Research Application Summary

A comparative analysis of breeding information sourcing and net margin estimates of inseminations and replacement decisions of smallholder dairy farmers

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Abstract

Milk deficit (MD) in western Kenya (MD) has created high demand for dairy breeding stock. This is mainly sourced from the neighbouring milk surplus Rift Valley (RV) region. Because of limited access to artificial insemination (AI) services, supply of breeding stock is insufficient and stock prices therefore high for most farmers. Farmers therefore inseminate (breed) using bulls of unproven and often poor progeny or purchase cull-cows. Cull-cows are either too old or problematic. To quantify the benefits associated with these decisions, this study analysed breeding information smallholder farmers seek and the net margins associated with their insemination and replacement decisions. The study employed a cross-sectional survey of households in both the MD and RV areas. In both regions, majority of the farmers (58 – 67%) use AI to upgrade their stock while 38 – 44% use bulls. Milk yield potential was the most important consideration when purchasing a heifer or making a cull-cow replacement in both regions. Fertility was however more important for farmers in MD areas. While farmers in the RV region seek information on breed, source and breeders' reputation, performance and price when making insemination and replacement decisions, those in MD areas only seek for price and source of the stock. Per day of productive life, the estimated net margins for heifer progeny was higher ($p = 0.000$) for AI progenies (Ksh 132.03 ± 11.14) than for bull progenies (Ksh 66.43 ± 2.83) while net margins for heifer progenies (Ksh 77.92 ± 6.80) was comparable ($p = 0.092$) to that from cull-cow progenies (Ksh 63.48 ± 5.33). Results demonstrate differences in breeding decisions between MD and RV areas and that AI is more beneficial than a bull, and that herd replacement with heifers result in comparable benefits with those from cull-cows under smallholder dairy breeding circumstances.

Keywords: Artificial insemination, breeding stock, bulls, cull-cows, dairy, net margins.

Résumé

Le déficit de lait (MD) dans l'ouest du Kenya (MD) a créé une forte demande pour le stock de la production laitière. Ceci est la principale source de l'excédent de lait des environs de la région du Rift Valley (RV). En raison de l'accès limité aux services de l'insémination artificielle (IA), la fourniture de stock de production est insuffisante et les cours boursiers sont donc élevés pour la plupart des agriculteurs. Les agriculteurs qui font l'insémination (race) en utilisant des taureaux en provenance des descendants ou non prouvée, souvent médiocre ou l'achat des vaches sélectionnées. Des vaches sélectionnées sont soit trop vieux ou problématiques. Pour mesurer les avantages associés à ces décisions, cette étude a analysé la reproduction d'information par les petits agriculteurs, en relation à la recherche et à la recherche des marges nettes liées à leur insémination et aux décisions de remplacement. L'étude a utilisé une enquête transversale des ménages à la fois dans les zones MD et RV. Dans les deux régions, la majorité des agriculteurs (58 à 67%) utilisent AI pour mettre à niveau leur stock, tandis que 38 à 44% utilisent des taureaux. Dans les deux régions, le potentiel de rendement en lait était le facteur le plus important lors de l'achat d'une génisse ou d'un remplacement de la vache, ou faire le remplacement de la vache sélectionnée. La fertilité était toutefois plus importante pour les agriculteurs dans les zones MD. Alors que les agriculteurs de la région RV recherchent des informations sur la race, l'origine et la réputation des éleveurs, les performances et le prix, quand ils prennent des décisions d'insémination et de remplacement. Ceux des zones MD cherchent seulement le prix et l'origine du stock. Par jour de productive, les marges nettes estimatives pour une jeune génisse était plus élevé (p = 0,000) pour la descendance de l'IA (Ksh 132.03 + 11.14) que pour les descendances de taureaux (Ksh 66.43 2.83), tandis que les marges nettes pour descendances des génisses (Ksh 77.92 + 6,80) étaient comparables (p = 0,092) à celles de la vache de réforme descendances (Ksh 63.48 + 5.33). Les résultats montrent des différences dans la reproduction des décisions entre les zones MD et VR, et que l'IA est plus bénéfique qu'un taureau, et que le remplacement du troupeau avec des génisses résulte des avantages comparables à ceux des vaches sélectionnés sous des petits producteurs laitiers dans des circonstances de reproduction.

