



SMALLHOLDER  
DAIRY PROJECT

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# SDP POLICY BRIEF 8

## LPS: a practical alternative for reducing post-harvest milk losses

### Key points

- In Kenya, the movement of milk along the marketing chain is often hindered by such factors as lack of or dysfunctional milk cooling facilities, poor road infrastructure and irregular electricity supply.
- As a result, milk spoilage is a major cause of loss of income for milk marketing agents and farmers.
- The use of the lactoperoxidase system (LPS) offers a means by which milk collectors can preserve milk quality for a longer period, and salvage spoilage losses incurred.
- Use of LPS could be considered as an option for milk quality preservation where cold chain is not feasible or economical. This would allow farmers in such circumstances to sell more milk and increase their incomes.



### Introduction

A key characteristic of milk production in Kenya is the existence of distinct milk surplus and milk deficit areas. Unfortunately, such factors as poor road infrastructure and lack of means of preservation hinder the smooth flow of milk from the surplus to the deficit areas, and spoilage is a major source of lost income. It is estimated that Kenya loses about 67 million litres of milk annually due to waste and spoilage, which is equivalent to some US\$ 18 million.

While cooling is the preferred method of bulk milk preservation, it is sometimes not feasible due to cost or irregular or absent power supply. In such areas an alternative method of preservation using the internationally approved lactoperoxidase system (LPS) is possible for groups of farmers linked to dairy processors.<sup>1</sup> This policy brief presents a spatial analysis of milk surplus and deficit areas in central and western Kenya and considers the feasibility of use of LPS compared to the present method of cooling.

### Milk surplus/deficit and market access in Kenya

To determine where interventions might help improve market accessibility and reduce milk spoilage it is necessary to take into account two main factors: the current milk surplus or deficit, and market access. Available data were used, as described in box 1, to construct a map showing the spatial interaction of these factors in highland Kenya (figure 1). The areas of primary concern are those where a high milk surplus occurs in areas of low or medium market access. In these areas improvement of road infrastructure or dissemination of appropriate milk preservation technologies would increase marketing possibilities and reduce loss through spoilage.



**Box 1.**  
**Study of milk surplus and deficit areas and mapping of milk coolers: Data sources and methods**

To determine milk surplus and deficit areas, estimates of potential milk production were projected using available data on cattle numbers from the MoLFD and on milk yields from surveys by SDP. Milk demand was computed using human population data and milk consumption indexes from a study by SDP of selected urban and rural areas.

For the comparison of costs of cooling and use of LPS, data were obtained from four milk cooling centres (three large-scale and one small-scale). The relationship between potential and utilized capacity and cost of cooling in the plants is shown in table 1.

Data on benefits and costs of LPS were collected during trials with two milk collection groups (Olbutyo and Gelegele) in Bomet District and two private milk collection agents (denoted NY-02 and NY-03) in Nyandarua District. Both districts have a high milk surplus but poor infrastructure hinders distribution. Before the trials the groups in Bomet did not sell their evening milk as they lacked means of preventing spoilage. The trial agents in Nyandarua sold both morning and evening milk but reported routinely adding hydrogen peroxide to the milk to prevent spoilage.

In addition, data on location and capacity of available milk coolers, both functional and dysfunctional, were collected and mapped.

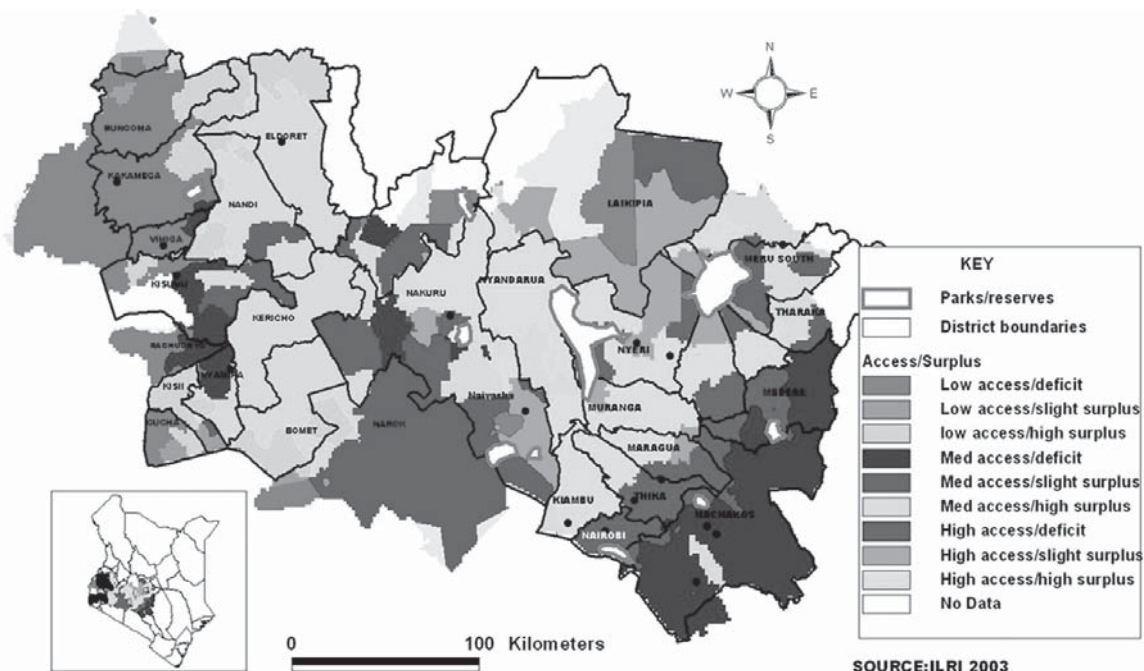
**Comparative study of milk preservation using cooling or LPS**

