Uganda Journal of Agricultural Sciences, 1999, 4: 7-11
Printed in Uganda.

ISSN 1026-0919

Factors affecting dairy production in peri-urban areas of Kampala

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Abstract

The number of small holder dairy farms in the peri-urban areas of Kampala are increasing. This could be due to the high demand for dairy products by the increasing urban population and the need to provide an alternative source of income especially for the resource poor urban population. The farmers rear both improved breeds and local breeds. However, no detailed study has been carried out to address the factors that affect peri-urban dairy production. A survey was carried out in the peri-urban areas of Kampala to find out how these factors affect production. Specifically the study aimed at investigating how socio-economic factors affect dairy production. The econometric model (Cobb-Douglas production function) and descriptive statistics were used. The results showed that the breed of the cows, experience in dairy farming, purchased feeds and labour were the biggest variables affecting dairy farming in the peri-urban areas of Kampala city. It was therefore recommended that if milk production in the peri-urban areas of Kampala is to be increased, farmers should be encouraged to rear improved breeds.

Key words: Dairy production, peri-urban, Kampala

Introduction

Cattle production in Uganda falls in six main grazing/ management systems. These are communal grazing, pastoral herding, tethering, enclosed ranching, fenced/ paddocks dairy farms and zero grazing. In the peri-urban areas the most common ones are zero grazing and small holder fenced dairy farms (Agricultural Secretariat, 1994; Tumutegyereize, 1997).

The Ugandan dairy sector like any other sector of the economy was plagued by economic crisis in the 1970s and early 1980s. Between 1970-1986, the cattle population was reduced from about 5.1 million heads of cattle to less than 3.9 million. Milk collected through the formal milk markets was reduced from about 19.5 million litres in 1972 to about 123,000 litres in 1983 (Ministry of Finance and Economic Planning (MFEP), 1993). As a result the per capita milk consumption is estimated at 22 litres compared with 120 litres in Kenya (Venegas and Akwang, 1992). Consequently malnutrition is high, affecting more than 30% of the infants below 5 years. Expectant mothers and the aged also experience high rates of malnutrition (Ssekibobo, 1996). Yet this is happening when the human population growth is increasing and is currently estimated at 20 million people. In Kampala alone, the urban population is estimated at 1 million (MFEP, 1996) as compared to about 500,000 in the mid 1970s.

Most dairy farmers depend on local breeds (Bos indicus) whose average lactation is about six months and when under good management produce about 800 litres of milk. The exotic breeds and their crosses which constitute approximately 10% of the total national herd, produce about 3,000 litres of milk per lactation of 10 months (Bibangambah, 1977; Euro Consult, 1983; Jonson et al, 1993; Nsubuga, 1995; ILRI/MUK/ODA, 1996).

To salvage the dairy sector, the Government through the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Non-Governmental Organisations (NGOs) and church organizations started importing high yielding breeds of cattle especially the Friesians and their crosses that could adopt to the conditions in Uganda. With land becoming scarce especially in peri-urban areas, small holder dairy farms especially, zero grazing and fenced dairy farms may be a viable option. Moreover the small holder farms are considered by the Government as viable option (MAAIF, 1993; Daniel, 1995).

Therefore this study tried to find out the critical factors that affect dairy production in the peri-urban areas of Kampala.

Methodology

A survey was carried out in the peri-urban areas of Kampala focusing on small holder farmers. The area covered was

within the radius of 20 km from the city centre. Using multistage stratified sampling technique, the area was first stratified according to counties, and then later to sub counties. After consulting with field officers and the local leaders, Wakiso and Nangabo sub counties were purposively selected. From these two sub counties, two parishes of Bukasa in Wakiso and Kitezi in Nangabo sub counties were randomly selected. After developing the sampling frame, sixty farmers were randomly selected for an interview, half from each parish.

The farms studied were those with cows not exceeding 20 in number with at least a milking cow that had calved down at least once. Questionnaires were addressed through personal interviews and covered production, levels of resource use, socio-economic and demographic variables.

The descriptive statistics and the Cobb-Douglas type of production function using multiple regression analysis were used to analyse data. The ordinary least squares (OLS) technique was employed in the analysis. (Douglas, 1948; Battese, 1992; Muwanga, 1994). The Cobb-Douglas type of production function was linearlised by transforming it into double log as shown below.

