



East Africa Dairy Development

In partnership with



COST OF MILK PRODUCTION IN UGANDA-ROUND 2 (2012)

1. INTRODUCTION

In line with the monitoring and evaluation of the impacts of the East Africa Dairy Development Project (EADD) on farm level production in different seasons, a series of farm level surveys were carried out in selected sites of each project country. The first round of the survey in Uganda was conducted in July 2011. The results showed that costs of dairy production at that time were higher among the medium-scale farmers and also in the extensive production hubs (Table 1 and Table 2). Mortality of animals was a main contributor to the high cost of production. Other important cost components in various hubs included milk to calves and hired labour (EADD 2011).

Table 1: Mean Revenue, Costs and Profits in medium and small-scale farms in 2011

UgSh. per litre	Small-scale	N	Medium-scale	N	Significance
Total Milk revenue	556.9	37	439.9	21	**
Cattle revenue	436.7	37	910.4	21	*
Total Revenue	993.6	37	1350.4	21	ns
Total Cost	481.2	37	1355.7	21	**
Profit from milk only ¹	75	37	-915.7	21	***
Total Profit ²	511.7	37	-5.2	21	*

Table 2: Mean Revenue, Costs and Profits in intensive and extensive system in 2011

UgSh per litre	Intensive	N	Extensive	N	Significance
Total Milk revenue	643.9	23	429.5	35	***
Cattle revenue	209	24	870.5	35	**
Total Revenue	853.2	23	1300.1	35	*
Total cost	543.6	23	965.6	35	**
Profit for milk only	100.3	23	-536	35	***
Total Profit	309.4	23	334.5	35	ns

*** significant at 1%; ** significant at 5%; * significant at 10%; ns-not significant

The second round of the monitoring of costs of milk production was conducted in the month of September 2012 in the same sites as the first round. The monitoring aimed to:

1. Assess the costs of production and profitability of the dairy enterprise in 2012
2. Identify interventions that the EADD should target in order to enhance profitability of dairy farming in the project countries

¹ Revenues used in calculation do not include cattle sales

² Revenues used in calculation include sale of milk and cattle

2. METHODOLOGY

The six project sites selected during the first round of the survey were used. Farming practiced in three of the sites was mainly intensive, while that in the other three sites was mainly extensive. Most of the farmers sampled in the first round of the survey were interviewed in the second round. In the few cases where farmers who participated in the first round were not available, replacement farmers within the vicinity and under similar farming conditions were requested to provide information for the survey. Small-scale farmers comprised those owning less than three cows in the intensive production systems and those owning less than 15 cows in the extensive production systems. Medium-scale farmers comprised those owning more than four cows in the intensive system and more than fifteen cows in the extensive system³. A total of sixty farmers were interviewed; twenty-seven from mainly intensive systems and thirty-three from mainly extensive systems (Table 3).

Table 3: Sample size for cost of milk production survey

	Production Systems ⁴		Total
	Mainly Intensive	Mainly Extensive	
Hubs per system	3	3	6
Small-scale farmers	22	8	30
Medium- scale farmer	5	25	30
Total sample size	27	33	60

Milk production

An estimate of total milk production 3 months preceding the survey was obtained based on farmer recall using a carefully designed set of questions that captured milk production immediately after calving, and the milk production on the day prior to the interview. These were collected for every lactating cow at the time of the survey to estimate milk yield using the area under the lactation curve. Details of this calculation are provided in Annex 1.

Revenue computation

Two different scenarios were considered in calculating revenues, one which included revenue from the sale of the animal, and one in which this was not a factor. These are presented in Table 4. In the scenario that included cattle sales, an attempt was made to provide some insight into the effects of animal prices on profitability. It should be noted that cattle sales are infrequent, hence the scenario with sale of animals occurs less frequently. Milk given to calves and labourers was included as both an expense and revenue since it is a product of the farm. Milk sales were valued using prices from the corresponding marketing channels in a project site. The price reported for the hub was obtained as the mean price from the various market outlets in every hub. Milk consumed at home and milk given to labourers and to calves was valued at the same price as that of the nearest hub.