A comparative study was made of milk cooling and LPS technologies.<sup>2</sup> The study used data obtained from four milk cooling centres, and from LPS trials using milk collection agents. Data for the cooling centres (table 1) show costs per litre of milk cooling ranging from about KSh (Kenya shillings) 1.10-1.30 per litre in the larger centres (A, B and C) to KSh 1.77 in the small-scale plant (D). In comparison, the cost of preservation using LPS was in the range KSh 1.02-1.10 per litre. For the cooling centres, costs decreased with higher levels of utilized capacity (table 1); the plants studied were all operating at levels below their potential capacity (25-71%), with fluctuations according to seasonal availability of milk.

The operators of milk cooling centres identified several key constraints, including the high costs of equipment and electricity; lack of a chilled milk price premium from dairy processors to offset these costs; and difficulty of transporting milk to the processors under chilled conditions. Milk losses due to spoilage accounted for 26% of the variable cost of cooling in the small-scale centre (D) compared to zero in the larger centres. Spoilage in centre D was due to power interruptions, and lack of milk testing equipment.

**Figure 1. Spatial distribution of milk surplus/deficit and market access in central and western Kenya**

**Combining Market access/Milk Surplus/Deficit areas**



SOURCE:ILRI 2003

**Table 1. Capacity and costs of milk cooling centres in sample study**

Cooling centre	Potential capacity (litres)	Utilized capacity (%)	Cost (KSh per litre)
A	100,000	48	1.26
B	52,000	71	1.11
C	20,000	68	1.32
D	1,200	25	1.77

## Results of study of use of LPS by collectors

Table 2 shows the results of a benefit-cost analysis of use of LPS by the four milk collection bodies. An increase in sales was expected among the trial groups, particularly due to the preservation of evening milk for collection the next morning. However, certain constraints hampered this new sales opportunity:

- Reduced milk supply during the dry season due to poor productivity of animals.
- A preference by some farmers to keep the evening milk for home consumption.
- Reluctance by women to pass control of the evening milk to their husbands for sale through milk marketing groups.
- Lack of milk market during the wet season due to milk intake quotas instituted by dairy processors.

It was found, however, that LPS could boost profitability when used strategically on morning milk; that is, only when there was risk of spoilage. On the other hand, the milk collection agents in Nyandarua (NY-02 and NY-03) found that

substitution of LPS for hydrogen peroxide entailed higher private costs than benefits, though the trial study did not capture the large social benefits connected with non-use of hydrogen peroxide. The groups and agents did, however, perceive certain advantages:

- Simple to learn and use.
- Milk preserved with LPS rather than hydrogen peroxide retained its natural physical properties (density, appearance and smell).
- LPS has scientific backing.
- Reduced milk rejections by processors.

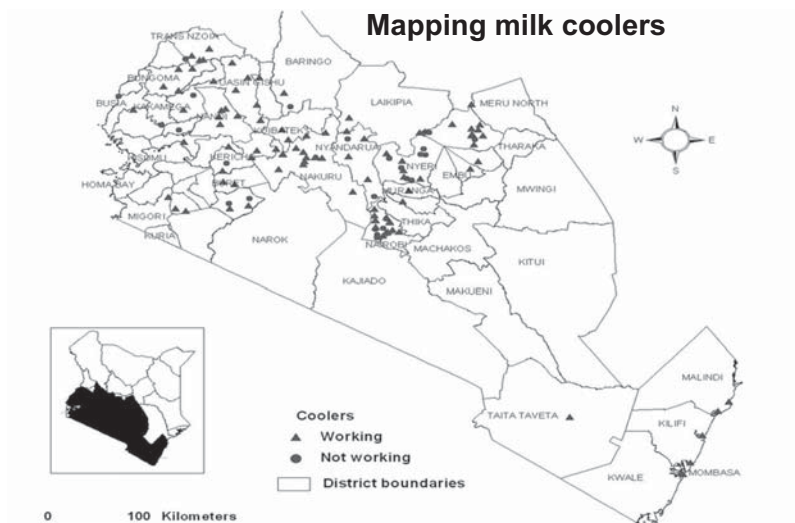
However, some concerns were expressed by the milk collection agents:

