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Research Article

Constraints to Use of Breeding Services in Kenya

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ABSTRACT

Most Kenyan farmers are in need of services to improve their cattle breeds. The artificial insemination and bull services are the only available options to improve these breeds. A study was conducted to determine constraints associated to the use of breeding services in Kenya. The methods used to collect the data included random survey using questionnaires, focus group discussion and key informant interviews. It was noted that the artificial insemination was the most preferred mode of service when compared to bull service. However bull service was more used than artificial insemination, indicating that farmers do not always use what they preferred. Bull service was preferred mostly because it was cheap while artificial insemination was preferred for offering breed variety. There was a high proportion of cross breed cattle suggesting that Kenyan farmers are inclined towards improving their cattle breeds. Larger land sizes production systems were associated with more use of bull service. Households that had used artificial insemination had more cross breed cattle with more number of cows producing more milk. The main constraints to use of artificial insemination cited were availability of service and its associated costs. However other constraints cited included lack of breed varieties, non-conception leading to repeat services, service provider non-responsiveness, information asymmetries and farmer cash availability. Other external constraints cited were inadequate credit facilities and infrastructure. It emerged from this study that there is need to provide information to farmers to help them in making confident decisions in order to maximise the benefits of a service. In particular it was felt that it is necessary to train farmers on breeding management, especially on monitoring of heat of the cow and consequent planning for the breeding service so as to overcome cash flow constraints. A multifaceted approach to all the constraints could be used in Kenya to improve use of artificial insemination for enhanced breeding service.

Key words: Cattle, Breeding service, Constraints, Kenya

INTRODUCTION

Dairy production is a major activity in the livestock sector and an important source of livelihood for over 600,000 smallholder farmers around the country, who account for 56% and 70% of the total produced and marketed in the country respectively (Mutembei *et al.*, 2015; SDP, 2004). Increasing productivity in the dairy sector is necessary for enhancing farm incomes, improved nutrition, reducing poverty as well as meeting the growing demand for dairy products by the growing urban population. Appropriate breeding methods are crucial in ensuring access to dairy breeds that are not only necessary for increased productivity but also for long term growth and sustainability of the dairy sector. However, there are concerns that the long term sustainability of the dairy sector is undermined by a number of constraints such as lack of adequate replacement stock and disharmony in the organization of breeding services (SDP, 2004). In the past, public-owned large-scale dairy farms produced dairy replacements for smallholders at subsidised costs (Conelly 1998). These sources are now very limited because the majority of the large scale farms have collapsed or have been subdivided for resettlement (Bebe, 2003).

According to Ngigi (2004), widespread introduction of highly productive breeds of dairy cattle has been the major source of increased productivity in Kenyan dairying. Provision of efficient and affordable reproductive services has been crucial in raising productivity of the Kenyan dairy herd. Through the use of AI, Kenya has managed to upgrade and expand the national dairy herd population from about 300, 000 in the mid 1960s to around 6.7 million animals (The Organic Farmer, 2007). Between 1964 and 1987, smallholder dairy farmers received a subsidy of up to 80 percent on artificial insemination and veterinary services from the government

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which led to widespread adoption of improved breeds. The withdrawal of subsidies from 1988 onward has led to a withdrawal of public services and rapid, geographically uneven growth of private services. (Ngigi 2004; Karanja, 2003).

After privatization of AI services in Kenya, there has been a decline in the use of AI attributable to various constraints across the country (Okeyo *et al.,* 2009). Recent studies have shown that a great proportion of farmers are reverting to natural service. According to Baltenweck et al. (2004), approximately 81% of the farmers use bull service although they prefer AI. Despite significant increase in availability of private AI over the last one decade, its use is still very low. Given the importance of AI as a breeding service, its low uptake since its introduction in Kenya in 1945 has serious implications on dairy productivity and sustainability. As such it is necessary to diagnose the low use of AI breeding service. Whether a farmer chooses to use a particular breeding service or not is influenced by the characteristics of the breeding services itself (its attributes) and by other factors as well. These factors can be largely classified as those related to household characteristics such as demographic and social-economic characteristics and; farm characteristics such as the number and type of cattle and land size. This study compared the characteristics between farmers who had used AI and those who had not within a period of 5 years prior to the time of the study. By default, it was assumed that given that in Kenya the widely available services are AI and bull service (Baltenweck *et al.,* 2004), a farmer who had not used AI had used the alternative (bull service). The objective of this study was to analyse the constraints to use of breeding services in Kenya in a bid to advice on measures to upgrade its uptake in the small holder dairy unit.

