

FAO ACTION PROGRAMME FOR THE PREVENTION OF FOOD LOSSES

**Milk and dairy products, post-harvest losses and food safety in sub-Saharan
Africa and the Near East**

**TYPES, LEVELS AND CAUSES OF POST-HARVEST MILK AND DAIRY
LOSSES IN SUB-SAHARAN AFRICA AND THE NEAR EAST**

Phase One Synthesis Report
by Tezira Lore, Amos Omore and Steve Staal

International Livestock Research Institute, Nairobi

January 2004

SUMMARY

The following report synthesizes and highlights the types, causes and levels of post-harvest milk and dairy product losses in Ethiopia, Kenya, Syria, Tanzania and Uganda, based on national study documents submitted by consultants from the respective countries. The dairy industry strengths, weaknesses, opportunities and threats in each country are also discussed. Based on these, recommendations on the next steps have been suggested.

1. COUNTRY DAIRY SYSTEM DESCRIPTIONS

Following is a brief description, based on the country level reports, of the key features of each country dairy industry. Table 1 provides information on national cattle populations, milk production estimates and consumption per capita as liquid milk equivalent (LME).

Ethiopia

In addition to fresh and fermented milk, traditional Ethiopian dairy products include significant proportion of butter, cottage cheese (*ayib*) and ghee, in which feature Ethiopia differs significantly from other East African countries. Per capita milk consumption is, however, relatively low (14 litres per annum) compared with that of some neighbouring countries such as Sudan and Kenya. The informal sector dominates the dairy marketing, mostly by direct sales to consumers, and although reported at 80%, is likely to be actually much larger. The formal sector comprises only two large milk processors, along with some smaller actors. Traditional butter making and other processing technologies are potential avenues of increasing milk storage life and minimizing losses, a unique opportunity in this region due to strong demand for processed products.

Kenya

Kenya's per capita milk consumption is comparatively very high, mainly in form of liquid milk. Annual per capita consumption of marketed milk in 1990 was estimated at 125 kg and 19 kg in urban and rural areas, respectively. However, a recent study indicates a reversal of this trend, with more milk being consumed in rural-producing areas. Overall consumption levels are among the highest globally of any low-income developing country, and Kenyan households spend some 18% of their total income on milk and dairy products. The informal raw milk sector has grown since the late 1980's and now represents 86% of all milk sold. The formal milk market consists of 30 processors, though the four largest command 80% of the formal market share. There is very low demand for any products besides liquid and soured milk. In terms of growth, population of dairy cattle, which is by far the largest herd in Africa and in terms of levels of milk consumption, Kenya can be regarded as a dairy success story.

Syria

Because of geographic and cultural differences, the patterns are quite different in Syria compared to the rest of the project countries. Annual per capita milk availability in Syria is fairly high (86 litres) and mainly in the form of cow and sheep milk products, the latter an important output of dryland pastoral systems. Most processing of sheep milk is done at farm level, using traditional methods to produce

cheese (*labneh*), ghee and yoghurt. Informal marketing of raw milk predominates, either directly to consumers or through vendors. The formal market is relatively concentrated, limited to 3 parastatal processors, and 12 private.

Tanzania

Tanzania's milk production is estimated at 900m litres per annum, corresponding to a relatively low per capita consumption of about 26 litres, with most consumption limited by tradition to certain areas of northern and central parts of the country. Milk marketing is dominated by the informal sector. Small and medium scale milk processors often operate below installed capacity. Small-scale processing of fermented milk and cheese by women groups is on the increase although product quality is inconsistent. Recent studies on the quality of informally marketed raw milk found adulteration, antibiotic residues and sub-standard milk to be issues of concern.