³ Threshold was determined by mean cows owned from baseline survey (EADD 2010b)

⁴ 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.

Table 4: Revenue and cost components included in calculations, per scenario

	Revenues included in calculations	Costs included in calculations
Scenario 1	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
Scenario 2	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

Information on non-market benefits such as draught power, manure used in the farm and benefits derived from cattle as a form of savings and insurance were not collated in the survey, hence were not included in computation of revenue.

Cost computation

Costs included in the analyses for the two different scenarios are presented in Table 4. To determine costs resulting from mortality within herds, the farmers were requested to provide information on the number of animals within different age classes that had died on their farms over the last six months. The proportionate mortality within the different animal categories is presented in table 5.

Table 5: Percent mortality for different categories of animals over the period of study within all sites

Animal Type	Mortality rate
Bull>3yrs	16.4%
Castrated males >3yrs	3.3%
Immature males	8.3%
Dry Cows	2.2%
Lactating cows	2.2%
Heifers	4.2%
Male calves	14.9%
Female calves	10.2%

The highest mortality within the period studied was among bulls (16.4%). Mortality of both male and female calves was also high (>10%). The cost of mortality was calculated using the mortality rate and the market price for each animal type within the different sites. Information on these prices was provided within the questionnaire. The total cost of mortality within a site was then calculated as the sum of the mortality costs over all animal types within the site. The cost of mortality per litre of

milk produced was obtained by dividing the total cost of mortality by the total milk production over the last three months.

Fixed costs included depreciation of machines, equipment, buildings, other cattle enterprise structures and their maintenance. Variable costs comprised of hired labour, feeds, animal health inputs, breeding costs, extension and milk transport. Cattle purchases were not included in computing expenses. Details of calculations are provided in Annex 2.

Analytical procedure

Profits for the two scenarios presented in Table 4 were calculated as the difference between the revenues and the costs using partial budget analysis. Profitability was compared between hubs, farmers' scale of operation and production systems. Comparison of mean revenues, costs and profits was done between production systems and scales of operations using t-tests and anova to determine whether the means were significantly different. Descriptive statistics were used to show distribution of revenues, costs and profits across hubs.

3. RESULTS ON PROFITS PER LITRE ACROSS HUBS

Table 6 presents results from scenario 1 as detailed in Table 4 while Table 7 presents results from scenario 2.

Profit per litre from milk and cattle revenue combined

Under the first Scenario, farmers in half of the hubs (Buikwe, Ggulama and Kiboga) made profit per litre of milk produced (Table 6). The greatest contributor to the lower returns from the dairies was the high rate of mortality reported by the farmers in all the hubs. This was different from the first round of the survey as at that time the farmers were not requested to quantify the mortality. The highest costs resulting from mortality were incurred by farmers in Bbale (Ush 2570, Table 6).

In this round of the study, farmers in Kiboga received the highest revenue and overall profit from their dairy enterprise. As in the first round of the survey, farmers using the more intensive system of production received higher average prices for every litre of milk (milk revenue, Table 6), while farmers in the extensive system received higher average revenues from cattle sales. The sale of manure was only noted in Bukwe and Bubusi hubs (Table 6). It was evident that farmers generate considerable revenue from sales of cattle.