MATERIALS AND METHODS

Data collected during baseline survey done by East African Dairy Development (EADD) project was utilized and information on the sampling design was drawn this project. Briefly, one third of the projects 17 hubs were surveyed to capture site variability. The areas were purposively selected based on characterization using two indicators of climatic characteristic (Length of Growing Period/LGP) and access to urban centre (as an indicator of market access), using GIS layers. Using the median as the threshold for each indicator, the area was divided into; low market access / low climatic potential, low market access / high climatic potential, high market access / low climatic potential and high market access / high climatic potential domains. Under the classification, Kabiyet and Kaptumo (Nandi district) and Kandara (Murang'a district) had high access and high LGP, Soy (Uasin Gishu district) had high access and low LGP, Siongiroi (Bomet district) had low access and high LGP, Metkei (Keiyo district) had low access and low LGP while Simur (Siaya district) had average access and average LGP. Data drawn from the various domains ensured that there was representation of all Kenyan conditions.

A relatively small percentage of the farmers were interviewed. In order to draw a minimum sample size that would be representative of the population, subject to allocated budget, an appropriate sample size had to be established. Daily milk production was used as the most appropriate variable. The project aim was to identify a 1.25 litre increase in milk production to be significant. A formula adopted from Woodward, (2005) and applied to obtaining such a sample size was;

$$N = \left[\frac{(Z_\alpha + Z_\beta)\sigma}{\delta} \right]^2$$

Where Z_α is the standard normal value representing the significance level for a 1-sided test (5%), δ is the difference to be identified, σ is the standard deviation of the difference and Z_β is the standard normal value representing the power to detect this difference as being significant (80%). According to a previous study, in the context of a small holder dairy development, standard deviation of milk production per cow was 4.3 (Staal and Kaguongo 2003), which was taken to be the standard deviation of the difference. Substituting values into the equation above provided a required sample size of N = 73, this was increased to 75 to simplify enumeration in the field and allow for incomplete data.

$$N = \left[\frac{(1.64 + 0.84)4.3}{1.25} \right]^2 = 72.8$$

A geographical random sampling proved to be most suitable in the absence of a sampling frame with a list of the population from which the required number of farmers would be selected using a particular sampling methodology. First, each survey site was defined as the hub catchment area, a circular area of 20km with the hub at the centre of the circle irrespective of administrative boundaries. The corresponding radius in each site was chosen based on the maximum feasible distance farmers or traders would travel to supply milk to the chilling plants; after consulting with project management and using expert opinion. Second, circular survey area was divided into grids cells which, depending on population density, so that, on average, each cell should contain 1 household. In all cases, urban, un-populated areas, forest and marshy areas were masked out. Finally, by applying a simple random sampling technique, 75 grids were selected from all the grids.

To identify respondent households and approach the interviewees for the survey, each of the 75 grids was assigned a latitude and longitude coordinate which were then uploaded into a Global Positioning System (GPS) instrument. The survey team guided by a GPS instrument went to the location and conducted the questionnaire with a household situated nearest to the grid in that particular grid. If the survey team encountered more than one household in the grid cell and the coordinate located in between, the team would randomly select one of the households. If there were no households in the vicinity of the GPS coordinate, the survey team would randomly select a direction (north, south east or west) and walk being guided by the GPS/compass to a farmhouse.

For the purposes of this study one third household were randomly selected from the sample of 75 household in the 7 hubs. A total of 157 household were selected. Information on household characteristics, farm characteristics preference for breeding services, availability and use of breeding services and problems of the breeding services used was sought. In addition to the baseline surveys, focus group discussions with farmers were also conducted in June 2009. This involved 4 groups of between 10 to 15 smallholder farmers, drawn from village communities in the sampled villages. The groups comprised of youth, female and male participants. qualitative information sought was on important traits of dairy cattle preferred by community members, dairy breeds and breeding services used, main ways of acquiring animals in the area, preference for certain breeding services and reasons, factors considered in choosing a breeding service, major constraints faced in accessing preferred breeding services and existing opportunities for availing other breeding services. Additional information was collected through interviews held with breeding service providers to cross check some of the information generated from focus group discussions.

Descriptive statistics was used to analyse the data. Data was subjected to t-tests and chi-squared tests to determine significance of selected variables' association with the breeding services used.

