



East Africa Dairy Development

In partnership with



COST OF MILK PRODUCTION IN UGANDA

1. INTRODUCTION

As in most East African countries, small scale producers dominate milk production in Uganda and own about 90% of the cattle population in the country, a majority of which are indigenous (FAO, 2004). Production is characterized by use of low levels of inputs, and the dairy enterprise is often not fully market oriented. For many farmers, cattle are viewed as a source of wealth and status and less as a means of production (IGAD, 2008). Various interventions have been developed by different stakeholders geared towards enhancing market orientation and even commercialization of the dairy sub-sector.

The profitability of dairy farms in the EADD project sites has not been assessed since the EADD baseline survey conducted in 2008. In the areas where EADD is providing support to producers and their associations, it was deemed important to assess the current cost of milk production for various types of dairy farmers to determine levels of profitability of the dairy enterprise. The study was therefore undertaken to

1. To assess the cost of production and the profitability of the dairy enterprise
2. To identify which cost components EADD interventions should target in order to enhance profitability of the dairy farms in EADD project sites.

2. METHODOLOGY

Purposive sampling was applied in selection of three hubs from each production system. A list of all farmers was obtained from every hub and farmers classified according to scale of operation where a random sample of seven small-scale farmers and three medium-scale farmers was drawn per hub¹. Table 1 below gives the distinction between small-scale farmers and medium-scale farmers.

Table 1: Definition of famers according to scale of operation

Scale of operation	Definition
Small-scale farmers	Small-farmers comprised of farmers owning three cows and below in the intensive production system and 15 cows and below in the extensive production system
Medium-scale farmers	Medium-scale farmers comprised of farmers owning more than four cows in the intensive system and more than fifteen cows in the extensive system

¹ This was the initial sampling procedure but due to survey limitations, it was achieved in two hubs only (Bubusi and Bbale). Buikwe had only one medium-scale farmer while Ggulama had none. Kiboga and Kinyogoga had four small-scale farmers and six medium-scale farmers each

The threshold was determined by the mean number of cows owned from the baseline survey report on dairy production and marketing (EADD 2010). Sixty farmers were interviewed as detailed in Table 2 below.

Table 2: Sample size for cost of milk production survey

	Production Systems ²		Total
	Intensive	Extensive	
Hubs per system	3	3	6
Small-scale farmers	20	19	39
Medium- scale farmer	4	17	21
Total sample size	24	36	60

Milk production

An estimate of total milk production in the last 3 months preceding the survey was conducted based on recall but using a carefully designed set of questions that capture milk production at lactation, at time of interview and the day prior to the interview. These were collected for every lactating cow to estimate milk yield using the area under the lactation. Details are provided in Annex1.

Revenue computation

Revenue was calculated as the sum of milk consumed at home, milk sales as well as cattle sales and milk given to labourers and calves. The milk sold was valued using prices from the various marketing channels and the reported price is the mean from the various market outlets for every hub. Milk consumed at home and milk given to labourers and calves was valued at the hub's price.

Cost computation

Costs consisted of variable costs, fixed costs, cattle mortalities, milk spoilage, milk provided to labourers and calves. Cattle mortalities expenses were calculated as value of the herd multiplied by 7.4% which is Uganda's mortality rate (EADD 2010) and apportioned for three months period. Fixed costs included depreciation of machines and equipment, buildings and maintenance of buildings. Variable costs comprised hired labour, feeds, animal health inputs, breeding costs, extension and milk transport. However, cattle purchases were not included in computing expenses. Details of calculations are provided in Annex 3.

Analytical procedure

Partial budget analysis was used to compute profits from different hubs. Profits are defined as the difference between all the revenues and all the costs.

