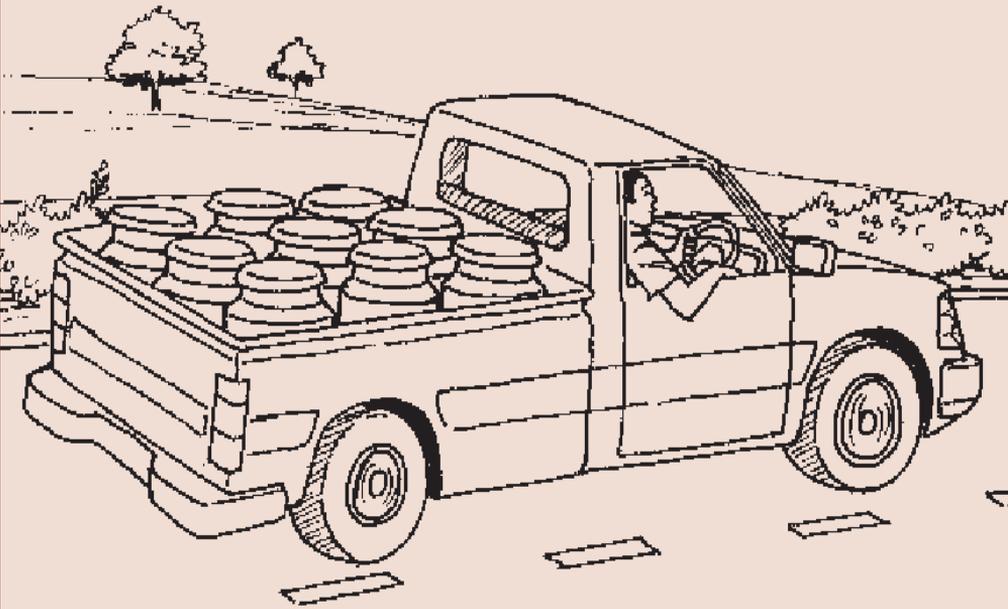


Hygienic milk handling, processing and marketing

Training guide for trainers of small-scale milk traders in Eastern Africa



A Programme of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)



Lusato R. Kurwijila

Volume 2

Hygienic milk handling, processing and marketing: Training guide for trainers of small-scale milk traders in Eastern Africa



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February 2006

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Printing Regal Press Kenya Limited, Nairobi

Correct citation: Kurwijila, L.R. 2006. *Hygienic milk handling, processing and marketing: training guide for trainers of small-scale milk traders in Eastern Africa*. ILRI (International Livestock Research Institute), Nairobi, Kenya.

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Acknowledgement

This training manual is a result of lessons learnt during two collaborative projects. The first, funded by the UK Department for International Development (DFID), studied informal dairy markets in Kenya, Tanzania and Ghana and involved the International Livestock Research Institute (ILRI), the Kenya Agricultural Research Institute (KARI) and Sokoine University of Agriculture. The other was between ILRI and the Eastern and Central Africa Programme for Agricultural Policy Analysis (ECAPAPA). Between 2002 and 2005, ECAPAPA embarked on a two-phase programme titled “*Rationalisation and harmonisation of policies and standards in the dairy industry in Eastern Africa*”. The first phase dealt with harmonisation and rationalisation of standards of milk and dairy products in Eastern Africa. The second phase addressed the issue of training of informal milk traders for certification so that they can begin to participate in dairy markets in a manner that is acceptable to dairy industry regulatory authorities, by observing quality and safety aspects of traded milk and dairy products. Under this programme ECAPAPA brought together dairy industry experts from Kenya, Tanzania, Uganda and Rwanda to develop a training programme that would enhance the competence of informal milk traders in hygienic milk handling, marketing and small-scale processing so as to ensure that consumers are supplied with nutritious and safe milk and dairy products at all times.

The contributions of the following national resource persons are highly acknowledged: Dr Philip Cherono (Kenya Dairy Board), Mr Isha Muzira (Dairy Development Authority, Uganda), Mr Obed Ndankuu (Tanzania Dairy Board) and Dr Michel Ngarambe (Ministry of Agriculture, Rwanda). Dr Amos Omoro and Ms Tezira Lore of ILRI performed their task of coordinating the work of the national resource persons with much diligence thus enabling this work to be completed on time.