Table 6: 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	768.2	10	796.4	8	733.3	10	550	10	400	9	458.3	9
Milk revenue	660.6	10	675.6	8	710.3	10	516.3	10	218.5	9	466.2	9
Cattle revenue	477.9	10	59.5	8	171.4	10	2252	10	415.1	9	1689.7	9
Manure revenue	25	10	0	8	5.6	10	0	10	0	9	0	9
Total revenue	1164	10	735	8	887	10	2768	10	634	9	2156	9
Variable cost	430.4	10	214.8	8	497.7	10	565.3	10	267.6	9	559.6	9
Fixed cost	15.6	10	7.6	8	27.7	10	3.2	10	0	9	68.9	9
Milk given out	5.2	10	29.6	8	31.1	10	1.9	10	1.1	9	0	9
Calf milk	33.1	10	59	8	26.2	10	0	10	0	9	0	9
Mortalities	285.5	10	171.8	8	357	10	888	10	532	9	2570	9
Milk spoilage	0	10	0	8	0	10	28.7	10	181.5	9	0	9
Production cost	770	10	483	8	940	10	1487	10	982	9	3199	9
Profit per litre	394	10	252	8	-53	10	1281	10	-348	9	-1043	9

Profit per litre from milk revenue only

In all the hubs, profits were much lower when revenue calculated did not include that from sale of animals (Table 7). Farmers rearing animals under both intensive and extensive production systems incurred losses when revenue was considered as that from milk sales without taking into account animal sales. It was only in Ggulama hub that farmers made profits from revenue generated only through sale of milk. This result indicates the importance of cattle sales to profitability of dairy enterprises in Uganda.

Table 7: 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	660.6	10	675.6	8	710.3	10	516.3	10	218.5	9	466.2	9
Production cost*	770	10	483	8	940	10	1487	10	982	9	3199	9
Profit per litre	-109.4	10	192.6	8	-229.7	10	-970.7	10	-763.5	9	-2733	9

* Production costs are same as those from Table 6

Percentage contribution of milk and cattle sales to dairy enterprise

The proportional contribution of revenue from the sale of cattle to the dairy enterprise relative to that from milk sales is presented in Figure 1. Farmers in extensive production systems made relatively more income from cattle sales than from sales of milk, while farmers in more intensive production systems made relatively more revenue from the sale of milk than from the sale of animals.

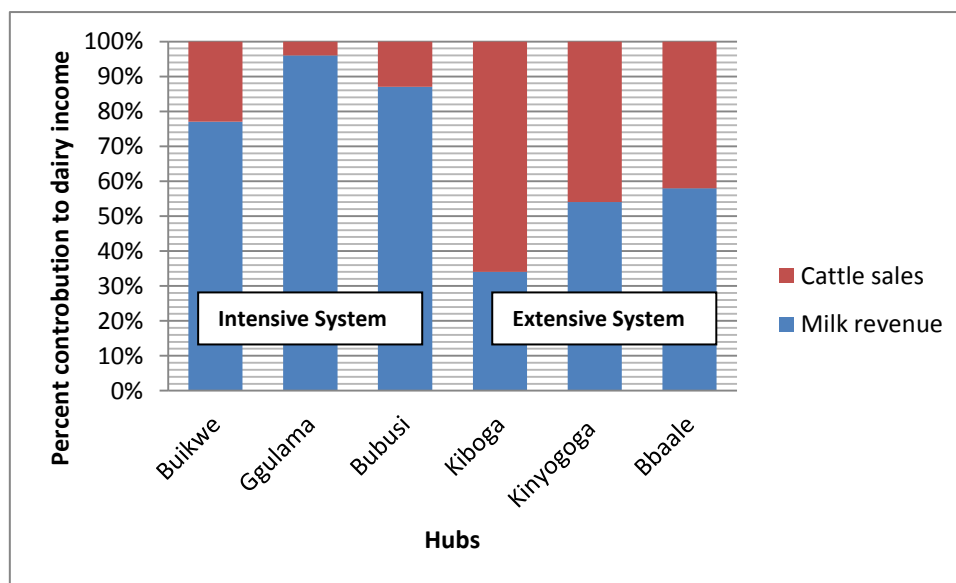


Figure 1: Percent contribution of cattle sales and milk sales across hubs

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

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

Revenues

Differences in revenue due to scale of farming operation are presented in Table 8. Small scale farmers made more revenue from milk than the medium scale farmers (Milk sales, $p < .01$). Though the farmers also generated some revenue from the sale of manure, this was relatively low and not significantly different between small and medium scale farmers (Table 8). Although revenues from sales of cattle between the two systems were different, not all farmers in the two systems sold animals. Farmers practicing medium scale production however obtained higher revenues from sales of animals than small scale farmers.