Mots-clés: insémination artificielle, animaux de reproduction, taureaux, vaches sélectionnées, les produits laitiers, les marges nettes

Background

Western Kenya is a milk deficit region despite favourable climatic conditions for dairy farming and expanding local market opportunities. The growing milk demand has created demand for dairy breeding stock as evidenced by sourcing of breeding stock from Rift Valley (RV) by smallholder dairy farmers in Western Kenya (MD) (Njoroge *et al*., 2004). The breeding decisions are however difficult under the situation of shortage of quality breeding stock (Kahi *et al*., 2004). Faced with shortage of quality breeding dairy stock, smallholders continue to inseminate with bulls of unproven progeny merit and this likely depresses the gains already made in performance levels in the parental population. Smallholders often purchase cull cows for breeding because quality in-calf heifers are in shortage and too costly. Improving dairy herds using bull inseminations and replacement with cull cows which often are 'problem cows' forced to extend productive life could impact negatively on productivity.

The study was a comparative analysis of breeding information when inseminating or replacing dairy herd and the net margin estimates of the progenies from such insemination and replacement decisions among smallholders in RV and MD regions in Kenya.

Literature Summary

Dairy breeding decisions can have significant long-term effects on production efficiency and profitability which farmers need to know. It is unclear in Kenya of what informs breeding decisions of smallholder farmers faced with limited access to Artificial Insemination (AI) services, insufficient supply of breeding stock and high unaffordable stock prices when demand for breeding is rising (Bebe *et al*., 2003; Njoroge *et al*., 2004). Under these circumstances, farmers commonly inseminate with bulls of unproven progeny merit and replace herds with cull-cows which are often disposed 'problem cows' from other farms (Bebe *et al.*, 2003).

Parcella *et al*. (2010) have emphasized that management decisions based solely on short-term reproductive benefits often fail to take into account the importance of many long-term managerial strategies. These include lifetime performance and comparative reproductive capacity between heifers and cows as well as milk prices. Therefore, smallholders need to know the consequences of inseminating with bulls or AI and replacement in the dairy herds with heifers or cull cows (Perez-Cabal and Alenda, 2003).

Study Description

The study was undertaken in two neighbouring regions that trade in dairy breeding stock. One region (Vihiga division) is a milk deficit area in western Kenya (MD) and the other (Nandi South) is in a milk surplus region of Rift Valley (RV). Smallholder dairy households sampled in a cross sectional survey through stratified random sampling provided the needed data collected using a pretested structured questionnaire. Farmers rated the frequency (1 for never, 2 for occasionally and 3 for often) at which they receive or seek breeding information when making breeding decisions. Other data collected were animal lifetime performance, inputs and outputs which were used to compute revenue and costs and profit margins. Logistic regression was used to estimate the influence of region, breed, insemination and replacement decisions on breeding information sought while a linear regression was used to estimate the relationship between these variables and the net margin was computed using a discounted profit function.

Research Application

The most important reason in insemination decision are summarised in Table 1. Majority of the farmers in both regions (58 – 67%) stated that they use AI to upgrade their stock while 38 – 44% use a bull when AI is lacking. The second most important reason for choice of bull service in RV was lack of AI services and disease prevention for choice of AI service.

Table 2 shows that milk yield potential was the most important consideration when purchasing heifer and cull-cow replacements in both regions, but fertility is more important for farmers in MD when purchasing heifer replacement. The second most important reason for choice of cull cow and heifer in RV and heifer in MD was body conformation. Body size was the second most important reason for choice of cull cow in MD. The third most important reason for cull cow choice in RV and MD was udder conformation and body size for choice of heifer.

Smallholders in RV often sought information on production, specific traits, breed, price, breeders' reputation and source of service for insemination and replacement decisions while the most frequently sought information in MD was price of insemination service and replacement cattle. The breed of dairy cows kept was the most significant determinant of breeding information sought in RV an MD.

Table 1. Farmers' reasons (%) for insemination practices.

Reason for choice	Insemination	1st ranked reason		2nd ranked reason		3rd ranked reason	
		Producers	Buyers	Producers	Buyers	Producers	Buyers
Upgrading	Bull	38.9	44.3	22.6	7.3	16.6	6.5
	AI	66.7	58.4	27.9	8.4	13.4	2.6
Preventing disease	Bull	0.9	5.3	3.8	6.3	10	4.4
	AI	8	3.6	44.2	53	58.6	52.5
Lack of alternative services	Bull	38.9	46	50	77.3	34.4	60.9
	AI	0	2.4	2.3	2.4	1.2	6.3
Other reasons	Bull	21.3	4.4	32.6	9.1	38.9	28.3
	AI	25.3	35.7	25.6	36.1	26.8	38.8

Table 2. Farmers' reasons (%) for herd replacement practices.