We hope that this manual, set in two volumes, will provide a useful tool for training and certification of informal milk traders by national dairy industry regulatory authorities in the wider East and Central Africa region. It may be translated into local languages where appropriate.



Introduction

In most countries in sub-Saharan Africa, smallholder dairy farmers, milk producers, milk traders and processors account for more than 80% of the production, marketing and value addition in the dairy industry. However, government policies have tended to discourage informal market players in favour of centralised, medium- and large-scale milk processing. Recent research in Kenya, Tanzania and Ghana by ILRI and national partners has shown that informal markets provide high prices to producers while delivering milk at prices that are affordable even to poor consumers. Contrary to perceived public health concerns, the marketing of raw milk does not pose public health risks as most consumers boil milk before drinking it.

Assessment of the quality of traded milk and milk products has shown that value addition through small-scale processing is important for income generation and reduction of post-harvest losses. Lack of training contributes to poor hygiene and low microbial quality of raw milk and processed dairy products. Stakeholders and regulatory authorities in Kenya, Tanzania and Ghana have indicated the need to improve milk handling and processing through training of various cadres of milk traders, producer groups, transporters, milk bar operators and small-scale processors in order to meet quality and regulatory requirements.

In Kenya, a training module for informal milk traders titled *“Improve the quality of your milk and please your customers”* has been developed and tested by ILRI, the Kenya Dairy Board and the UN Food and Agriculture Organisation (FAO). Similar modules are being developed for milk producer groups, transporters, milk bar operators and regulatory authorities. Diploma and graduate dairy / food technologists with adequate skills in participatory training and adult learning techniques can deliver such training modules. However, in many countries most public advisory service



providers and private business development service (BDS) providers for small-scale dairy industry operatives are not specialised dairy / food technologists.

In the past, “Training of Trainers” courses in dairy technology have been conducted by the International Livestock Centre for Africa (ILCA) at Debre Zeit Station in Ethiopia, FAO Regional Dairy Training Team (FAO-RDDT) at the Dairy Training Institute in Naivasha, Kenya and more recently by the FAO Post-harvest Losses Project at the ILRI Debre Zeit Station. Participants at these courses were mainly diploma holders and university graduates in the fields of general agriculture, animal science and veterinary medicine. The need to develop minimum competencies for training in dairy technology for agricultural extension officers and service providers in medium and small enterprises (MSEs) who do not have specialist dairy training cannot be overemphasized. A large pool of competent trainers and advisors in grassroots dairy technology education for farmers, traders and small-scale milk processors will be required in the years to come in order to transform and integrate the large informal sector into a regulated one while enhancing the important role played by small-scale operators in contributing to household incomes and nutrition of the poor, and the economy as a whole.

This generic guide has been designed to impart dairy advisory service providers and trainers with the necessary competence to train and advise:

- Milk producer groups on hygienic milk handling on the farm
- Milk transporters on hygienic and profitable milk transportation business practices
- Small-scale traders on hygienic and profitable milk handling and marketing
- Milk bar / milk parlour / kiosk operators and retailers on hygienic milk handling and profitable milk bar operation and retailing
- Small-scale processors on hygienic and profitable small-scale milk processing
- All small-scale dairy chain operators on basic and essential regulatory procedures, standards and regulations governing the technical and business operations in the dairy industry



- All small-scale dairy chain operators on milk marketing and business planning

In order to be able to deliver on the above core competencies, trainers need to know and understand aspects of:

- Milk quality management at the farm
- Milk quality management at milk collection/cooling centres
- Milk quality and management of milk transportation and small-scale milk trade
- Appropriate technologies for small-scale milk processing and preservation
- Appropriate record keeping and business management for small-scale milk traders, transporters and processors
- The code of hygienic practices and regulations governing milk handling, transportation and processing

The generic guide is prepared in two volumes. Volume 1 covers the subject content required to impart the necessary basic knowledge and understanding of dairy hygiene and milk quality control, and how best to deliver it taking into account the conditions under which small-scale farmer groups, milk traders and small-scale processors operate. A three- to four-week long “Training of Trainers” course may be designed to develop the above-listed competencies of trainers and advisors to enable them master the requisite subjects contained in Volume 1.