Costs

The medium-scale farmers incurred higher total costs per litre of milk produced than the small-scale farmers (Table 8). This was mainly due to significantly higher costs of milk spoilage, and higher

mortality costs within these systems ($p < 0.01$). Small scale farmers on the other hand incurred higher cost from milk given to calves ($P < 0.05$).

Profits

In this round of the survey, under both Small scale and medium scale operations, the farmers made losses when profit was calculated using revenues from milk sales only (Table 8). The loss was higher for medium scale farmers. However, when profits were calculated using combined revenue from milk and cattle sales, small scale farmers generated some profit, however medium scale farmers still made an overall loss in their dairy enterprise (Table 8).

Table 8: Mean Revenue, Costs and Profits in medium and small-scale farms

Item in UgSh per litre	Small scale	N	Medium Scale	N	T-test
Consumed milk	106.4	28	69.2	28	1.7349*
Milk sales	493.6	28	357.3	28	2.8204***
Total Milk revenue	641.5	28	445.6	28	3.9677***
Cattle revenue	599.2	28	1130.5	28	1.2184
Manure revenue	9.8	28	1.1	28	-1.3754
Total Revenue	1250.5	28	1577.2	28	0.7449
Variable cost	432.9	28	427.7	28	-0.0662
Fixed cost	21.5	28	19.3	28	-0.2153
Milk given out	8.4	28	14	28	0.4552
Milk to calves	33	28	5	28	2.2512**
Milk spoilage	0	28	68.6	28	3.5141***
Mortalities	466.6	28	1126.4	28	1.8108
Total Cost	962.6	28	1661.1	28	1.7029
Profit from milk only ⁵	-321.1	28	-1215.5	28	-2.1665
Total Profit ⁶	287.8	28	-83.9	28	-1.0864

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

Revenues

Farmers from the extensive production system generated significantly higher total revenues when both milk and cattle sales were considered ($p < 0.05$, Table 9). Within these systems, the farmers also generated higher revenues from cattle sales than farmers operating intensive production ($p < 0.01$). In contrast, farmers from the intensive systems generated higher revenue from milk sales ($p < 0.01$, Table 9), demonstrating the important role played by milk sales among the intensive system farmers and that of cattle sales among the extensive system farmers in enhancing profitability of the dairy enterprise.

Costs

Farmers from the extensive production system incurred higher total cost per litre than those from the intensive system ($p < 0.05$, Table 9). A main contributor to the costs in these systems was a high cost of mortality ($p < 0.01$) and milk spoilage ($p < 0.01$). In contrast, farmers from the intensive

⁵ Revenues used in calculation do not include cattle sales

⁶ Revenues used in calculation include sale of milk and cattle

production system incurred higher costs from milk given to labourers ($p < 0.1$) and to calves ($p < 0.01$, Table 9).

Profits

Farmers from both intensive and extensive production systems made losses when considering revenues from milk sales only ($p < 0.01$, Table 9). This was a result of the high costs of mortality reported in both systems. When revenue was considered from both milk and cattle sales, farmers operating more intensive production made a profit, while those operating extensive production made losses. The loss made was however significantly lower than that made when only revenue from milk was considered Table 9.

