cost of AI to the farmer was about $67.80, while that of natural service was $100.50 (Lima *et al*., 2011). Those who adopted AI had reasons that included; control of breeding diseases, positive impact on milk produced per cow (Macdonald, 2010) and improved reproductive successes as indicated by conception rate and lowered calving interval (Hogeland, 1990).

The purposes of cattle rearing were mainly grouped into milk, meat or both, with farmers rearing for milk constituting 80%, meat 2.5% and both milk and meat forming 17.5%. AI

was widely used in dairy as opposed to beef cattle. This is because dairy cows were observed at least twice daily especially during milking. It is therefore easier to identify and inseminate cattle that are in estrus (Chupin & Thiber, 1995).

The level of education was important for adoption of breeding technology in terms of detecting the heat signs, making records and other management practices for dairy cattle. 35% of farmers were educated to secondary level, 30% primary level and 22.5% tertiary level. This is an indication that the dairy sector is a source of employment for youth who have completed both secondary and primary school levels. Adoption of AI was likely to propel to efficient production in the dairy sector. 12.5% of the respondents did not answer this question and were assumed to be illiterate.

Rural areas still do not enjoy good infrastructure and therefore poor state of roads made veterinary services inaccessible. Most farmers were living 3 or more kilometers away from service providers. During rainy seasons, technicians could not access these roads. Only 32.5% of the total farmers lived within 1 kilometer and the rest (77%) were far from technicians therefore could not access them in appropriate time. This affected the rate of conception and could be expensive for farmers to do repeat services for a cow as the cost was around Kshs 800-1000 per service. From this then the failure of the cow to conceive could be due to several factors namely; the technician, the farmers not avail information about heat signs and poor timing for insemination.

A large group of farmers making 77.5 % had never accessed information on dairy production and only 17.5 % were shown to have had access to this information. This indicated that only the small percentage who had accessed the information had adopted AI technology and therefore extension services have to be improved to create an impact in the dairy sector.

Effects of Artificial Insemination on Milk Production

The milk production data was determined according to natural and artificial insemination used by farmers. The amount of milk produced per day for each cow was; 4.15, 10.6 and 9.7 litres for cows born out of natural, AI and natural/AI services combined use, respectively as shown in table 3. The use of AI was greatly beneficial to farmers and the dairy industry because of the use of superior bulls that had gone through the rigorous selection process for improving milk production.

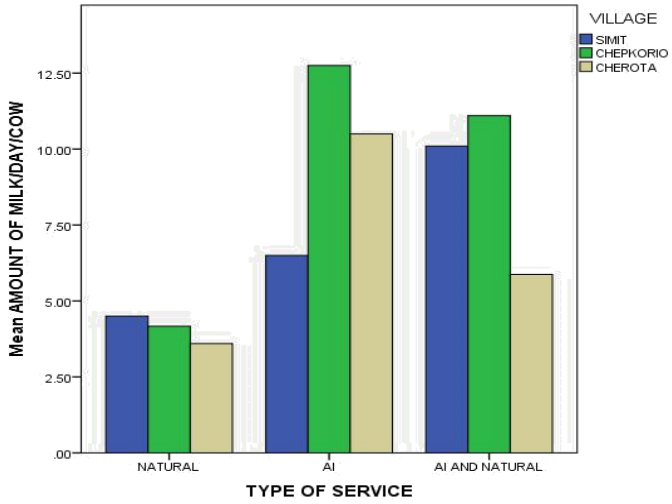

Figure 3. Milk produced by the offspring sired from service adopted

CONCLUSIONS AND RECCOMMENDATION

In conclusion, the study found that the factors that affected the adoption of artificial insemination among farmers at Chepkorio Division included; availability of cheap bulls either from neighbours or their own in comparison to paying for the AI service; level of education of farmers with those who attained form four level showing high adoption. The other factors were purpose for which cattle were kept- farmers preferred using the technology for improving milk production; availability or proximity of AI technicians which was influenced by distance and road condition and the availability of extension services.

The amount of milk produced was; 4.15, 10.6 and 9.7 litres for cows born out of natural, AI and natural/AI services combined use. The use of AI improved milk yields from the Division and was greatly beneficial to farmers and the dairy industry. This was attributed to the use of superior bulls that had gone through rigorous selection process for improving milk yields.

It is therefore recommended that extension services are enhanced to sensitize the dairy farmers on the benefit of using Artificial Insemination and better management of the offspring for better milk production in the Division. Secondly, another study should be carried out to establish the economic benefits of using AI as compared to natural mating to more information for extension purposes.

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BIO-DATA

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