This guide (Volume 2) is designed for trainers of small-scale dairy farm workers, transporters, traders and processors. The guide will assist trainers to plan, organise and deliver effective short courses of up to three weeks’ duration. This will be particularly useful to trainers and BDS providers who do not have diploma- or degree-level training in dairy technology and are not professional trainers. For purposes of this guide, the term “milk traders” refers to itinerant milk traders, milk transporters, milk bar operators and retailers while the term “processors” refers to small-scale milk processors.



Preparation and delivery of short course residential and outreach training for informal milk traders

National dairy regulatory authorities and the government ministries responsible for vocational and technical dairy education in Eastern and Central Africa recognise that informal milk traders play an important role in linking farmers to consumers in areas where the formal sector is still unable to collect, process and distribute milk at prices that all categories of consumers can afford. Furthermore, these institutions recognise that training and certification of informal milk traders is one of the most effective ways of integrating them into the national dairy chain in the short to medium term. The training and certification scheme is a strategy to provide a policy environment that will facilitate the gradual transformation of informal milk trade into formal small- and medium-scale enterprises while safeguarding public health and ensuring quality throughout the dairy chain from the farm to the consumer table.

For the training, certification and accreditation programme to be effective, various stakeholders have to play specific roles as follows:

BDS providers shall:

- Provide competent trainers and adequate facilities necessary to impart the requisite knowledge and skills to the trainees
- Train dairy chain operators on milk quality control and hygienic handling to enable them attain minimum levels of competence to handle milk safely
- Issue certificates of competence to trained milk traders



- Report their activities to the regulatory authority

Milk traders shall:

- Undertake training and obtain a certificate of competence in hygienic milk handling and marketing
- Apply for a milk traders license and pay any necessary fees to the regulatory authority
- Conduct their businesses within the norms accepted and approved by the regulatory authority

The dairy regulatory authority shall:

- Accredite BDS providers based on agreed minimum standards of competence for trainers
- Monitor the accredited BDS providers to ensure they comply with the approved competence level for trainers
- Issue licences to trained traders based on the evidence of a certificate of competence
- Monitor certified milk traders to ensure they comply with approved minimum standards for hygienic milk handling

2.1 Short course and outreach training in Eastern and Central Africa

Most dairy training institutes and agricultural universities in the eastern Africa region offer short courses and outreach training programmes designed to improve competency of farmers. A few also have training programmes for milk traders and processors. Established dairy education and training institutions as well as BDS providers need to make their short course training programmes known so that prospective individuals, farmer groups, traders and partners who support them in capacity building can easily access these tailor-made courses.



2.2 Organising short course training

The following points need to be considered when organizing short course training:

- Each course should have a course coordinator.
- The training coordinator should keep a register of enquiries and process responses and registration of those who confirm participation.
- Training fees should be worked out carefully, taking into account tuition fees and direct trainee costs such as accommodation, meals and off-pocket allowances where applicable.
- The training coordinator should formulate a participants' pre-evaluation for each course.
- Confirmation of financial support for admitted candidates should be done within one week of the participants being informed of their admission.
- A course should only be held if there are at least 10 to 15 applicants. If there are too few applicants, the course should be postponed to a later date and the applicants should be informed accordingly.
- Courses should be scheduled taking into account availability of resource persons.
- Resource persons should be informed well in advance so that they can plan accordingly.
- All session guides and reference materials should be prepared well in advance.
- All audio-visual equipment and materials required for the programme should be tested and prepared well in advance.
- Accommodation and cafeteria arrangements for participants should be booked well in advance.



- All financial matters (income and expenditure) should be handled by the finance department of the training institute or BDS organisation, in accordance with standing regulations and procedures.
- All detailed course materials (notes, session guides, etc.) should be prepared before the course starts. Each participant is to be provided with the relevant course guide, training programme and other training materials (pens, note books, etc.).