- LPS was more costly and less readily available than hydrogen peroxide, and market limitations made it difficult to defray the expense.
- Addition of LPS involved an increased workload, and was ineffective in poor quality milk.
- Cultural norms were opposed to additives in milk.

**Table 2. Total costs and incremental incomes in milk preservation using LPS**

	Groups		Independent milk collection agents	
	Gelegele	Olbutyo	NY-02	NY-03
Time of use	Morning only	Morning only	Morning/evening	Morning/evening
Strategy of using LPS	Strategic	Routine and strategic	Routine	Routine
Benefits: Increased revenue (KSh)	2,596	1,800	1,535	1,140
Cost: Increased expenses (KSh)	2,180	3,468	10,200	10,815
Benefit-cost ratio	1.2	0.5	0.2	0.11

Figure 2. Distribution of functional and dysfunctional milk coolers in central and western Kenya



The mapping of milk coolers (figure 2) showed that there are about 200 milk coolers in the country with a total capacity of about 1.4 million litres per day.<sup>3</sup> About half of these coolers, mainly those owned by farmer groups, were found to be dysfunctional due to various reasons, including lack of economies of scale and costly electricity. This demonstrates that LPS could be considered for use even in areas where coolers are present.

## Policy implications

- The cost of using LPS compares favourably with that of cooling, particularly small-scale coolers. It may be cost-effective to use LPS rather than cooling in areas where milk quantities are small, cooling is non-economic, or power supply is not regular.
- LPS would be a preferred alternative to hydrogen peroxide, which is reported in use in some areas.
- Social and intra-household issues should be considered in any application of LPS technology, since they may constrain its adoption.
- Use of LPS is one of a related raft of policies and interventions that could improve the flow of milk through the marketing chain; for example, improved rural roads and reliable, lower cost power are other key areas for policy intervention.
- Current government standards in Kenya restrict additives and preservatives in whole milk, which apparently precludes use of LPS. However, proponents of LPS argue that it is a natural ingredient in milk. Given the international approval of LPS by the Codex Alimentarius, policymakers should review regulations and consider endorsing its use.

<sup>1</sup> LPS works by activating the natural lactoperoxidase in milk, which has antibacterial effects. Two activators - first thiocyanate and then percarbonate - are added to and mixed in good-quality milk 2 to 3 hours after milking. Use of LPS is approved by both the Food and Agriculture Organization of the United Nations/World Health Organization (FAO/WHO) Expert Committee on Food Additives and the Codex Alimentarius Commission. The process is natural and is not to be confused with the use of the banned and harmful chemical hydrogen peroxide.

<sup>2</sup> Smallholder Dairy (R&D) Project. 2004. An Assessment of the Costs and Feasibility of Alternative Milk Preservation Systems in Kenya. International Livestock Research Institute (ILRI), Kenya Agricultural Research Institute (KARI) and Ministry of Livestock and Fisheries Development (MoLFD).

<sup>3</sup> This compares favourably to the quantity of milk processed in Kenya daily, which currently can reach 1 million litres.



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The Smallholder Dairy Project (SDP) carries out research and development activities to support sustainable improvements to the livelihoods of poor Kenyans through their participation in the dairy sub-sector. SDP is jointly implemented by the Ministry of Livestock and Fisheries Development, the Kenya Agricultural Research Institute, and the International Livestock Research Institute, and is funded by DFID.

### CONTACTS:

SDP Project Manager  
MoLFD  
P.O. Box 30028 Nairobi  
Tel: +254 (20) 2722601  
[sdp-ma@africaonline.co.ke](mailto:sdp-ma@africaonline.co.ke)

SDP Assistant Project Manager  
KARI Headquarters  
P.O. Box 57811-00200 Nairobi  
Tel: +254 (20) 4183301/20  
[DMMwangi@kari.org](mailto:DMMwangi@kari.org)

SDP Field Manager  
ILRI  
P.O. Box 30709  
Nairobi 00100  
Tel: +254 (20) 4223000  
[s.staal@cgiar.org](mailto:s.staal@cgiar.org)