$LnYi = A + a_1 Lnlab + a_2 Lninv + a_3 Lnfeed + a_4 Lnvet + a_5 ext + a_6 lnexp + a_7 bre + a_8 Lnfarm + U.$

where Yi=Milk produced per year, lab=labour expenses per year(including family labour),inv=investment expenditure, feed=cost of purchased feeds, vet=veterinary expenditure, ext=extension services. Its a dummy. 0-no extension, 1-if there is extension, exp=experience in dairy farming (years), bre=breed of the cow. Its a dummy. 0-local breeds, 1-improved breeds. fam=farm size (hectares). Ln= natural logarithms, U=error terms, A=constant /efficiency parameter, a_{1-8} =parameters to be estimated.

Results and discussion

Socio-demographic characteristics

The average age of the farmers was 47.1 and 46.7 years in zero grazing and fenced dairy farms, respectively. There were more women (43.3%) in zero grazing units than the 26.7% on fenced dairy farms (Table 1). This was attributed to the existence of projects dealing in zero grazing that are biased towards women. Such projects include Mpigi Heifer Project for women farmers (MHPWF) and Heifer Project International (HPI). The high numbers of male managers were attributed to the dominance of males in the families. The household had an average of 8 people. Most of the respondents were married with families. For example, in zero grazing system there was no manager who was single. The explanation for this scenario is that zero grazing is labour intensive needing cheap family labour that is readily available. Thus "single" families may find it difficult to manage the cow.

Experience in farming, an indicator of the skills acquired, varied greatly across and between farms. The minimum years of experience was 1 while the maximum was 32 years. The experience of zero grazing farmers was low (5.3 years) compared with farmers with fenced dairy farms (13.8 years), this is because zero grazing is a relatively new production system having been introduced in Uganda in the 1980s.

Table 1. Socio-demographic characteristics of the farmers

Variable	Zero grazing	Fenced farms
Mean age (years)	47.1	46.1
(sex (%)		
Male	56.7	73.3
Female	43.3	26.7
Marital status (%)		
Married	100.0	86.6
Single	13.3	
Mean experience (years)	5.3	13.8
People in Household	8.0	8.0
Education level (%)		
No formal	20.0	20.0
Primary	26.7	33.3
Secondary	26.7	20.0
Above secondary	26.7	26.0

The results from regression analysis (Table 2) show that experience in farming was significant in zero grazing while in fenced farms it was highly correlated with milk output and was thus dropped from the model. Probably, this was because fenced dairy farms were dominated by indigenous breeds that can be reared despite the skills of the manager.

Organization of labour

Labour consisted of the family and hired labour. Family labour provides the major source of labour accounting for approximately 80% of the total labour use in dairy farming. The hired full time labour were normally males. Hired labour was used to do all the farm activities like water collection, feeding and general management. The same hired labour would be used for non-farm activities like domestic household work. These findings confirm studies by Agricultural Secretariat (1994) and World Bank/UNDP/ MFEP (1994) which concluded that in small holder farms, the family is the biggest reservoir of labour and that females are generally not hired for dairy farming in Uganda.

In zero grazing farms, female labour formed an important portion of the total labour use. For example, out of the 30 farmers who had zero grazing units, only 6.7% reported that women never help them on the farm work. In fact in zero grazing units women had the overall responsibility of managing the farm with other family members "assisting" them. Contrastingly, 47.4% of fenced dairy farms reported non-participation by women. The implication of this therefore is that zero grazing generally is a womens' affair while small holder fenced dairy farms is a males affair.

Tests were done for the difference in labour input between males and females using t-tests for the independent samples. The results in Table 3 show that there was a significant difference in the labour input between males and females. The results from the regression analysis showed that labour was significant at 5% in zero grazing farms while in fenced farms it was insignificant. This means that in zero grazing farms, a one unit change in labour expenses brings a change in milk output by approximately 62%. The above results concur with the

Table 2. Regression results of factors affecting milk production in the peri-urban areas of kampala

Variable	Zero grazing farms	Fenced farms
R Square	0.714	0.705
Adjusted R	0.655	0.662
F statistic	12.009	6.427
Significance of F	0.000	0.000
Constant (A)	4.467	1.985
MSE	0.736	0.660
Labour (Lnlab)	0.619**	0.375
	(0.027)	(0.205)
	0.263 SE	0.288SE
Investments (Lninv)	-0.501	0.184
	(0.137)	(0.158)
	0.325 SE	0.126SE
Purchased feds (Lnfeed)	0.532***	0.564
	(0.011)	(0.312)
	0.193 SE	0.175SE
Veterinary expenses(Lnvet)	Y	0.146
	(0.332)	0.148SE
Extension services	0.623	0.695
	(0.871)	(0.921)
	0.563 SE	0.612SE
Experience(Lnexp)	0.574	0.094)
	Y	0.329SE
Breed of the cow (bre)	Y	0.842***
	(0.002)	0.245 SE
Farm size (Lnfarm)	0.230	(0.127)
	Y	0.146 SE