Uganda

Uganda's smallholder sector markets 75% of all milk sold and women are directly involved as key players in household milk production, processing and marketing. Per capita milk consumption is relatively low (22 litres per annum) and mainly in form of liquid milk. Liberalization of the sector in 1993 saw the emergence of eight private processors. These processors, together with the parastatal Dairy Corporation Ltd, manufacture mainly pasteurised and UHT milk. However, Uganda's private sector is still weak and processors often operate below installed capacity, mainly due to weak demand and management problems. Again, the informal market predominates.

2. MILK MARKETING

As is typical in these regions, the informal raw milk sector dominates the dairy markets in all five countries, selling 80% or more of all milk and dairy products in terms of LME. The informal milk market comprises producer-sellers, itinerant traders or "milk hawkers", wholesalers and retail outlets like shops, kiosks and milk bars, as well as cottage-industry manufacturers of traditional products such as butter (Ethiopia) and sheep milk cheese (Syria). The large-scale formal milk processors sell pasteurised milk and other processed products like yoghurt, cheese, butter, ghee and ice cream. The main markets for the formal milk sector are located in the urban areas, with only small quantities sold in rural areas, due to limited demand. Details of processing capacities of the milk processors are highlighted in Table 2.

3. SWOT ANALYSIS OF NATIONAL DAIRY INDUSTRIES

Results of the SWOT (Strength, Weakness, Opportunity, Threat) analysis as given by the national consultants are given in Table 4. However, a summary SWOT analysis across the countries is given below:

Main strengths

Widely acknowledged social benefits of dairying, including opportunities for women; income and employment generation; improved nutrition; strong complementarities with crops.

Main weaknesses

Low productivity; poor infrastructure; non-supportive policy for small traders; poor input services; weak farmer groups; seasonality; small scale.

Major opportunities

Strong traditions of dairy product consumption; increasing demand due to increasing populations and/or incomes; available processing capacity.

Main threats

Poor quality control; poor infrastructure; lack of regulation; lack of training and extension.

4. TYPES, CAUSES AND LEVELS OF POST-HARVEST DAIRY LOSSES

Generally, quantified information on the levels of post-harvest milk loss is often unavailable, and what is available is unlikely to be reliable. The few estimates available indicate that small-scale traders experience greater losses than factory processors. In Ethiopia and Uganda, women incur most of the losses as the key players in their respective dairy industries. Detailed information on types and causes of post-harvest dairy loss is indicated in Table 3.

On-farm

Losses occurring on the farm are often in the form of “forced consumption” due to limited milk marketing outlets and non-collection of evening milk. Such milk may instead be given to neighbours, fed to calves, etc. In Kenya, this is estimated by some to be as high as 40-50%. The problem is aggravated during the wet season supply glut, when dairy collection centres give farmers quotas on milk deliveries. In Ethiopia, strong Orthodox Christian traditions mean that milk demand declines sharply during Lent, when followers of that faith do not consume dairy products. It should be noted that this type of “loss” is particularly hard to quantify, because it usually represents a partial loss of value rather than a complete loss of the value of the product. Other losses occurring at the farm are related to unhygienic milk handling, poor milking procedures and spoilage due to lack of cooling facilities.

4.1 Milk transport

Losses during delivery of milk to markets are mainly in the form of bacterial spoilage due to lack of cooling facilities and long distances to collection centres. This is often compounded by poor road infrastructure in the rural milk-producing areas. Milk spillage and contamination are common causes of loss in Ethiopia. Adulteration of milk with contaminated water has been noted as a cause of milk loss among some small-scale traders in Uganda and Mwanza, Tanzania.

4.2 Milk collection centres

In Kenya and Uganda, there are reportedly significant losses (over 50%) due to non-collection or “unfair” rejection of milk, mainly during periods of supply glut. Losses due to spoilage also occur due to lack of adequate transportation and cooling facilities.

4.3 Processing

Factory-level losses are not widely recorded but in Uganda, these are related to mechanical faults during processing, e.g. improper sealing of packages and product spillage. In Kenya and Uganda, factory losses are estimated to be less than 2%. In Ethiopia, traditional butter processing is associated with “losses” of up to 12% due to low rates of butterfat recovery. It is questionable however, as to how real these losses are, since the buttermilk is used to make *ayib*, a traditional soft cheese, which consumers prefer with the additional fat resulting from the inefficient butter making.