RESULTS AND DISCUSSION

Descriptive results of the selected variables are shown in Table 1; the average size of households 5.89, the average age of household head was 49.9 years and the average level of education of household head was 5.8 years. This suggested that at least most of the farmers were literate given that also the average farming experience of household head when measured in number of years of farming was 23.1 years. Thus, by extension, this indicated that farmers had been engaged in farming for a long time.

The production system used by majority of the farmers was the free range grazing system where the cows freely grazed with the bull. This was easily supported by the large land resources because the average land size of the farm was 42.1 acres supporting an average number of 2.7 cattle kept per household.

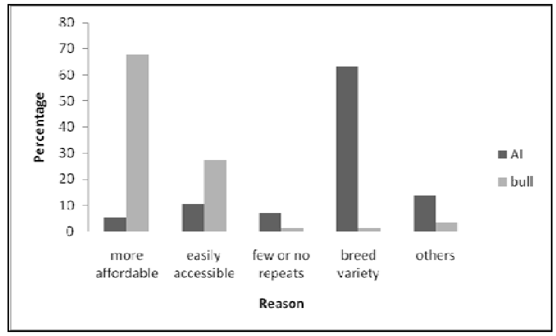

Fig. 1: Reasons for preferring a breeding service.

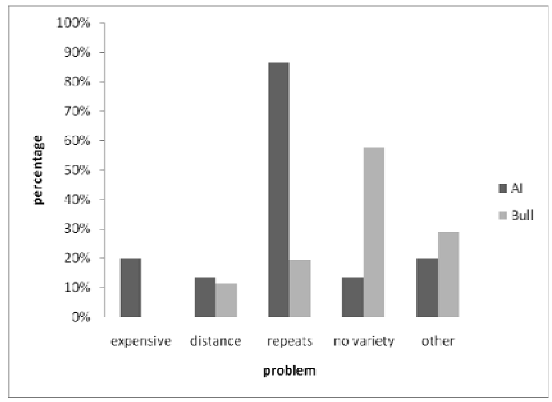

Fig. 2: Problems of AI and bull service

In average 88% of the farmers kept an average of 2.6 cows per household producing 13.2 litres of milk per day. This indicated that that most of the farmers in the study area can be classified as small scale dairy farmers who practised mixed farming; only keeping cows to supplement their income; 72% of them sold 11.2 litres of the milk produced per cow to supplement their household incomes. This is supported by the fact that the average annual income from dairy farming in USD was 871.96.

In terms of breeding service cost, the cost of AI service within a period of 6 months preceding the time of study was $11.7 and that of bull service was $1.8. This means AI service was viewed more costly than bull service. Unless other benefits of AI service were felt by farmers, then this cost of AI was seen as constraint to use of AI. This benefit of the use of AI was generally felt by the farmers because about 70% of them kept cross breed

Table 1: Descriptive statistics of selected variables

Variable	N	Mean	Std. Dev.	Min	Max
Household size	127	5.94	2.55	2	14
Household head education	127	5.82	4.27	0	21
Household head age (years)	127	49.64	14.64	20	85
Household head experience (years)	127	23.09	14.45	0	67
Land size (acres)	127	42.05	171.36	0	1280
Number of cattle	127	2.69	2.18	1	15
Number of cows	114	2.61	1.93	1	10
Milk production (litres)	100	13.15	15.82	1	94
Milk sold (litres)	72	11.33	12.17	1	60
Distance to milk selling point (km)	101	3.64	6.18	0	25
Gross annual dairy income ($)	104	871.96	975.79	16.80	5600
Cost of AI ($)	78	11.66	5.37	5.33	40
Cost of bull service ($)	111	1.84	3.45	0	16

Table 2: percentage of breed and type of cattle

Breed	Percent	Type	Percent
Holstein-Friesian (pure)	0.79	Immature males	2.36
Holstein-Friesian (cross)	15.87	Cows	12.6
Ayrshire (pure)	3.17	Heifers	22.83
Ayrshire cross)	42.06	Pre-weaning males	11.81
Jersey (pure)	0.79	Pre-weaning females	50.39
Jersey (cross)	2.38		
Guernsey (cross)	5.56		
Local zebu	24.6		
Others	4.76		