*** 1% level of significance
** 5% level of significance
* 10 percent level of significance
Absence of asterisks indicate no significance of t-values and elasticities.
SE= standard error of individual coefficients
MSE= Mean squared error
Y = Were found to be highly correlated with milk output and were thus dropped from the model

Table 3. T-tests for independent samples of labour input

Variable	t-value	df	2-tails sig	SE of Diff
Zero grazing farms				
equal	1.93	28.0	0.064	52541.2
unequal	1.82	19.3	0.084	55647.0
Fenced farms				
equal	1.81	28.0	0.052	6242.0
unequal	1.78	20.0	0.069	6132.0

Mean female-male difference
Levens test for equality of variance:
F=0.689 P=0.413 for zero gazing farms.
F= 0.546 P=0.425 for fenced farms
Land use feeding.

findings of Muwanga (1994) who found labour to be the most significant variable influencing zero grazing production. Possibly this is because zero grazing needs a lot of labour for water collection, collecting and chopping grass, and for general cleanliness.

The total land devoted to dairying varied across and between farms. In zero grazing farms, the average farm size was about 0.5 hectare (ha) while it was approximately 0.8 ha for fenced farm (Table 4). The average farm size found sharply contrasts the findings of MAAIF (1993) which estimated the average farm size in Uganda to be 1.5 hectares. The difference, however, is attributed to the fact that MAAIF (1993) made an average for the whole country including rural areas where farm land is large while this study was conducted around the peri-urban areas of Kampala where land is scarce. Most of the farmers (86.7 and 93.3 % of zero grazing farmers and farmers with fenced dairy farms, respectively) owned their land. Less than 10% of the farmers depended on rented land.

Due to the small plots of land devoted to dairy farming coupled with poorly managed small plots of pastures and non existent use of hay and silage, dairy production in the peri-urban areas largely depends on purchased feeds. These include elephant grass (*Pennisetum purpureum*), crop residues, banana peels and dairy meal. The elephant grass may be collected from the farmers' own fodder plots, from public places like along the road sides or purchased. This was especially so with zero grazers. The results from econometric model (Table 2) show that purchased feeds were highly significant in zero grazing farms while in fenced dairy farms it was insignificant in the model. This was because in fenced dairy farms about 50% of the farmers depended on natural pastures and therefore, the use of purchased feeds was limited.

Water intake was estimated at 22.4 and 30 litres/cow/day for fenced farms and zero grazing farms, respectively. This is far below the recommended daily water intake of 70-100 litres/day/cow in tropical climate (Chamberlain, 1989; Nsubuga, 1995). There is need therefore to educate the farmers on the implications of providing inadequate water to their cows, as this affects milk production.

Production parameters

Milk output varied according to the type of breed and production system. In zero grazing production system,

Table 4. Land use and other enterprises on the sampled farms in peri-urban areas of Kampala

Variables	Zero grazing	Fenced
Mean farm size (hectares)	0.5	0.8
Enterprise of farmers (%)	100.0	93.3
With other enterprises dairying	-	6.7
Ownership of land (%) use own land	86.7	93.3
Rented land only	3.3	-
Rent and own	10.0	6.7

the average milk outputs were 17.5, 10.0, and 5.0 l/cow/day from the friesians, cross breed, and local breeds, respectively. The lactation period also varied according to the breed and was estimated at 10.4, 8.1 and 5.0 months for friesians,-crossbreeds and local breeds, respectively (Table 5). In fenced dairy farms on the other hand, average milk output per day was 9.0, 7.0, and 4.0 l/day/cow for the friesians, crosses breeds, jersey and local breeds respectively. The lactation period averaged 8.0, 7.0 and 5.0 months for friesians, cross breeds and local breeds.

The calving interval in zero grazing farms was estimated at 13.0, 14.0 and 17 months for friesians, cross breed and local breeds, respectively. In fenced farms it was estimated at 13.5, 15 and 19.0 months for the friesians, cross breed and local breeds. It can thus be deduced from these results that the difference in calving interval lies in the differences among the breeds rather than the production system. The short lactation period coupled with the long calving interval reduces the milk available per farm per year and the country generally. This also limits the multiplication of the herd size thus affecting the total herd size in the country. Therefore, if milk production is to be increased, cows with a high lactating capacity and with a short calving interval like the friesians should be popularised.