4.4 Retail outlets

Recent study results from Kenya show that 25% of milk traders record unsold leftover milk of about 7% of the previous day’s sales. This leftover milk is used by the family or sold as fermented milk. Only a small percentage of traders (2%) threw away leftover milk.

4.5 Consumer level

In Ethiopia, reduced consumption of dairy products on certain days by Orthodox Christians results in losses at the consumer level. Though unquantified, these losses are significant since Orthodox Christians form 52% of the population. Rejection of milk by consumers because of spoilage or adulteration has been reported in Tanzania, though losses are not quantified.

Summarizing milk loss types

The above milk losses can be summarized into two main types, with the following characteristics.

Type 1 - Forced consumption on farm or in community

Causes:

- Poor infrastructure, limited collection
- Over-supply of milk
- Unreliable buyer or market
- Institutional failure (in milk collection)
- Seasonally variable demand for milk

Result:

- Reduced value for milk
- Some value retained depending on use (calves, children, soured milk)

Those affected:

- Farmers primarily
- Traders

Type 2: Spoilage and spillage during collection, processing, distribution

Causes:

- Poor hygiene, handling including on farm
- Inappropriate containers
- Unsustainable technology or equipment, resulting in equipment failure
- Poor road or power infrastructure
- Poor management
- Adulteration
- Regulations/harassment

Result:

Complete loss of value of milk in most cases

Soured milk may retain some value

Those affected:

Traders, processors, retailers

5. CONCLUSIONS AND RECOMMENDATIONS

- The national reports were generally unable to identify reliable existing data on milk market losses. There is thus need for more accurate assessment of the causes and levels of post-harvest dairy losses at key stages of the milk chain from cow (or sheep, in case of Syria) to consumer. This will facilitate identification of pragmatic interventions to reduce or eliminate identified losses. Features of this quantification should include:
 - Common approaches to allow for easier cross-country analysis and comparisons.
 - Quantification of losses in terms of both milk quantity and value.
 - Identification of the causes as clearly as possible.
- Valuing the first type of losses identified above (forced consumption) is highly problematic and is likely to be subjective. Because these losses are largely due to market supply and demand factors, these may also be the most resistant to easy solutions or interventions.
- The informal market (raw milk and traditional products) dominates the dairy industries of all five project countries. Further, these markets exhibit higher rates of losses than the formal markets. At the same time, reducing losses in the informal markets may be difficult to accomplish due to their unregulated nature. Regardless, particular attention may be given to informal markets due to high levels of losses.
- Some prioritisation should occur among different loss types, particularly to identify and target those losses most amenable to interventions. Criteria for priority targeting should include:
 - Losses which are most significant in value
 - Losses which have pragmatic and realistic interventions/solutions possible
- Identified causes of loss should be linked to possible solutions and specific roles for policy makers, regulatory bodies and other stakeholders, especially for losses associated with inefficient quality control systems and poor transport and cooling infrastructure. Some of the responsible dairy authorities/boards in the region have initiated activities geared towards the informal sector which appears to be a serious strategic effort to address losses, safety and quality concerns.
- For target loss areas, identify appropriate strategies for a) technology, b) training, c) information and d) policy.

- **Technology:** appropriate, low cost equipment, lactoperoxidase milk preservation system (LPS), appropriate standards. Where appropriate, wider application of practical technology options, such as the LPS, to prolong the shelf life of milk should be explored with national policy makers when current restrictions in Codex rules limiting its use are lifted.
- **Training:** farmers, farmer groups, small-scale traders, informal market agents. Development of milk hygiene training programmes (such as being undertaken in Kenya) will contribute significantly towards improvement in milk quality and reduction of losses due to contamination and adulteration.
- **Information:** up-to-date dairy information systems are needed to provide relevant data on national dairy industries, and to make available technology and training information to users.
- **Policy:** bridging the formal-informal gap, through the avenue of training+licensing. Training alone, without some sort of licensing or certification, is unlikely to have significant impact.