2.3 Course curriculum

Course curricula should be developed for each cadre of dairy market operatives and according to need. Within the envisaged ECAPAPA training and certification programme, dairy experts in Eastern Africa have developed generic curricula for 1-2 day training as follows:

Module 1: Hygienic milk production (for farm-level workers and milk handlers)

Module 2: Hygienic milk collection and testing (for milk collection centre operators)

Module 3: Hygienic milk trading (for small-scale milk traders)

Module 4: Hygienic milk transportation (for milk transporters)

Module 5: Hygienic small-scale milk processing (for small-scale milk processors)

Module 6: Fundamentals of marketing and dairy business management (for small-scale dairy farmers, milk traders, transporters and processors)

These generic modules have been designed to impart dairy chain operatives with the minimum competences required to handle milk hygienically and safely. The modules have been approved by dairy regulatory authorities for certification of informal milk traders who successfully undertake the prescribed training and follow the approved code of hygienic practices. The modules may be adapted to suit the



specific situation and circumstances in a particular country. Refer to Chapter 3 for a detailed description of the modules.

2.4 Setting up at the venue

- The class-room should be booked well in advance and ready at least two days before the training is due to start.
- Confirm that the trainers are adequately prepared with respect to the subjects to be presented, time schedules, audio-visual and other equipment needed during their presentations.
- Set up and test equipment. Only the programme coordinator / facilitator / officer in-charge and a trained technician should set up and adjust the equipment.
- As far as possible, all the participants should report to the training venue on the evening prior to the start of the programme.
- Accommodation and cafeteria arrangements should be properly organised.
- Some entertainment video films should be shown to the participants in the evening hours.
- A sufficient amount of money should be kept ready for miscellaneous and contingency expenses during the course.
- Programme coordinators may assign the various responsibilities to various persons but they should monitor each activity themselves.
- Reference material and stationery for participants should be ready before the session starts.

2.5 Training sessions

- The schedule of training sessions should be strictly followed according to the training programme, which should be circulated to the participants in advance. The duration of the session will depend on the topic being presented.
- The training coordinator should introduce each facilitator to the participants at the start of the session.



- The facilitator should then explain the topic, session objectives, and importance of the subject as it relates to the participants and their respective businesses, and facilitate the session using participatory approaches.
- The facilitator should use relevant audio-visual equipment as needed.
- Enough time should be given to the participants to clear any doubts by asking questions. Key issues should be recorded on flip charts/white board.
- Summarise each session with a focus on issues and problems raised by the participants during discussions. Re-emphasise the importance of the main message of the session.
- Distribute handouts and reference materials to the participants.
- Draw participants' attention to the training session evaluation and if possible share the evaluation findings with them.
- After the first day of training, begin each new session with a quick review of the previous day's session(s).

2.6 Monitoring and evaluation

Trainees should be monitored for their participation and interest shown during the training sessions. At the end of the course a one-hour test should be given covering vital aspects of the course content. A post-training evaluation should also be carried out at the end of the course to assess the extent to which the participants have achieved the objectives of the training programme. To this end, each participant should complete a post-training evaluation form, a sample of which is indicated in Appendix 2. The feedback from participants should be reviewed by the training team and any modifications can be considered for future training programmes.

2.7 Packing down

As soon the training is over, all the teaching aids should be deposited with the store keeper.



2.8 Reporting

When the programme is over, a detailed report should be prepared and submitted to the head of the training institute or BDS organisation. The report should include:

- Title of the programme
- Duration of the programme
- Name of trainer(s) and their qualifications
- Number of participants who attended the course
- Name, position and organisation of the participants
- Problems faced during the programme
- Course evaluation findings
- Name and number of certificate given
- Changes suggested for the future programmes
- Statement of expenditure

2.9 Training session guides

In preparing for delivery of different sessions of the module, the following aspects should be followed:

2.9.1 *Course unit*

This is a subunit of the course module which addresses a specific topic and may last for one or more sessions (lectures, periods, etc.)

2.9.2 *Session*

This is a subunit of a course unit, which is delivered in one sitting lasting 1 to 2 hours. A session should be broken down into two sub-sessions each lasting not more than 30 minutes and separated by 5-10 minutes break.