Two scenarios were considered: mean revenues were computed using revenue from both milk and cattle sales generated within the last three months. The second approach was to use revenue generated from milk sales only. Profitability was compared between hubs, farmers' scales of operation and production systems Table 3. Cattle sales are infrequent and therefore comparison of

² Extensive production system is characterized by more land and less labour use, livestock mainly rely on grazing and there is little use of purchased inputs. Intensive system is characterized by cattle confinement, integration of crop and livestock and use of manufactured feeds.

profits with and without cattle sales was done to provide an insight on variation of the enterprise profitability under the two scenarios. Milk given to calves and labourers is an expense but it is also included as revenue since it is a product of the farm. Comparison of mean revenues, costs and profits was done between production systems and scales of operations where t-tests were conducted to determine whether the means are significantly different.

Table 3: Revenue and cost components included in calculations, per option

	Revenues included in calculations	Costs included in calculations
Option 1	<ol style="list-style-type: none"> 1. Milk sales 2. Milk consumed by household 3. Milk given to calves and labourers 4. Sale of animal 	Variable Costs Fixed costs Milk given to calves and labourers Milk spoilage Mortality
Option 2	<ol style="list-style-type: none"> 1. Milk sales 2. Milk consumed by household 3. Milk given to calves and labourers 	Variable Costs Fixed costs Milk given to calves and labourers Milk spoilage Mortality

Given the survey limitations, non-marketed benefits such as draught power, manure used in the farm and benefits derived from cattle as form of savings and insurance were not included in computation of revenue.

3. RESULTS ON PROFITS PER LITRE ACROSS HUBS

Table 4 presents results from Option 1 as detailed in Table 3 while Table 5 presents results from Option 2.

Profit per litre from milk and cattle revenue combined

The Option 1 analysis found when comparing means across hubs in different production systems, farmers in the three intensive production systems hubs made profits but those from two hubs in the extensive system made losses. Bbale had the highest cost of production per litre and hence the highest losses. On the other hand Kinyogoga was the best performing hub in terms of profitability (Table 3). Farmers in the intensive system were receiving higher average prices for every litre of milk. Farmers in the extensive system were receiving higher average revenues from cattle sales.

Table 4: Average total revenues and costs across hubs

UgSh. per Litre	Intensive hubs						Extensive hubs					
	Buikwe	N	Ggulama	N	Bubusi	N	Kiboga	N	Kinyogoga	N	Bbale	N
Price per litre	711	9	688.7	12	700	9	400	10	383.5	10	345	10
Milk revenue	640	10	670.3	11	606.6	10	386	10	379.6	10	350	9
Cattle revenue	197.5	10	459.2	11	189.2	10	407.5	10	1392.3	10	1148.3	10
Total revenue	837.5	10	1129.6	11	795.8	10	793.6	10	1772	10	1498.3	9
Variable cost	300	10	223.4	11	314.5	10	386.9	10	248.2	10	269.5	9
Fixed cost	19.4	10	5.1	11	10.9	10	3.3	10	0	10	5.9	9
Milk given out	5.5	10	34.4	11	0	10	5.8	10	11.8	10	4.7	9
Calf milk	112.7	10	104.7	11	126	10	96.2	10	16.6	10	74.4	9
Mortalities	126	10	100.5	11	76.1	10	372.2	10	405.8	10	1397.5	9
Milk spoilage	0	10	0	11	23.3	10	13.9	10	0	10	0	9

Production cost	563.9	10	468.3	11	550.9	10	878.4	10	682.6	10	1752.2	9
Profit per litre	273.5	10	661.2	11	244.9	10	-84.8	10	1089.3	10	-253.9	9

Profit per litre from milk revenue only

Farmers from the extensive production system hubs incurred losses when revenue was considered from milk sales only (Option 2), as seen on Table 5. This is an indication of the significant contribution of cattle sales to profitability of dairy enterprise in these three hubs.

Profit per litre in the intensive system also reduced drastically when revenue from cattle sales was not included although they remained positive. This indicates that farmers across the hubs are generating significant revenue from cattle sales to supplement milk sales in order to achieve profitability. This underlines the fact that in dairy systems milk sales should never be considered the sole source of revenue: sales of animals play a central role in profitability of any dairy production system. The breakdown of the production costs in Table 5 can be found in Table 4.

