

# Dairy production practices among smallholder dairy farmers in Butere/Mumias and Kakamega districts in Western Kenya

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Accepted: 13 February 2007 / Published online: 5 April 2007  
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**Abstract** A survey was conducted on 176 smallholder dairy farms in Butere/Mumias and Kakamega districts of Western Kenya to establish the dairy production practices and constraints in the industry. There was low milk production (16.6 kg of milk per capita), which was attributed to the low number of dairy animals. The average land size was 2.4 ha with only 30.3% being allocated to pasture or fodder crops. Farmers with large farms (>2 ha) set aside bigger pieces (1.2 vs 0.4 ha) for pasture/fodder crop cultivation ( $p < 0.001$ ), owned more (5.25 vs 3.18)

dairy animals ( $p < 0.01$ ) and produced more (9.2 vs 7.5 kg/cow per day) milk ( $p < 0.05$ ) compared to those on smaller farms of less than 2 ha. The average herd size was 4.2 animals, of which only 45.0% were in milk, producing 8.0 kg/animal per day. Every kilogram of dairy meal fed increased milk production by 0.68 kg ( $p < 0.001$ ). Over 90% of milk produced was consumed locally. The public institutions provided 74% of total extension services to farmers. About 49.5% of total dairy animals were bought from other districts owing to scarcity.

**Keywords** Smallholder · Dairying · Milk production · Production practices · Kenya

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## Abbreviations

AI	artificial insemination
GoK	Government of Kenya
KARI	Kenya Agricultural Research Institution
KES	Kenya shillings
MoLFD	Ministry of Livestock and Fisheries Development
NGOs	non-governmental organization

## Introduction

The highlands of Western Kenya represent 15% of the total area of the country and are home to 40% of the country's population. Population growth rate in

this area is 3.4% per annum, making it one of the most densely populated with 300–1200 persons/km<sup>2</sup>. The area lies in the medium- to high-altitude agro-ecological zone, characterized by an adequate and generally reliable bimodal rainfall (1200–2400 mm per annum). The cool environment is capable of sustaining growth of pastures and other crops that may be used as feed supplements. Eighty per cent of the population in the two districts of Butere/Mumias and Kakamega derive their livelihood from practising agriculture.

Although the area has the potential for dairy production, it is still predominantly at subsistence level (Waithaka *et al.*, 2000). Consequently, Western Kenya contributes less than 9% of the national milk output, which cannot meet the local demand (Omore *et al.*, 1999). Despite this market for milk and the potential to increase milk production through intensification, there still exists a huge deficit in milk production (Waithaka *et al.*, 2000). Most of the milk consumed comes from the neighbouring districts of the Rift Valley Province. Further development of the dairy industry in the area requires a good understanding of the current production practices. The present study was conducted to establish the current status of dairy production and to establish the constraints on the development of the industry among the smallholder farmers in Butere/Mumias and Kakamega districts of Western Province, Kenya.

## Materials and methods

### Project area

The study was conducted in Butere/Mumias and Kakamega districts of Western Province of Kenya. There are five administrative divisions in Butere/Mumias District, namely Butere, Kwisero, Matungu, Mumias and South Wanga. Kakamega District has seven divisions, namely Ikolomani, Ileho, Kabras, Lurambi, Kakamega municipality, Navakholo and Shinyalu. The area receives a bimodal rainfall, from February to May in the long rain season, and November to December in the short rain season. The project area is densely populated, with Kakamega district having a mean density of 432 persons/km<sup>2</sup>, while Butere/Mumias has 508 persons/km<sup>2</sup> (Government of Kenya, 1999).