2.9.3 *Purpose of the course unit*

Start the session by explaining the course unit being addressed, its purpose and objectives and how it will be organized. Present the course outline and how the learning impact will be assessed, i.e. whether there will be tests, quizzes, practical sessions etc.

2.9.4 *Objectives of the session*

Describe the session objectives by explaining the knowledge and skills that the participants are expected to gain by the end of the session and how these will contribute to their competence in hygienic milk handling and marketing.

2.9.5 *Session content*

Start by explaining what will be covered in the session and subsequent sessions (for the first session only) by distributing and explaining the course timetable.

2.9.6 *Training methods*

The training methods should include adult learning and training techniques such as discussions, pair-and-share, role play, demonstrations and practical exercises with emphasis on participatory approaches.

2.9.7 *Training materials*

Make sure that overhead transparencies, flip charts, handouts, dairy manuals and video equipment are prepared beforehand.

2.9.8 *Time per session*

Each theory session should last 30 to 45 minutes while practical sessions should be 1 to 3 hours long.

2.9.9 *Pre-evaluation*

Conduct a pre-evaluation for the course on the first day to find out what participants know and do not know, their expectations, etc. Refer to Appendix 1 for a sample pre-evaluation form.



2.9.10 *Session preparation and delivery*

- As the course will have a lot of practical exercises, ensure that materials required such as milk, reagents etc. are ordered / prepared one day before the practical.
- Decide whether the practical will be done by individuals or groups of 3–5 trainees. Remember: the smaller the group, the greater the learning impact.
- Go through your lecture materials beforehand and note the areas of emphasis for maximum learning impact.
- Encourage discussion and dialogue by each participant. Let participants ask questions, tell their experiences and answer questions.



Training modules for informal dairy chain operators

The training modules highlighted in this chapter were developed by a panel of dairy experts from Kenya, Rwanda, Tanzania and Uganda. The modules have been endorsed by dairy regulatory authorities for use in training and certification of the following cadres of dairy operators:

- Farm-level workers
- Milk collection centre operators
- Small-scale milk traders
- Milk transporters
- Small-scale milk processors

The five modules are designed to impart minimum levels of competences required to handle milk hygienically so as to provide assurance of quality and safety of milk and milk products. An additional module, titled “*Fundamentals of marketing and dairy business management*”, has been developed for all cadres of dairy operatives. Though the content of this particular module is not necessary for imparting minimum competence in hygienic milk handling, the knowledge conveyed will help small-scale dairy business operatives to carry out their business activities profitably.

In the rest of this chapter, the individual training modules are described in detail.



3.1 Farm-level workers

Farm-level workers are responsible for caring for milking cows, milking them and handling of the milk on the farm. They may own the animals or may be employed as labourers. Currently in Tanzania, Kenya and Uganda, aspiring farmers under heifer-in-trust (HIT) schemes receive two-weeks training in dairy husbandry at farmers' training centres. No such training is offered to traditional cattle keepers. The objective of these training programmes is to develop necessary knowledge and skills in dairy farming. Farmers who attend such courses do not receive any certification. For purposes of enhancing milk quality, training should be targeted at those who handle cows and milk on the farm rather than targeting owners *per se*. From the hygiene and public health point of view, farm-level workers need the following minimum competences:

- Feed dairy animals adequately with the right type of feeds at the right time
- Milk cows hygienically
- Handle and store milk hygienically
- Observe withdrawal periods for cows on treatment
- Be able to screen cows for mastitis
- Keep records and manage dairying as a profitable business
- Observe dairy regulations and good milk production practices

To become competent in the above, farm-level workers need to master the following subject content:

- Dairy cattle feeding
- Attributes of good quality milk and factors affecting milk quality and safety
- Sources of milk contamination, and how to minimise it
- Essential elements of personal and equipment hygiene
- Udder health, mastitis and environmental hygiene
- Cleaning, sanitation and storage of milk utensils



- Basic milk quality tests
- Quality and financial record keeping,
- Regulatory requirements for hygienic milk production and handling on the farm

Table 1 indicates the curriculum that may be used to design and deliver the module on hygienic milk production and handling for farm-level workers.