Table 3: Preference and use of AI and bull service

Preferred \ Used service	AI (n=16)	Bull (n=110)	Total
AI (n=68)	16%	98%	54%
Bull (n=58)	9%	91%	46%
TOTAL	13%	87%	

cattle when compared to only 25% who kept pure indigenous breeds and only 5% keeping pure exotic breeds (Table 2). The cross breeding program utilized AI service to yield Holstein-Friesian crosses (kept by 15.9% of the farmers) and Ayrshire crosses (kept by 42.1% of the farmers). This was attribute to higher inclination towards higher milk productivity. The Ayrshire crosses were more preferred due perceived higher resistance to diseases when compared to Friesian-Holstein crosses. The proportion of Zebu cattle was about 24.6%, mostly in high LGP /low access areas. About 85% of the households kept female cattle, 50% kept pre-weaning females, and 23% kept heifers. This is an indicator of the demand for female cattle probably as replacement stock.

In terms of use of AI (Table 3), 54% of the sampled farmers preferred AI while 46% preferred bull service. However, in terms of actual service utilization, only 16% 0f all 127 respondents interviewed had used AI within the past 5 years. This suggested that bull service was more practised than AI within even if AI was the most preferrd mode of service among farmers. Interestingly, 98% of the farmers who had a preference for AI practised bull service and 9% of the farmers who prefer bull service had used AI within the last 5 years. The results suggested that farmers did not always use their preferred method of breeding service. A focus group discussion revealed some of the reasons for preferring a particular breeding service. Artificial insemination was preferred particularly because;

- it offered a faster way of getting an improved breed because the breed of the sire was known
- it helped in preventing the spread of reproductive diseases
- it saved on cost of keeping a bull
- calves from this service grow faster and are sold at high prices

On the other hand, reasons for preference of bull service were:-

- accurate heat detection even when the farmer is unaware of the heat status of the cow
- high conception rates resulting in few repeat breeding
- it was cheap and readily available within the farm's environment which was convenient when the farmer does not have the money to pay for AI service.

Thirty six (36%) of the farmers using AI experienced problems with its use while 49% of the farmers using bull service had some problems its use (Fig 2). Mostly farmers (87%) using AI cited the problem of repeat breeding while 60% of the farmers using bull service had problem of limited breed variety. High cost of AI service was as a problem. Thus, as noted by other authors (Okeyo *et al.*, 2009), constraints to use breeding services in Kenya is a complex issue requiring multifaceted approach.

The results of data analysis are presented in Tables 4 and 5. The size of land other complex factors affected use of AI. For example, farmers who had not used AI had significantly more acres of land and therefore afforded to keep a bull for breeding. On the other hand, use of AI

Table 4: Comparison of quantitative variables between farmers who had used AI and those who had not

Variable	0	1	Difference	Sig. (2-tailed)
Household size	5.90	5.86	0.04	0.94
Household head education	5.59	6.43	-0.74	0.46
Household head age(years	49.98	47.81	2.17	0.54
Household head experience(years)	23.47	19.67	3.80	0.27
Income ($)	2420.95	2228.13	192.82	0.80
Land size(acres)	12.24	3.62	8.62	0.06*
Number of cross breed cattle	2.64	3.70	-1.06	0.09*
Number of cows	1.87	2.46	-0.59	0.04**
Milk production (litres)	12.12	21.55	-9.43	0.06*
Distance to milk selling point(km)	3.95	2.45	1.50	0.32

Note: ** Significant at the 0.05 level; * significant at the 0.10 level; Data coding: 1-use of AI and 0-otherwise (non-use)

Table 5: Comparison of qualitative variables between farmers who had used AI and those who had not

Variable	Response	Used AI (n=19)	Non-use of AI(n=108)	Chi-square	P-Value
		%	%		
Gender	Female	32%	19%	1.421	0.233
	Male	68%	81%		
Group membership	Yes	0%	13%	2.768*	0.096
	No	100%	87%		
Obtained loan	Yes	37%	44%	0.295	0.587
	No	63%	56%		
Access to extension	Yes	95%	79%	2.71*	0.10
	No	5%	21%		

Note: * significant at 0.10 level.

was significantly associated with group membership and access to government extension services. Gender of household head and access to credit facilities also affected the use of breeding service (Njoroge *et al.*, 2004; Hoffman, 2007). This complex scenario shows that capacity building is key to enhanced use of AI breeding service in Kenya.

Conclusion

Although AI was preferred breeding service in Kenya, constraints to its use among farmers force them to practice bull service. A multifaceted approach to these constraints is hereby recommended that include capacity building for farmers and additional research to inform policy decisions on breeding programs.

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