## Survey data

Secondary statistical data on number of animals and milk production in the area were obtained from the Ministry of Livestock Development and Fisheries (Ministry of Livestock and Fisheries Development, 2004). These data were analysed to provide an overview of the status of dairy production in the area. Primary data were obtained from a survey study conducted in August 2005 using a questionnaire administered to 176 smallholder farmers in Butere/Mumias (69) and Kakamega (107) districts. The farmers, owning at least one dairy animal (pure dairy cattle or their crosses with the Zebu cattle), were randomly selected from the study area based on the administrative units. The administrative subdivision of a district comprised the divisions, locations and sub-locations. A total of 15 or 16 participating farmers were randomly selected from each division with equal representation from every sub-location; where the sub-locations numbered more than 15 or 16 in a division, the selection was based on locations.

The questionnaires were administered by household visits. The questionnaire sought information on general farm characteristics, number of cattle, milk production, training, access to extension and veterinary services, use of dairy inputs, breeding programmes and marketing of milk.

### Data analysis

Data were analysed by descriptive statistics using the statistical package Genstat. Description of frequencies for multiple responses was based on weighted averages of all rankings of a particular trait. Analyses of variance was done on different groupings of farmers based on different traits.

## Results

### Distribution of dairy production

Statistical data from the MoLFD for the districts on number of animals and milk production is summarized in Table 1. Farmers kept few dairy animals, which formed 20.5% of the estimated number of cattle. The low number of dairy animals was more pronounced in Butere/Mumias district, where one

**Table 1** Number of cattle and annual milk production (kg) in Butere/Mumias and Kakamega districts of Western Kenya<sup>a</sup>

	Butere/Mumias	Kakamega	Overall
Cattle	58 645	155 672	214 317
Zebu cattle	51 699	118 788	170 487
Dairy cattle <sup>b</sup>	6 946	36 884	43 830
Dairy animals/km <sup>2</sup>	7.4	26.5	18.79
Persons/dairy animal	68.7	18.6	26.57
Milk produced	2 881 380	16 461 429	19 342 809
Milk per capita	6.04	23.93	16.6

<sup>a</sup> Source: Ministry of Livestock and Fisheries Development Annual Report, Western Province, Kenya, 2004.

<sup>b</sup> Dairy cattle includes pure dairy cattle and their crosses with Zebu cattle.

dairy cow served 68.7 people, whereas there were more animals per unit of land in Kakamega district. Estimated milk per capita availability in Butere/Mumias was about 25% of the production in Kakamega district.

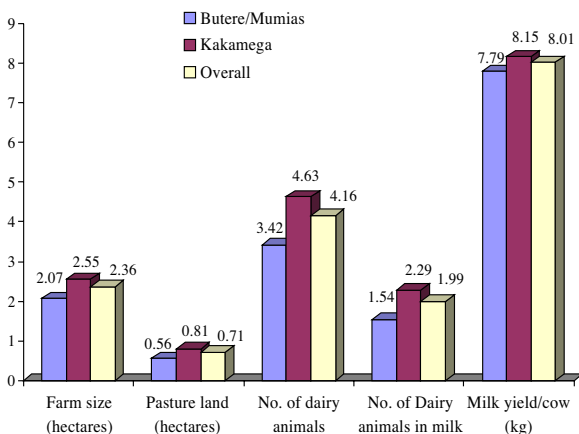
#### Characteristics of dairy production on smallholder farms

Farmers in Kakamega district had bigger farm sizes than those in Butere/Mumias (Fig. 1). The smallest land holding was 0.1 ha while the largest was 22 ha. Despite the large variation in land size of households surveyed, 65.9% of farmers owned up to 2 ha. About 30.3% of land was set aside for pasture or fodder cultivation.

The dairy herd was variable, with 52.6% of farmers having between 3 and 5 dairy animals, and 18.7%

keeping more than 5 dairy animals. The percentage of dairy animals in milk was 45.03%. Most farmers raised dairy cattle under zero-grazing (57%) and semi-zero-grazing (21%) systems.