Table 1: Training curriculum and minimum competencies for farm-level workers

Target Group	Course Title	Type of course & location	Course units (sessions)				
Farm-level workers (milkers, handlers)	Hygienic milk production	Residential/on-site/outreach	Milk production				
Subunits	Objectives (Competency sought)	Course content	Duration		Training method/materials	Evaluation	Award
			Theory	Practical			
1. Hygienic milk production	Milkers and milk handlers knowledgeable and skilled in production of safe and clean milk	Factors influencing milk quality Feeding Animal health Milking practices	1 hour		Lectures Discussions Questions & answers Participatory adult learning techniques	End of course theoretical written or oral test End of course practical test	Pass or fail
		Animal and udder health - zoonoses - mastitis	45 min				
		Hygienic milking	45 min	2 hours			
2. Milk handling	Milkers and milk handlers knowledgeable and skilled in hygienic milk handling	Factors contributing to milk spoilage	½ hour		Lectures Discussions Questions & answers Participatory adult learning techniques Hands-on milking practice		
		Types of milk handling & storage equipment	½ hour				
		Cleaning and sanitation agents	½ hour				
		Cleaning & sanitation of equipment	½ hour	1 hour			
3. Basic milk quality tests	Milkers and milk handlers knowledgeable on basic milk quality tests and reasons for raw milk testing	- Sight and smell (organoleptic) - Alcohol - Clot on boiling - Lactometer	½ hour	2 hours	Lecture Discussion Demonstration Hands-on testing		
			5 hr	5 hr	End of course theoretical/oral ½ hour) and practical (1 hour) test	Certificate in basic hygienic milking & milk handling	

Note: After completing the 2-3 day outreach training in milking and milk hygiene and passing a practical evaluation, farm-level milkers and handlers will be issued with a certificate of competence by the BDS provider. In the interests of public health, employers of farm-level workers should require them to undergo such training.



3.2 Milk collection centre operators

There is no pre-requisite level of formal education necessary to enter into the milk trade. However, since milk collection centres bulk large volumes of milk from many individual milk producers, the quality of milk is likely to vary widely. Hence, the operation of milk collection centres—whether or not they are equipped with cooling facilities—requires special skills in distinguishing between poor and good quality milk, maintaining the quality of the milk until delivery and keeping accurate records of milk suppliers. Milk collection centre (MCC) operators should be able to demonstrate competence in hygienic milk handling and ensure milk safety.

Therefore the MCC operators should be able to:

- Distinguish between good and poor quality milk
- Maintain good personal hygiene
- Clean and sanitise dairy equipment and premises
- Maintain and operate milk handling equipment
- Maintain and operate milk cooling machines
- Carry out basic milk quality tests
- Follow good hygienic practices
- Maintain the quality of milk by proper storage, use of appropriate equipment and approved milk preservation methods
- Comply with regulatory requirements

To become competent in hygienic milk handling, MCC operators need to have knowledge (and skills where appropriate) on the following subjects:

- Characteristics of good quality milk
- Factors affecting milk quality and how to maintain quality during milking, storage and transportation
- Techniques for carrying out basic milk quality tests and milk sampling



- Characteristics of good milk handling equipment
- Procedures for cleaning and sanitation of milk handling equipment
- Requirements for a dairy (location, design and waste disposal)
- How to take care of milk storage and dispensing equipment: troubleshooting and basic maintenance
- Provisions of dairy and environmental regulations
- Basic dairy record-keeping and business management

The training curriculum for MCC operators is shown in Table 2.