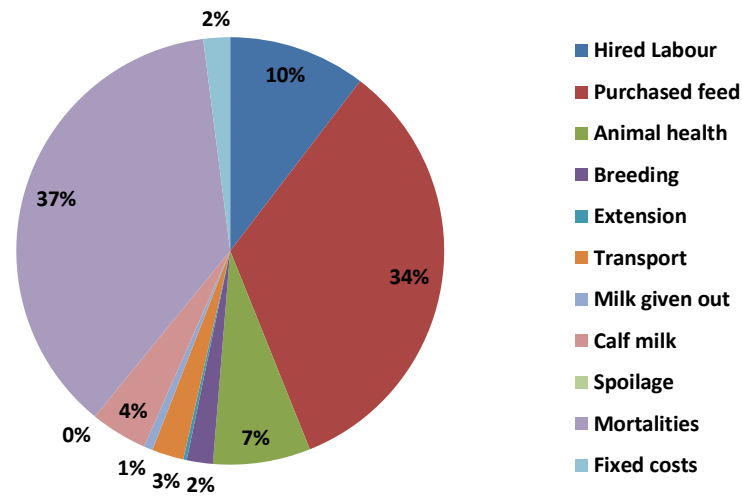
Table 9: Mean revenue, costs and profits in intensive and extensive system

Item in UgSh per litre	Mainly intensive	N	Mainly extensive	N	T-test
Consumed milk	79.8	25	94.3	31	0.6917
Milk sales	530.1	25	341	31	4.166***
Total Milk revenue	676.5	25	436.3	31	5.2436***
Cattle revenue	278.7	25	1337.5	31	2.7681***
Manure revenue	12.2	25	0	31	-1.7581
Total Revenue	967.5	25	1773.8	31	2.0557**
Variable cost	388.8	25	463.8	31	0.9765
Fixed cost	19.5	25	21.3	31	0.1902
Milk given out	24	25	1	31	1.7293*
Milk to calves	42.6	25	0	31	3.2492***
Milk spoilage	0	25	62	31	3.445***
Mortalities	250.6	25	1236.8	31	2.7959***
Total Cost	725.5	25	1784.9	31	2.6601**
Profit from milk only	-48.9	25	-1348.5	31	-3.2892***
Total Profit	242	25	-11	31	-0.7306

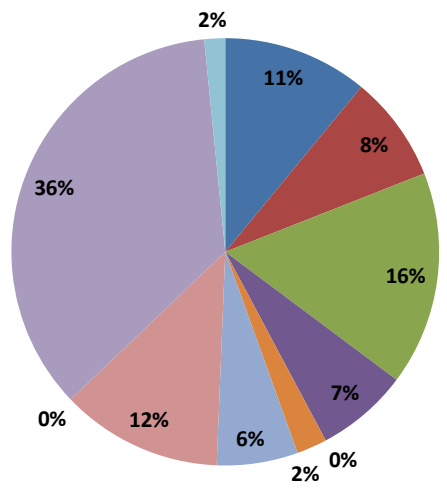
5 DISTRIBUTION OF COSTS BY HUB

5.1 Distribution of costs in intensive production system hubs

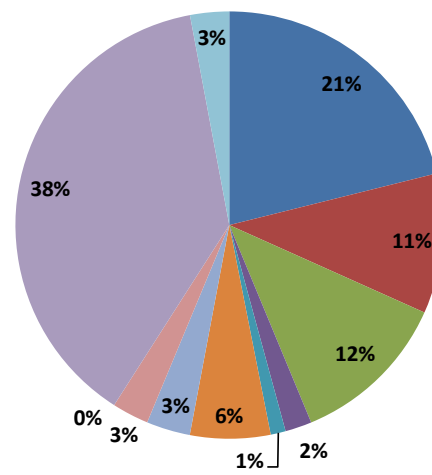
The proportional contribution of various components to the costs of dairy production within the different hubs where farmers practiced intensive production are presented in Figure 2. Within these hubs, mortalities, purchased feeds, hired Labour, animal health and calf milk were the major drivers of cost. Within these systems, the EADD project team needs to focus its efforts towards reducing these cost components when devising interventions to reduce cost of producing milk. Interventions that EADD is undertaking to improve feeding practices should be scaled out. Improved animal health practices also need to be emphasized to reduce expenses related to mortalities. Interventions to improve calf management also need to be scaled out to other project areas so as to reduce the cost that farmers are incurring on calf feeding.