Table 5: Average milk revenues and costs across hubs

UgSh. per Litre	Intensive hubs						Extensive hubs					
	Buikwe	N	Ggulama	N	Bubusi	N	Kiboga	N	Kinyogoga	N	Bbale	N
Milk revenue	640	10	670	11	606.6	10	386	10	379.6	10	350	9
Production cost	563.9	10	468.3	11	550.9	10	878.4	10	682.6	10	1752.2	9
Profit per litre	76	10	201.9	11	55.7	10	-492.3	10	-303	10	-1402.2	9

Percentage contribution of milk and cattle sales to dairy enterprise

Figure 1 below shows the distribution of cattle and milk revenues across the hubs. On average revenue from milk sales is higher in the intensive system than in the extensive system, partly due to higher prices received. Average revenue from cattle sales per litre is higher in the extensive system.

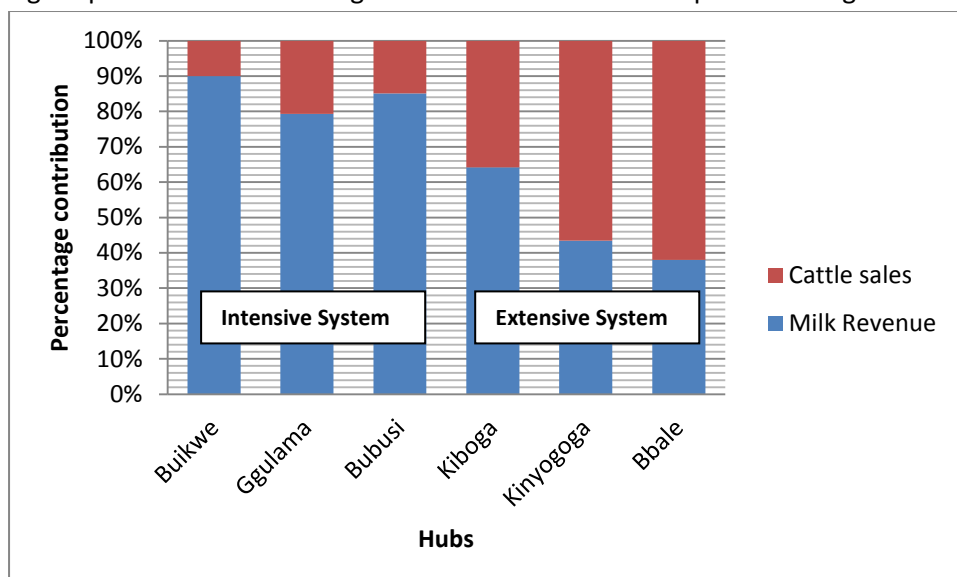


Figure 1: Percent contribution of cattle sales and milk sales across hubs

4. COMPARISON OF PROFITS BETWEEN DIFFERENT TYPES OF FARMERS AND PRODUCTION SYSTEMS

a. Comparison of revenue, costs and profits between the small-scale and medium-scale farmers

Revenues

There was no significant difference in total revenues between small and medium scale farmers; however, small scale farmers achieve significantly higher milk sale revenues than the medium scale farmers. On the other hand medium-scale farmers were making higher revenue from cattle sales as seen on Table 6.

Costs

The medium-scale farmers were incurring significantly higher total cost per litre produced than the small-scale farmers; this is mainly driven by high mortality costs that they are incurring. Medium-scale farmers were also incurring higher variable costs. There was however no significant difference in costs emanating from fixed costs, milk given to labourers, calves and milk spoilage (Table 6).

Profits

Small scale farmers were making higher profits, when considering revenues from both milk and cattle sale (Option 1 in Table 3). They also made higher profits when revenue was considered from milk sales only (Option 2 in Table 3).