The daily milk yield per cow varied from 1 kg to 29 kg, with 67% of farmers producing between 5 and 10 kg. Supplementary feeding of dairy meal, at the lowest rate of less than 2 kg/animal per day, significantly increased daily milk production by 2.23 kg (Table 2). However, higher levels of supplementation did not show corresponding increase in production. Animals on large farms yielded more milk than those on small farms (Table 3). Regression



**Fig. 1** Dairy production characteristics on smallholder dairy farms in Butere/Mumias and Kakamega districts, Western Kenya

**Table 2** Effects of use of dairy meal and size of herd on milk yield in Butere/Mumias and Kakamega districts of Western Kenya

	No. of farmers	Milk yield (kg/cow per day)
<i>Dairy meal (kg/cow per day)</i>		
None (0)	22	5.95
Low (0–2)	55	8.18
Medium (2–3)	61	8.36
High (>3)	26	8.57
SED		0.994
F probability		0.083
<i>No. of dairy animals</i>		
Small (<3)	45	6.61 <sup>a</sup>
Medium (3–5)	88	8.78 <sup>bc</sup>
Large (>5)	31	7.80 <sup>ab</sup>
SED		0.827
F probability		0.012

<sup>a,b,c</sup> Means in the same column and within the same effect having different superscript letters are significantly different at  $p < 0.05$ .

**Table 3** Effect of farm size on pasture/fodder crop-land, number of dairy cattle, usage of dairy meal and milk yield in Butere/Mumias and Kakamega districts of Western Kenya

Size of household land	No. of farmers	Pasture-land (ha)	No. of dairy cattle	Dairy meal (kg/cow per day)	Milk yield (kg/cow per day)
<1.2 ha	55	0.36 <sup>a</sup>	3.18 <sup>a</sup>	2.05	7.47 <sup>a</sup>
1.2–2 ha	53	0.56 <sup>b</sup>	4.19 <sup>ab</sup>	1.82	7.31 <sup>a</sup>
>2 ha	56	1.17 <sup>c</sup>	5.25 <sup>b</sup>	1.83	9.17 <sup>b</sup>
SED		0.103	0.653	0.313	0.763
<i>F</i> probability		<0.001	0.007	0.735	0.027

<sup>a,b,c</sup> Means in the same column with different superscript letters are significantly different at  $p < 0.05$ .

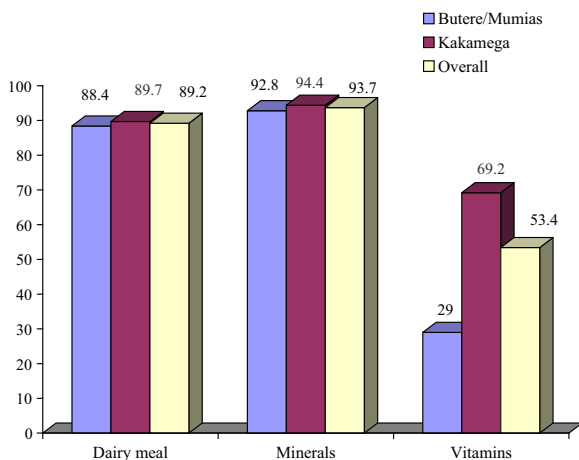
showed that farmers realized an increase of 0.68 kg of milk for every 1 kg of dairy meal offered to animals ( $p < 0.001$ ).

#### Utilization of dairy inputs

The survey sought to establish the extent of utilization of commercial dairy inputs to improve milk production. The proportions of farmers using commercial dairy inputs are given in Fig. 2. Apart from vitamin supplement, dairy meal and mineral supplement were regularly used on the farms. Whereas the amount of dairy meal offered varied from 0 to 12 kg/animal per day, 52% of farmers gave more than 2 kg.

#### Access to support services

Ministry of Livestock and Fisheries Development and Kenya Agricultural Research Institute played major roles in providing extension services to farmers in the



**Fig. 2** Percentage of farmers using dairy inputs in Butere/Mumias and Kakamega districts, Western Kenya

area (Fig. 3). Non-governmental organizations and dairy input suppliers also provide extension services to farmers especially during field demonstration and seminars/workshops. Farmers got exposure to animal husbandry through trainings and field demonstrations (57%), attendance at shows (21%) and visits to other farms (22%).