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 system hubs

5.2 Distribution of costs in extensive production system hubs

The proportional contribution of various factors to the costs of dairy production within the different hubs where farmers practiced more extensive production are presented in Figure 3. In these systems, high mortality rates are a major contributor to costs in all the hubs. Additionally, Hired labour, animal health and milk spoilage also reduced farmers' profits.

Interventions to reduce mortality costs should be employed in all hubs. Better milk handling practices should also be emphasized in Kiboga and Kinyogoga to reduce losses from milk spoilage.

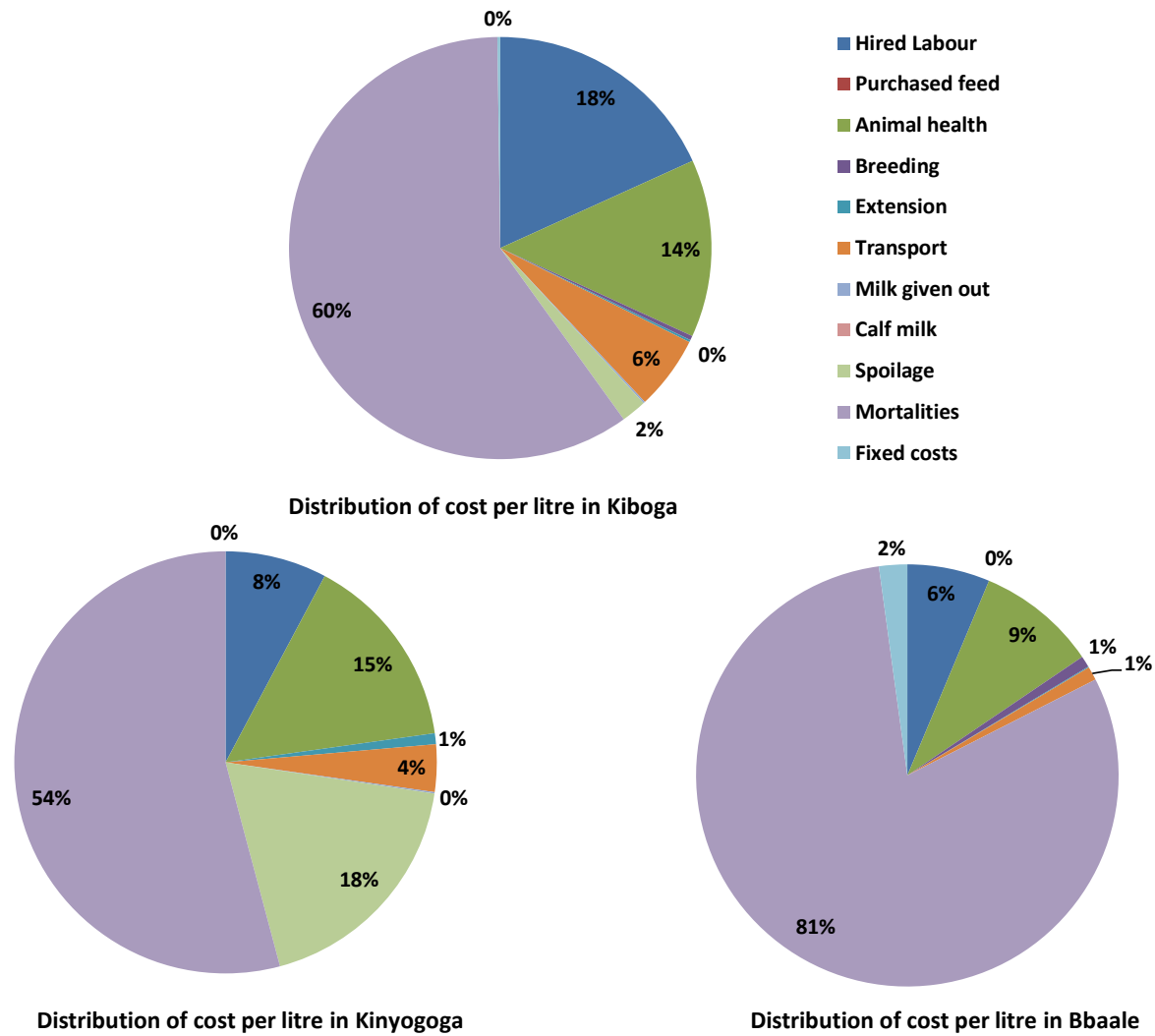


Figure 3: Distribution of cost per litre in extensive system hubs

Conclusion

The study showed that the cost of milk production was higher among the medium-scale farmers and also in the extensive production hubs similar to the findings from the first round of the survey. A major contributor to the costs of production was a high animal mortality rate. The project needs to fast-track efforts geared towards management of animals at different stages of growth, and improvement of animal health in order to reduce cattle mortalities. Both access to animal health services and capacity development of producers in areas of management and health are critical.

Strategies that EADD is implementing to improve feeding practices and avail feeds during dry seasons by utilizing the wet season surplus should be promoted in all hubs to assist farmers cut down on cost of feed and reduce fluctuations in feed availability on the farms. Likewise, interventions geared towards improvement of calf management and feeding need to be scaled out so as to reduce the cost that farmers are incurring on calf milk especially in intensive production system where demand for milk is high and farmers could be tempted to underfeed the calves. In select hubs, milk handling needs to be improved in order to reduce its spoilage.