Table 6: Mean Revenue, Costs and Profits in medium and small-scale farms

UgSh. per litre	Small-scale	N	Medium-scale	N	T-test
Consumed milk	106.4	37	68	21	-1.8368*
Milk sales	351.8	37	260.5	21	-1.9641*
Total Milk revenue	556.9	37	439.9	21	-2.4936**
Cattle revenue	436.7	37	910.4	21	1.8451*
Total Revenue	993.6	37	1350.4	21	1.3234
Variable cost	222.4	37	387.2	21	2.9443***
Fixed cost	8	37	4.4	21	-1.6382
Milk given out	13.8	37	6.6	21	-0.9991
Milk to calves	84.8	37	104.6	21	0.7626
Milk spoilage	9.9	37	0.3	21	1.0073
Mortalities	142.7	37	852.3	21	5.0198***
Total Cost	481.2	37	1355.7	21	2.4154**
Profit from milk only ³	75	37	-915.7	21	-5.5358***
Total Profit ⁴	511.7	37	-5.2	21	-1.8148*

b. Comparison of revenue, costs and profits between the Intensive and extensive production systems

Revenues

³ Revenues used in calculation do not include cattle sales

⁴ Revenues used in calculation include sale of milk and cattle

Farmers from the extensive production system were generating significantly higher total revenues when both milk and cattle sales were combined. They were also generating higher revenues from cattle sales than those from intensive system. However, farmers from the intensive system were generating higher revenue from milk sales than their counterparts from extensive system indicating the importance of milk revenue among the intensive system farmers and cattle sales revenue among the extensive system farmers Table 7.

Costs

Farmers from the extensive production system were incurring higher total cost per litre than those from the intensive system. Mortalities contributed the highest proportion of cost per litre in the extensive system. Nevertheless, farmers from the intensive production system were incurring higher fixed costs per litre than those from extensive system Table 6. There was however no significant difference among the farmers on expenses emanating from milk given to labourers, calves and milk spoilage.

Profits

Farmers from intensive production system were making higher profits, when considering revenues from milk sales only (Option 2 in Table 3). However there was no difference in profitability when revenue was considered from both milk and cattle sales (Option 1 in Table 3).

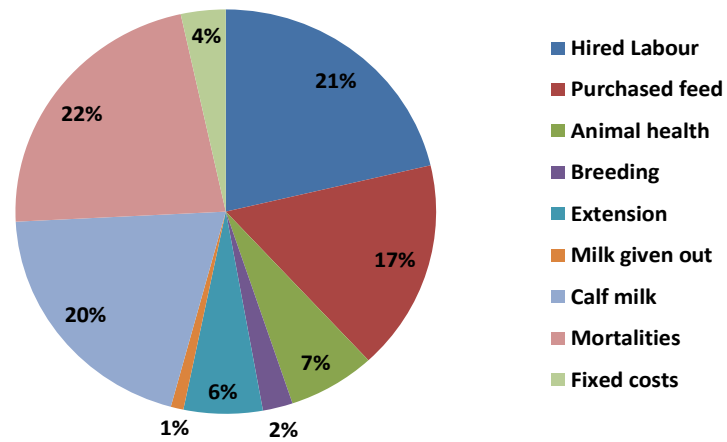
Table 7: Mean revenue, costs and profits without mortalities in intensive and extensive system

UgSh per litre	Intensive	N	Extensive	N	T-test
Consumed milk	96.1	23	90.1	35	-0.2866
Milk sales	405.4	23	261.8	35	-3.3281***
Total Milk revenue	643.9	23	429.5	35	-5.4604***
Cattle revenue	209	24	870.5	35	2.5137**
Total Revenue	853.2	23	1300.1	35	1.7049*
Variable cost	286.9	23	278.9	35	-0.1354
Fixed cost	12.7	23	2.7	35	-5.5114***
Milk given out	9.3	23	12.5	35	0.4416
Milk to calves	133	23	65.1	35	-2.8301
Milk spoilage	10.1	23	3.9	35	-0.6532
Mortalities	91.3	23	602.2	35	3.1580***
Total cost	543.6	23	965.6	35	2.2361**
Milk Profit only	100.3	23	-536	35	-3.1580***
Total Profit	309.4	23	334.5	35	0.0872