#### Type and source of dairy animals

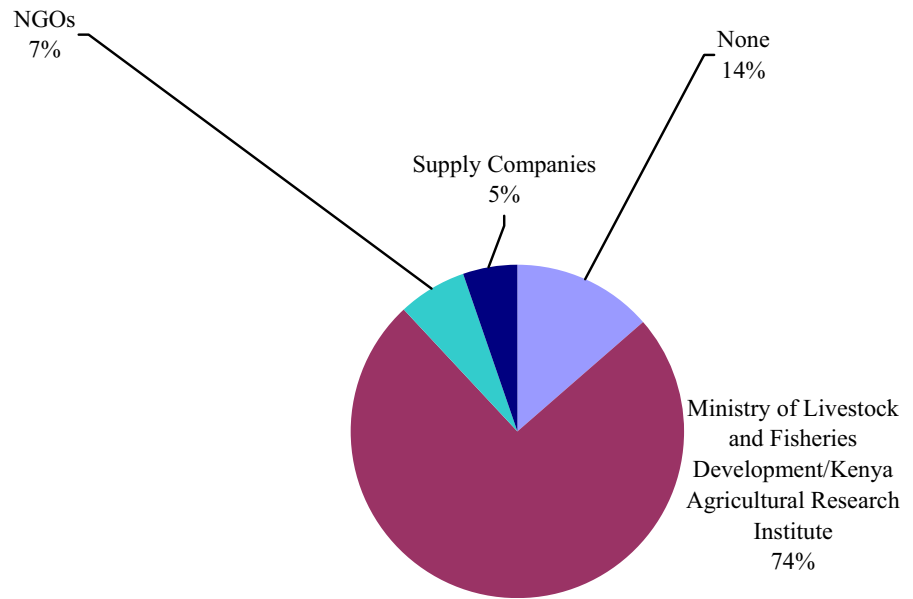
The dairy breeds were kept in varying proportions except for the Jersey, which was the least popular. The most common dairy breeds owned by farmers were Friesians (46.0%), Ayrshire (37.5%) and their crosses with indigenous cattle (38.6%).

The dairy animals were bought either locally (50.1%) or from other districts (49.5%). Prices of animals varied depending on where they were purchased, but the majority (35.2%) were in the price range of KES 10 000–20 000 (Kenya shillings; US\$ 1=KES 72), followed by KES 20 000–30 000. Few farmers (16.5%) could afford to buy animals at a price over KES 30 000.

#### Marketing of milk

The bulk of milk produced was sold locally to neighbours, local hotels, and shops (78.5%). The rest of the milk was sold to milk vendors (18.1%) and cooperative societies (3.4%). Some farmers in Matungu division of Butere/Mumias District and Kabras division of Kakamega District could not sell their milk during the rainy season owing to lack of market. The supply to the big towns, such as Kakamega and Mumias, was satisfied by importation of milk from the neighbouring Nandi and Trans Nzoia districts of the Rift Valley Province. The price of milk

**Fig. 3** Extension service providers to farmers in Butere/Mumias and Kakamega districts, Western Kenya



varied between KES 18 and KES 32 per kilogram with an average of KES 28.7/kg. Lower prices of KES 18/kg were reported in Kabras division.

### Discussion

As in other parts of the country, farmers preferred to raise local Zebu cattle or a few exotic cattle because the exotic breeds were generally expensive to purchase and required more inputs. The two districts had more dairy animals per unit of land (18.8/km<sup>2</sup>) (Table 1) compared to the provincial mean of 12.3 (Omoro *et al.*, 1999). There were more people served by a dairy animal (26.6) compared to the national mean of 10. Milk per capita (16.6 kg) was below both the provincial and national figures of 36 and 106 kg, respectively (Peeler and Omoro, 1997). The figures reported indicate that the area had insufficient milk production, which could be attributed to the small number of dairy animals.