Table 1: Estimates of cattle populations, milk production, dairy markets and consumption per capita

Country	Total cattle pop '000 (FAO stats)	Improved dairy cattle pop '000	Tot milk prod. M. Lts (FAO stats)	Marketed qty (M. lts) ^a	Informal market (% of marketed LME)	Consumption per capita (lts LME)
Ethiopia	34,500	50 (half in Addis area)	1,197	?	80	14
Kenya	11,745	>3,000	1,952 (>2600 ^b)	1,720	88	>80
Uganda	5,900	140	511; (900 ^c)	? ^c 55% of prod ^c	Nearly 75 ^c ; 90 ^d	22
Tanzania	17,000 (FAO); 15,900 (NBS)	450 (NBS)	810	126 ^e	98 ^e	28
Syria	900 (with 12,000 sheep and over 1,000 goats)	Friesian: 135 Local improved: 600	1,600 ^f	?	90%	86

^aMainly from improved dairy herd; ^bEstimates by MoARD and Rapid appraisal 1999; ^cEstimate by Kasirye (2003); ^dRapid appraisal (1996).

^eRapid appraisal 1998; ^fcows produce two thirds.

Table 2: Types of formal and informal milk traders

Country	Types of informal traders	Types of formal traders
Ethiopia	Producer sellers, butter processors, middlemen and others	Only 2 processors: Shola and Mama Dairy 13,000lts/day (4703 MT/year); mainly butter
Kenya	Producer-sellers, mobile hawkers, shops, kiosks, milk bars, farmer groups	Pasteurizers – dominated by 4 processors (80% of market) processing about 600,000lts/day; coops,
Uganda	Producer-sellers, farmer groups street vendor, shops	Dairy Corp + 10 others (total installed capacity = 343,000lts. Actual utilization of capacity = 30%)
Tanzania	Producer-sellers, vendors, milk-bars, wholesaler, retailer	Emerging private processors of up to 5000lts/day. Total processed is 95,000lts/day (35000 MT/yr)
Syria	Producer sellers, traditional processors, middlemen	3 public and 12 private

Table 3: Types, levels and causes of post-harvest dairy loss

Country	Types of losses & where incurred	Estimates of losses	Causes and factors	Reference
Ethiopia	From farm - consumption	20 – 35%		Winrock, 1992
	Too much left for calf	Up to 30%	Poor milking	
	At the farm	2-5%	Poor equipment & poor hygiene	
	Farm and market	Un-quantified	Poor storage	
	Transportation and distribution in market	Un-quantified	Lack of cooling; long distances	
	During butter processing	8-12%	Low rate of butter recovery in traditional systems	
	Reduced consumption		Dairy products not consumed by Orthodox Christians on some days	
Kenya	‘Forced consumption’	40-50%; limited information to verify		Dairy Master Plan, 1991
	At the farm	30%	Mainly due to poor roads and varies by season	MoA
	Leftovers and milk thrown away by small traders	25% of small traders recorded leftovers of approx. 7% daily. But only 2% of traders threw away any milk	Leftovers often sold as fermented milk by some traders	Omoro <i>et al.</i> , 2002
	At the market	35%	Varies by season	Press reports
	Non-collection and milk rejection by processors	Collection reduces to only 3 days/wk and ‘unfair’ rejection of over 50% of delivered milk	This occurs at peak of supply glut	
	Losses at the factory	Likely less than 2%	Most processors not willing to discuss this	
Uganda	Processing	Low (less than 1%)	Spillage, improper sealing, power-cuts	
	At milk collection centres	11% and 37% in dry and wet season, respectively	Lack of cooling, poor handling and low quality	
	On farm	10-52%	Poor marketing infrastructure, low quality	
Tanzania	Given away for free, forced consumption, not milked	Un-quantified	Wet season supply glut	
	Processed cheese	One case of 800kg lost	Poor hygiene resulting in spoilage	
	Rejection by consumers	Un-quantified	Adulteration, spoilage	
	Forced to dispose by municipal regulators	Un-quantified	Adulteration, especially in Mwanza	
Syria	From farm - consumption	10-15% in summer; 2-5% other seasons. Lower losses in public sector (1%)	Spoilage due to lack of cooling	