Milk consumption and distribution

At the farm level an average of 13.6 litres/day was produced in zero grazing farms out of which 3.2 litres was consumed at home (Table 6). The maximum number of litres of milk consumed at home was five and the minimum two. In fenced dairy farms on the other hand, the milk produced averaged 7.75 l/day of which 2.1 l of milk was consumed at home. The consumption averages of 3.2 l and 2.1 l/per day per household is a step towards reducing the chronic low per capita milk consumption of 0.5 l/day (World Bank/UNDP/MFEP,1991). All the milk was purchased in the neighbourhood and thus farmers did not have problems in marketing dairy products.

Access to services

The use of credit was none existent. This was probably because the targeted population was small holder dairy farmers who are resource poor, thus lack securities. Paradoxically, however, even those who got revolving funds like "Entandikwa"did not invest in dairy farming. Due to lack of resources, and non existent credit facilities, total investments were generally low (Table 7). More than 63% of the farms studied had a total investment of less than 100,000 Uganda shillings (1 US $= 1100 Ug. Shs as of March 1998), mostly for equipments. Because of the low levels of investments, there is need to encourage funding agencies to focus on dairy farming. The investment expenditure was, however insignificant in all production systems (Table 2). This is probably due to the fact that in small holder farms, capital investments are very uneconomical to establish. thus, investments were mainly for production equipments.

Insurance

There was no farm insured in the peri-urban areas of Kampala. This was attributed to lack of insurance policies

Table 6. Milk consumption and distribution

Variable	Zero grazing farms	Fenced farm
Home consumption (litres)		
Mean	3.2	2.1
Minimum	2.0	
Maximum	5.0	5.0
Milk marketing (%)		
neighborhood	76.7	70.0
nearby collecting centre	6.6	3.3
not selling any	16.7	26.7

Table 7. Investment expenditure on studied farms

Capital Investments	Zero grazing	Fenced
Amount of capital in UShs. (% of farms) less than 100,000	63.3	66.7
between 100,000 - 199,999	23.3	23.3
200,000 and above	13.4	10.0

Table 5. Production parameters on the surveyed farms

	Zero grazing farms					Fenced farms				
Variable	All	Friesians	Cross	Local breed	Other breeds	All	Friesians	Cross	Local breeds	Other breeds
No cows	75	38	25	8	4	107	3	51	48	5
Milking cows	33	18	12	2		43	2	23	17	
Milk output per day/cow	13.6	17.5	10	5		7.0	9.0	7.0	5.0	
Lactation period (months)	9.1	10.4	8.1	5		6.0	8.0	7.0	5.0	
Calving interval (months)	13.90	13	14	17		17.3	13.5	15.0	19.0	

that are tailored to the needs of small holder farmers or/ and it is considered expensive. Yet agriculture is a risky business that requires insurance. To cover against risks farmers responded by keeping local breeds and cross breeds that are considered less risky given their management levels. Others have responded by having different enterprises on their farms (mixed farming) and/or combine dairying with other forms of employment. Thus there was no specialization and this reduces efficiency.

Extension services

These are important as they increase farmers awareness and educate them on the available means of production. However, 83.3% and 76.7% of farmers with fenced dairy farms and zero grazing farms, respectively, had never received extension services. This partly explains why extension was found to be insignificant in all dairy production systems (Table 2). There is need therefore to re-focus extension services to small holder farmers who are the backbone of the economy.

Conclusion

There were a number of factors that affect dairy farming in the peri-urban areas of Kampala. The most important ones were the breed of the cow reared, purchased feeds and experience in dairy farming . Output was found to be generally low because the breeds of the cow reared were mostly cross breeds and local breeds that are low yielders. Farmers also lacked support services such as extension services, insurance and credit facilities. The family was the biggest reservoir of labour in small holder dairy farms. It is recommended that farmers should be sensitised and facilitated to rear improved breeds, if they are to increase dairy output. Secondly, this study was carried out in a short period, it is therefore recommended that a similar study should be carried out for a long period of time (three - five years), in such a study, more conclusive results can be attained.

Type of breeds reared

In zero grazing farms about 50.7% of the cows reared were friesians, 33.3% were cross breeds, 10.7% were local breeds and the rest were other breeds. In fenced dairy farms, 44.8% of the cows were local breeds, 47.7 percent were cross breeds, the friesians constituted 2.8 % while the rest were other breeds. The results from econometric model (Table 2) showed that in fenced dairy farms the breed of the cow was the most important variable affecting dairy production. A change in the breed of the cow from a local to the improved breeds brings a change in milk output by 84 percent. In zero grazing production system the breed of the cow was found to be highly correlated with milk output and was thus dropped from the model.

Acknowledgments

This study was funded by United States Agency for International Development (USAID).

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