The small pieces of land had negative effects on milk production in terms of number of animals, land available for pasture/fodder crops and milk production per animal. This was expected since farmers in the area practised mixed crop/livestock farming and utilized the same piece of land for growing subsistence and cash crops. In view of the shrinking farm sizes, most farmers raised animals under zero-grazing

and semi-zero-grazing systems. Thus the only way to improve the dairy industry in the area is by intensifying production. The low proportion of dairy animals in lactation was indicative of poor reproductive management practices within the herds.

The majority of farmers produced between 5 and 10 kg of milk per animal per day. However, most of them (52%) supplemented their animals with over 2 kg of dairy meal per animal per day. This level of milk production could be sustained on cheaper good-quality pastures with no supplementation. Feeding dairy meal increased milk yield, but higher levels of supplementation did not show a corresponding increase in yields (Table 2). This could have been due to offering dairy meal beyond the genetic potential of the animals. Whereas most farmers used dairy inputs (Fig. 2), these results indicated that they were not used as recommended. Thus poor knowledge regarding supplementation and low genetic potential of animals were probably among the limiting factors in milk production in the area. These results indicate that effective and economic use of dairy inputs can only be realized if it is backed with proper training of farmers so that they are conversant with the interactions of factors affecting milk production.

Despite the new government policy of privatization of extension services (Owango *et al.*, 1998), government is still an important extension service provider. However, NGOs and dairy inputs supply companies

need to be in the lead in offering extension services as a back-up to their activities.

Nearly half of dairy animals bought came from other districts. There was only one breeding farm in the area, Mukumu Guernsey farm, which produced few animals that could not satisfy the high demand. A good dairy animal from this farm and other breeding farms in the country cost over KES 50 000. Thus the farmers bought animals of low genetic potential, a possible reason for the generally low milk yields. This is in agreement with the observation that animals on high levels of dairy meal supplement did not show a corresponding increase in yield. Whereas farmers would be expected to choose the smaller dairy breeds because of the small farms, most preferred the larger and high-yielding Friesians and Ayrshires. Poor AI service was responsible for the use of indigenous bulls, leading to a downgrading of the few dairy animals.

The area has a large market potential for milk, which was not exploited by farmers from the remote rural areas. The prices offered for milk in this area were good because in most areas in Kenya, especially where dairy is well established, milk sells between KES 14 and KES 18 per kilogram (Thorpe *et al.*, 2000).

In conclusion, Butere/Mumias and Kakamega districts are not self-sufficient in milk production. This was attributed to there being few dairy animals, low production per animal; small farms and low use of inputs. The number of dairy animals in the area was limited by diminishing land sizes and scarcity of pastures and fodder crops, but supplementing dairy meal increased milk production. Consequently, future development in dairy will depend on intensification, introduction of genetically superior breeds, availability of dairy support services, increased use of dairy inputs and training in intensive dairy husbandry techniques. Farmers should be encouraged to form cooperatives to provide training, dairy support services such as veterinary services, dairy inputs and connection to breeders outside the districts and markets for milk. The majority of farmers produced milk at subsistence level and should be trained to consider dairying as a business.

**Acknowledgements** The Department for International Development, UK (DFID) through Citizens Network for Foreign Affairs/Agricultural Market Development Trust (CNFA/

AGMARK) funded this study as a baseline survey on improving productivity and incomes of smallholder dairy farmers in Western Kenya. The views expressed are those of the authors and not necessarily those of DFID, CNFA and AGMARK. The many inputs and critical contributions to the logistics of the design and analysis of data by Dr Caleb Wangia, The East Africa Regional Director CNFA and Managing Director, AGMARK, are highly appreciated. Special thanks are due to all the staff of AGMARK, especially Mr Osborne Barasa and Mr James Mutonyi for their support and participation in this study. The staff members of the Ministry of Livestock and Fisheries Development in Butere/Mumias and Kakamega districts are gratefully acknowledged for their support in administering the survey questionnaire, especially in providing information on the location of farmers. The authors are also grateful to all farmers for their cooperation and provision of valuable information in this study.