Reasons for decision	Replacement	1st ranked reason		2nd ranked reason		3rd ranked reason	
		Producers	Buyers	Producers	Buyers	Producers	Buyers
Milk yield	Heifer	54.8	27.0	3.5	4.3	3.5	7.8
	Cull cow	64.3	56.0	11.4	11.2	4.4	7.8
Fertility	Heifer	19.1	30.4	33.9	27.8	9.6	1.7
	Cull cow	13.0	6.0	20.2	20.7	11.4	10.4
Body conformation	Heifer	7.0	11.3	36.5	33.0	24.6	13.0
	Cull cow	14.8	10.3	24.6	19.8	14.9	6.1
Body size	Heifer	2.6	15.7	12.2	13.0	30.7	30.4
	Cull cow	1.7	5.2	17.5	31.9	14.0	13.0
Udder conformation	Heifer	1.7	10.4	5.2	16.1	22.8	16.5
	Cull cow	6.1	9.5	16.7	6.0	32.5	40.9
Temperament	Heifer	14.8	5.2	7.8	15.7	8.8	30.4
	Cull cow	0	12.9	9.6	10.3	22.8	21.7

The estimated net margins by breed were highest for Holstein Friesian (KSh 111.6) and Aryshire (KSh 91.1) relative to other breeds (Fig. 1) (1 US$ = 88 KSh.).

The net margins per day of productive life (Table 3) indicate that the progenies from AI services had about twice higher benefits than those from bull services in both RV and MD. The positive effect of upgrading indigenous breeds of cattle to dairy crosses is also evident on higher net margin. Smallholders

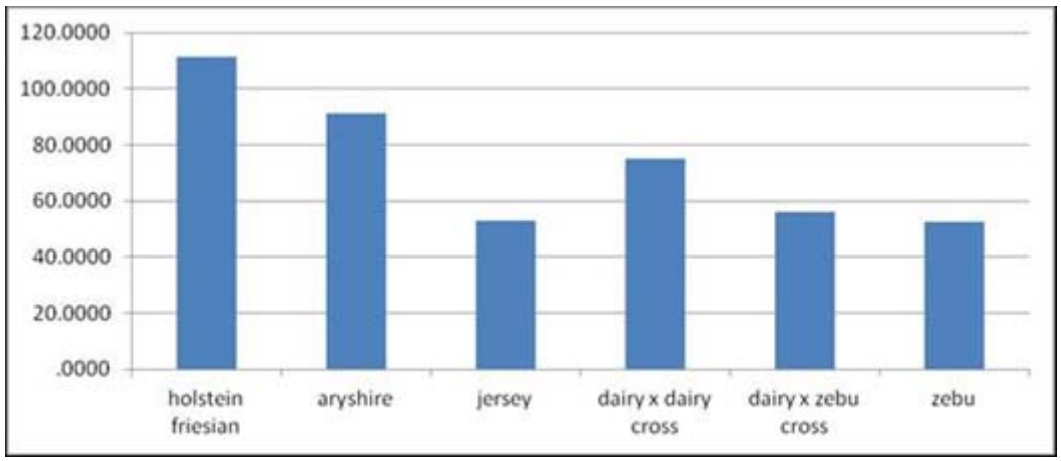

Figure 1. Net margins (in KSh) by breeds on smallholder farms.

Table 3. Estimated net margins for progenies of insemination and replacement decisions of smallholder dairy farmers.

	Progeny	PL (days)	Net margin	S.E	t-value	p-value
Rift Valley	Bull	1093	75.12	3.56	-4.89	0***
	AI	1454	139.41	12.65		
	Cull	1168	84.89	8.09	-0.715	0.476
	Heifer	1381	95.62	13.92		
Western Kenya	Bull	1564	48.2	4.27	-2.36	0.02**
	AI	1501	88.54	12.07		
	Cull	1647	40.7	5.9	-2.971	0.003***
	Heifer	1520	66.71	6.5		

in MD who purchase heifers also benefit more than those who purchased cull cows.

Per day of productive life, the estimated net margins for heifer progeny was higher ($p = 0.000$) for AI progenies (Ksh 132.03 ± 11.14) than for bull progenies (Ksh 66.43 ± 2.83) while net margins for heifer progenies (Ksh 77.92 ± 6.80) was comparable ($p = 0.092$) to that from cull-cow progenies (Ksh 63.48 ± 5.33). Results demonstrate differences in breeding decisions between MD and RV and that inseminations with AI are more beneficial than with bull while herd replacement with heifers result in comparable benefits with those from cull-cows under smallholder dairy breeding circumstances.

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