Cattle sales played a major role in enhancing revenue especially among the medium-scale farmers and for those practicing more extensive production. Conversely, revenue generated from milk sales was higher among small-scale farmers and those practicing the intensive production. Information on the actual productivity per individual animal within all the systems would assist in determining where the greatest interventions are required in both intensive and more extensive systems in order to improve profitability of dairy production and improve household incomes in the targeted populations.

The difference in results on costs of production from the second round of the survey relative to the first demonstrate annual variations in revenues and costs of raising dairy animals within the different areas of the country.

References

East Africa Dairy Development Project (EADD), Livestock Disease Challenges and Gaps in Animal Health Service Delivery, June, 2010.

East Africa Dairy Development Project (EADD), Dairy Production and Marketing, March, 2010.

East Africa Dairy Development Project (EADD), Cost of Milk Production, November, 2011.

Annex 1: Sample size by hub

Hub	System	Small scale	Medium scale	Total
Buikwe	Intensive	6	2	8
	Extensive	2	0	2
Ggulama	Intensive	10	0	10
	Extensive	0	0	0
Bubusi	Intensive	6	3	9
	Extensive	1	0	1
Kiboga	Extensive	3	7	10
Kinyogoga	Extensive	1	9	10
Bbaale	Extensive	1	9	10

Annex 2: 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 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	N	Ggulama	N	Bubusi	N	Kiboga	N	Kinyogoga	N	Bbaale	N
Hired Labour	80	10	53	8	198.3	10	271	10	76.4	9	202.2	9
Purchased feed	258.3	10	38.9	8	99.6	10	0	10	0	10	0	9
Animal health	56.7	10	78.2	8	113.1	10	202.7	10	147.4	9	294	9
Breeding	15.2	10	33.8	8	18.9	10	5	10	0	9	27.7	9
Extension	2	10	0	8	10.7	10	2.5	10	8.2	9	2.3	9
Transport	18.5	10	11.1	8	57	10	84.1	10	35.6	9	33.3	9
Milk given out	5.2	10	29.6	8	31.1	10	1.9	10	1.1	9	0	9
Calf milk	33.1	10	59	8	26.1	10	0	10	0	9	0	9
Spoilage	0	10	0	8	0	10	28.7		181.5	9	0	9
Mortalities	285	10	171.8	8	357	10	888.4	10	531.7	9	2570	9
Fixed costs	15.6	10	7.6	8	27.7	10	3.2	10	0	9	69	9