Table 2: Training curriculum and minimum competencies for milk collection centre operators

Target Group	Course Title	Type of course & location	Course units (sessions)				
Milk collection centre operators	Hygienic milk collection and testing	Residential/on-site/outreach	Milk production				
Subunits	Objectives (Competency sought)	Course content	Duration		Training method/materials	Evaluation	Award
			Theory	Practical			
1. Hygienic milk production	Milk collection centre operators knowledgeable and skilled in hygienic milk production	Factors influencing milk quality Feeding Animal health Milking practices	1 hour		Lectures Discussions Questions & answers Participatory adult learning techniques	End of course theoretical written or oral test End of course practical test	Pass or fail
		Animal and udder health - zoonoses - mastitis	45 min				
		Hygienic milking	45 min	2 hours			
2. Hygienic milk handling	Milk collection centre operators knowledgeable and skilled in hygienic milk handling	Factors contributing to milk spoilage	½ hour		Lectures Discussions Questions & answers Participatory adult learning techniques		
		Types of milk handling & storage equipment	½ hour				
		Cleaning and sanitation agents	½ hour				
		Cleaning & sanitation of equipment	½ hour	1 hour			
3. Basic milk quality control and testing	Milk collection centre operators knowledgeable and skilled in milk quality control and testing	- Sight and smell (organoleptic) - Alcohol - Clot on boiling - Lactometer - Inhibitor test	1 hour	3 hours	Lecture Discussion Demonstration Hands-on testing		
4. Milk quality grading and payment systems	Milk collection centre operators knowledgeable and skilled in milk payment systems	- Resazurin test - Butterfat test - Weighing and recording - Grading and payment	1 hour	3 hours	Lecture Discussion Demonstration Overhead projector Flip chart Chalkboard Felt pens		
			6.5 hr	9 hr	End of course theoretical/oral ½ hour) and practical (1 hour) test	Certificate in basic milk quality control and testing	

Note: After completing 1-2 days' training in hygienic milk handling and passing both theoretical and hands-on evaluation, MCC operators will be issued with a certificate of competency by the BDS provider. Trained MCC operators will also be expected to use approved milk containers. The certification and use of approved containers will be pre-requisites for licensing. Such certification should be mandatory for MCC operators.



3.3 Milk transporters

Milk transporters play an important role of transporting milk from collection centres to processing factories. They may transport milk in cans or bulk tankers. They carry large volumes of milk and therefore bear a huge risk if the milk gets spoiled. Although there is no pre-requisite level of formal education necessary to enter into the milk transport business, operators of such businesses need to have specific knowledge and skills in order to safeguard the quality and safety of milk until it is delivered to the milk collection centre or processing factory. In order to perform a profitable milk transport business, one should be able to demonstrate the following competences:

Milk transporters should be able to:

- Carry out basic quality tests on milk
- Distinguish between poor and good quality milk
- Transport milk in appropriate containers and in timely manner
- Maintain the good quality of the milk while it is delivered to the milk collection centre or processing factory
- Operate a milk transport business in compliance with regulations and good hygienic practices
- Maintain accurate records of the business

To become competent in hygienic milk transportation, milk transporters need to have knowledge (and skills where appropriate) on the following subjects:

- Approved design of milk transport vehicles and equipment
- How to take care of milk transport vehicles
- Factors affecting milk quality and how to maintain the good quality of milk during transportation
- Techniques of milk sampling
- Characteristics of good quality milk



- Basic milk quality tests
- Cleaning and sanitation of milk handling equipment
- Dairy, road safety and environmental regulations
- Good business practice (milk deliveries and financial records)

The knowledge and skills may be imparted in a 1-2 day residential or outreach training programme, whose curriculum is outlined in Table 3.