Table 4: SWOT analysis of national dairy industries

Country	S	W	O	T
Ethiopia	<ul style="list-style-type: none"> Increasing population and demand Strong tradition of dairy product consumption habits 	<ul style="list-style-type: none"> Milk considered by-product and not selected for Low productivity Poor infrastructure High fluctuation in supply 	<ul style="list-style-type: none"> Processing plants working under capacity Strong tradition of dairy product consumption habits Growth opportunity smallholders 	<ul style="list-style-type: none"> Poor quality control Poor infrastructure including roads Imported technology not always appropriate Lack of/ inefficient milk testing Lack of training
Kenya	<ul style="list-style-type: none"> Widespread adoption of dairy and long-term government support Strong tradition of milk as part of diet Over 85% of cattle in eastern Africa 	<ul style="list-style-type: none"> Pre-dominant small scale production and marketing Poor infrastructure that's very costly to producers Low use of concentrate feeding Supply fluctuations Low purchasing power of consumers Policy has not supported small traders 	<ul style="list-style-type: none"> Address weaknesses Upcoming revision of National Dairy Institution legislation Increasing human population Potential for rural employment by smallholder industry 	<ul style="list-style-type: none"> Lack of extension services Low use of AI Poor nutrition and low productivity
Uganda	<ul style="list-style-type: none"> Government support Adequate land Use of dual purpose animals Stakeholder associations being formed 	<ul style="list-style-type: none"> Small urban markets Low purchasing power Poor infrastructure Low levels of training and extension services Poor infrastructure Belated regulatory framework Lack of market information Lack of strong farmer associations 	<ul style="list-style-type: none"> Growing economy Conducive climate Increasing population Available feed resources 	<ul style="list-style-type: none"> Unregulated markets Milk imports Lack of subsidies High cost of borrowing Pollution from urban farming
Tanzania	<ul style="list-style-type: none"> Important source of income Profitable Source of good nutrition Improved herd growing fast – currently approx. 450,000 Valuable interaction with crops Source of employment 	<ul style="list-style-type: none"> Low productivity Poor statistics and dissemination Costly product for consumers No disaggregated information on supply and demand Poor input (AI, extension, research) services Institutional framework for coordination (National Dairy Board) in infancy Weak farmer organizations 	<ul style="list-style-type: none"> Strong demand (could be further increased through school milk prog.) Adequate land Good supply of skilled and unskilled labour Unused crops by-products Opportunity for goat milk Government support 	<ul style="list-style-type: none"> Subsidized imports Unfocussed research (little on socio-economics) Environmental pollution Regulations (if enforced) Lack of skills in some areas (large-scale dairying and processing) Increasing land sub-division Rural-urban migration / HIV/AIDS Poor rural infrastructure Poor management, corruption
Syria	<ul style="list-style-type: none"> Remarkable recent increased in production Great interest to improve sub-sector among stakeholders Strong tradition of dairy product consumption habits 	<ul style="list-style-type: none"> Dominance of informal production, processing and marketing Lack of information, experience and management skills Predominant small-scale production (95%) 	<ul style="list-style-type: none"> Proactive government willing to improve sub-sector New investments 	<ul style="list-style-type: none"> Large imports of subsidized milk powder. (Equiv. of 0.25 million tons in 2000) Droughts Health risks from consumption of raw milk

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