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## Pratiques de la production laitière parmi les éleveurs de bétail laitier dans les districts de Butere/Mumias et de Kakamega dans l'Ouest du Kenya

**Résumé** – Musalia, L.M., Wangia, S.M.M., Shivairo, R.S., Okutu, P. et Vugutsa, V., 2006. Pratiques de la production laitière parmi les éleveurs de bétail laitier dans les districts de Butere/Mumias et de Kakamega dans l'Ouest du Kenya. Santé et production animale tropicale. Une étude a été

menée sur 176 petites fermes d'élevage de bétail laitier dans les districts de Butere/Mumias et de Kakamega de l'Ouest du Kenya pour établir les pratiques de la production laitière et les contraintes dans l'industrie. Il a été enregistré une faible production de lait (16,6 kg de lait par tête) qui a été attribuée au faible nombre d'animaux laitiers. La taille moyenne des terrains a été de 2.4 ha avec seulement 30.3% des terrains affectés au pâturages ou aux cultures fourragères. Les fermiers propriétaires de grandes fermes d'élevage (>2 ha) gardaient en réserve des parcelles plus grandes (1.2 *par rapport à* 0.4 ha) pour les pâturages/les cultures fourragères ( $p < 0.001$ ), ils possédaient plus d'animaux laitiers (5.25 *par rapport à* 3.18) ( $p < 0.01$ ) et produisaient plus (9.2 *par rapport à* 7.5 kg par vache<sup>-1</sup> par jour<sup>-1</sup>) de lait ( $p < 0.05$ ) par comparaison à ceux ayant des fermes de moins de 1.2 ha. La taille de troupeau moyenne a été de 4.2 animaux, dont seulement 45.0% donnaient du lait, produisant 8.0 kg par animal<sup>-1</sup> par jour<sup>-1</sup>. Chaque kilogramme de farine pour production laitière alimentée a augmenté la production de lait de 0.68 kg ( $p < 0.001$ ). Plus de 90% du lait produit était consommé localement. Les institutions publiques fournissaient 74% du total des services logistiques aux fermiers. Environ 49.5% du total des animaux laitiers étaient amenés d'autres districts en raison de la pénurie d'animaux.

### **Prácticas de producción lecheras entre pequeños granjeros lecheros de los distritos de Butere/Mumias y Kakamega en el oeste de Kenia**

**Resumen** – Se llevó a cabo un estudio en 176 granjas lecheras pequeñas de los distritos de Butere/Mumias y Kakamega del oeste de Kenia para establecer las prácticas de producción lechera y las limitaciones de la industria. Hubo una producción láctea baja (16.6 kg de leche per cápita), que se atribuyó al bajo número de animales lecheros. El tamaño medio de la tierra fue de 2.4 ha, con sólo un 30.3% adjudicado a pastos o cultivos de pienso. Los granjeros con granjas grandes (>2 ha) reservaban trozos de tierra más grandes (1.2 vs 0.4 ha) para cultivos de pastos y forrajes ( $p < 0.001$ ), poseían más animales lecheros (5.25 vs 3.18) ( $p < 0.01$ ) y producían más leche (9.2 vs 7.5 kg vaca<sup>-1</sup> día<sup>-1</sup>) ( $p < 0.05$ ) comparado con aquellos en granjas más pequeñas de menos de 1.2 ha. El tamaño medio del rebaño fue de 4.2 animales, de los cuales sólo un 45.0% estaban produciendo leche, produciendo 8.0 kg animal<sup>-1</sup> día<sup>-1</sup>. Cada kilogramo de alimento lácteo suministrado aumentaba la producción de leche por 0.68 kg ( $p < 0.001$ ). Más del 90% de la leche producida era consumida localmente. Las instituciones públicas proporcionaban el 74% de la totalidad de los servicios de extensión a los granjeros. Aproximadamente el 49.5% de todos los animales lecheros se compraban en otros distritos debido a su escasez.