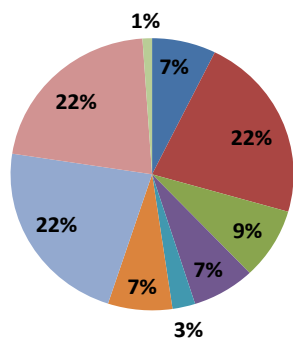
5 DISTRIBUTION OF COSTS BY HUB

5.1 Distribution of Costs in intensive production system hubs

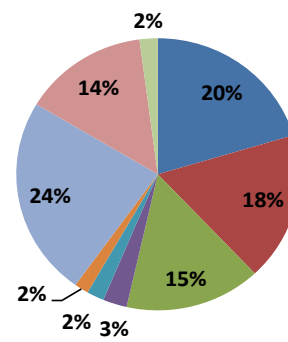
Calf milk, Mortalities, hired labour and purchased feeds were the major drivers of cost in the intensive production hubs Figure 2. These are the components that should be a high priority for project interventions. Mortalities can be feasibly reduced by improved management while expenses relating to feeds could be reduced through utilization of locally available resources. Expenditure on calf milk shows that farmers are not compromising the health of calves but optimal use of calf rations could assist in reducing this cost component.



Distribution of cost per litre in Buikwe



Distribution of cost per litre in Ggulama



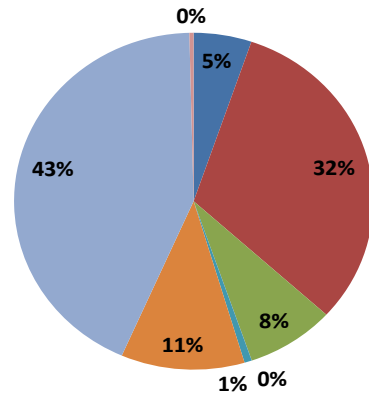
Distribution of cost per litre in Bubusi

Figure 2: Distribution of cost per litre in Intensive systems hubs

5.2 Distribution of Costs in extensive production system hubs

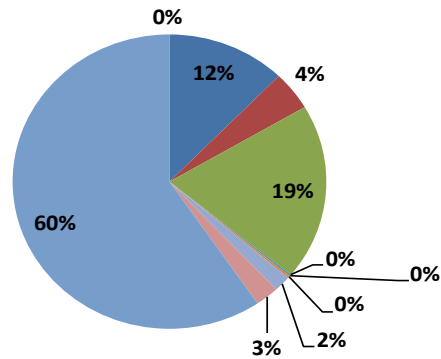
Mortalities cost came out as the major cost driver in the extensive production system hubs accounting for 43%, 60% and 80% in Kiboga, Kinyogoga and Bbale respectively. Purchased feeds, animal health and hired labour were also significant costs in Kiboga, Kinyogoga and Bbale.

The project should thus design intervention geared towards reducing costs related to mortalities in all hubs and purchased feeds in Kiboga. This could be through improved management practices and better utilization of available feed resources.

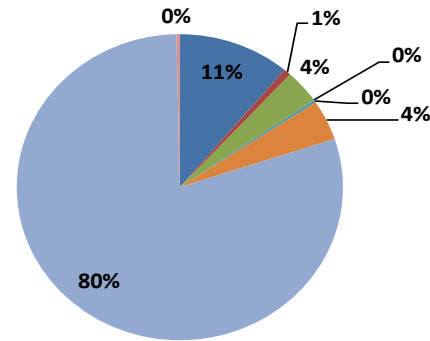


- Hired Labour
- Purchased feed
- Animal health
- Transport
- Milk given out
- Calf milk
- Mortalities
- Fixed costs

Distribution of cost per litre in Kiboga



Distribution of cost per litre in Kinyogoga



Distribution of cost per litre in Bbale

Figure 3: Distribution of cost per litre in extensive systems hubs

Conclusion

The study showed that the cost of production was higher among the medium-scale farmers and also in the extensive production hubs. This was mainly driven by mortalities which was the leading cost component in all hubs except in Bubusi. From the baseline survey, East Coast Fever, Anaplasmosis, Foot and Mouth Disease and Trypanosomosis were the most common causes of cattle deaths in Uganda (EADD 2010). An innovative solution should be developed to improve the capacity of both farmers and hubs to reduce this risk, as well as explore ways to better link to animal health service providers, both private and public.

Cost of feed was found to be a major component especially in the intensive production system. Therefore there should be accelerated efforts to assist farmers to make better use of their own resources to produce increased quality and quantity of feeds, so as to reduce reliance on purchased feeds. Farmers are feeding calves with significant amount of milk especially in the intensive system hubs but this need to be encouraged in the extensive system too. Use of calf rations could assist farmers reduce this cost component.

Cattle sales were seen to play a major role in enhancing profitability especially among the medium-scale farmers and those from the extensive system. The best performing hub (Kinyogoga) was generating the highest revenue from cattle sales. Small-scale farmers and those from the intensive system were generating more revenue from milk sales. This calls for the project to devise ways to enhance productivity per animal especially in the extensive production system.

Annex1: Three months milk yield estimation

Milk Yield Calculation;

A regression was done for milk production levels the day preceding the survey and at calving against time, for the different breeds. Lactating cows were grouped into two categories per breed;

- Those whose current lactation length is greater or equal to three months
- Those whose current lactation length is less than three months

The area under the lactation curve was calculated for these categories to get three months milk yield estimates.

Annex 2: Revenue and cost components included in calculations, per option

	Revenues included in calculations	Costs included in calculations
Option 1	<ul style="list-style-type: none"> 5. Milk sales 6. Milk consumed by household 7. Milk given to calves and labourers 8. Sale of animal 	<ul style="list-style-type: none"> Variable Costs Fixed costs Milk given to calves and labourers Milk spoilage Mortality
Option 2	<ul style="list-style-type: none"> 4. Milk sales 5. Milk consumed by household 6. Milk given to calves and labourers 	<ul style="list-style-type: none"> Variable Costs Fixed costs Milk given to calves and labourers Milk spoilage Mortality

Annex 3: Three months total cost computation

Cost	Components
Variable costs	Hired Labour <ul style="list-style-type: none"> • Casual wage • Monthly wage
	Purchased Feeds <ul style="list-style-type: none"> • Purchased fodder/forage • Concentrates • Minerals • Water
	Animal health <ul style="list-style-type: none"> • Deworming • Vaccination • Tick control • Curative treatments • Milking salve • Teat disinfection • dehorning
	Breeding <ul style="list-style-type: none"> • AI and Bull services
Fixed costs	Depreciation <ul style="list-style-type: none"> • Machines • Equipment and tools • Buildings

	<ul style="list-style-type: none"> • Other structures
	Maintenance <ul style="list-style-type: none"> • Buildings • Other structures
Other costs	<ul style="list-style-type: none"> ➤ Milk spoilage ➤ Milk given to labourers ➤ Milk given to calves ➤ Cattle mortality

Annex 4: Average variable, fixed and other costs per litre in hubs

	Intensive						Extensive					
	BUIKWE		GGULAMA		BUBUSI		KIBOGA		KINYOGOGA		BBALE	
Cost per litre	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Hired Labour	120.2	9	34.2	11	108.2	10	45.1	10	83.7	10	194.4	9
Purchased feed	94.8	9	103.5	11	93.6	10	272.6	10	29.2	10	12.8	9
Animal health	37.9	9	39.6	11	82.7	10	69	10	132	10	61.8	9
Breeding	13	9	33.6	11	14.6	10	0	10	0	10	0	9
Extension	34.2	9	0	11	10.5	10	0	10	1.3	10	0	9
Transport	0	9	12.2	11	8.6	10	0.06	10	1.7	10	0.3	9
Milk given out	5.5	9	34.4	11	0	10	5.8	10	11.8	10	4.7	9
Calf milk	112.7	9	104.7	11	126	10	96.2	10	16.6	10	74.4	9
Mortalities	126	10	100.5	11	76.1		372.2	10	405.8	10	1397	9
Fixed costs	19.4	9	5.1	11	11	10	3.3	10	0	10	5.9	9

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