Table 3: Training curriculum and minimum competencies for milk transporters

Target Group	Course Title	Type of course & location	Course units (sessions)				
Milk transporters	Hygienic milk production, handling and transportation	On-site	Milk production				
Subunits	Objectives (Competency sought)	Course content	Duration		Training method/ materials	Evaluation	Award
			Theory	Practical			
1. Hygienic milk production	Milk transporters knowledgeable and on factors influencing quality of milk at farm level	Factors influencing milk quality - Feeding - Animal health - Milking practices	1 hour		Lectures Discussions Questions & answers Participatory adult learning techniques	End of course theoretical written or oral test End of course practical test	Pass or fail
		Animal and udder health - zoonoses - mastitis	45 min				
		Hygienic milking	45 min	2 hours			
2. Hygienic milk handling	Milk transporters knowledgeable and skilled in hygienic milk handling	Factors contributing to milk spoilage	½ hour		Lectures Discussions Questions & answers Participatory adult learning techniques		
		Types of milk handling & storage equipment	½ hour				
		Cleaning and sanitation agents	½ hour				
		Cleaning & sanitation of equipment	½ hour	1 hour			
3. Milk quality control and testing	Milk transporters knowledgeable and skilled in milk quality control and testing	- Sight and smell (organoleptic) - Alcohol - Clot on boiling - Lactometer	1 hour	3 hours	Lecture Discussion Demonstration Hands-on testing		
4. Hygienic milk storage, preservation and transportation	Milk transporters knowledgeable on various hygienic milk storage, preservation and transportation methods	Appropriate milk storage vessels	½ hour		Lecture Discussion Demonstration Overhead projector Flip chart Chalkboard Felt pens		
		Appropriate milk transportation equipment	½ hour				
		Cleaning and sanitation of milk transportation equipment	½ hour	2 hours			
		Appropriate milk preservation methods	½ hour	2 hours			
5. Maintenance of milk handling and cooling equipment	Milk transporters knowledgeable on maintenance of milk coolers, milk handling equipment and transportation carriers	Maintenance of milk coolers	½ hour		Lecture Discussion Demonstration Overhead projector Flip chart Chalkboard Felt pens		
		Characteristics and maintenance of milk cans and bulk tanks	½ hour				
		Importance of carrier maintenance	½ hour				
		Legal requirements for milk transportation vessels and carriers	½ hour				
			9.5 hr	10 hr	End of course theoretical (½ hr) and practical (1 hr) test	Certificate in basic hygienic milk handling and transportation	

Note: After completing 1-2 days' training in hygienic milk handling and passing both theoretical and hands-on evaluation, milk transporters will be issued with a certificate of competency by the BDS provider. Trained transporters will also be expected to use approved milk containers. The certification and use of approved containers will be pre-requisites for licensing. The training may be spread over one to two weeks, divided into 2-3 hour sessions/units per day, to fit in with the transporters' daily work schedules. Milk carrier operators should attend the course for purposes of licensing.



3.4 Itinerant milk traders or vendors

Itinerant milk traders (also called vendors or hawkers) collect small quantities of milk (up to 60–80 litres) from individual farmers and mainly use bicycles to transport raw milk for sale. Often, the milk is transported without prior refrigeration. Milk is sold either to milk collection centres or door-to-door in urban centres. Adulteration of milk with water is a major problem among some itinerant milk traders. Recent studies in some regions of Eastern Africa report that as much as 30 to 60% of milk sold by itinerant traders is adulterated with water, though the practice varies depending on the season. The widespread use of non-foodgrade plastic containers, which are difficult to clean, is another factor that compounds the problem of low hygienic quality of informally traded milk in the region. Studies in Kenya show that if informal milk traders are trained and use hygienic metal containers, the quality of the raw milk they sell can improve significantly. In Uganda, concerted efforts by the dairy regulatory authority with co-operation from the milk traders themselves have led to a near elimination of plastic containers and a significant improvement in the quality of raw milk sold by small-scale traders. In order for milk traders to improve the quality of milk they handle, they should be able to:

- Distinguish between poor and good quality milk
- Use appropriate equipment and deliver milk in a timely manner
- Clean and sanitize milk handling vessels
- Carry out basic milk quality tests
- Observe the legal regulations regarding hygienic handling of milk including use of appropriate equipment, and absence of added water and antibiotic residues in milk
- Keep simple financial and milk records



To have the above competence, a milk trader needs to be knowledgeable on the following:

- Characteristics of good quality raw milk
- Factors influencing the quality and safety of raw milk
- Basic milk quality tests
- Legal requirements and standards on milk handling and hygiene
- Cleaning and sanitation of milk storage vessels
- Dairy and financial record-keeping

Knowledge on the above subjects can be imparted in a 1-2 day residential or outreach training programme, whose curriculum is shown in Table 4.



Table 4: Training curriculum and minimum competencies for small-scale milk traders

Target Group	Course Title	Type of course & location		Course units (sessions)			
Small-scale milk traders	Hygienic milk trading	On-site		Milk production			
Subunits	Objectives (Competency sought)	Course content	Duration		Training method/ materials	Evaluation	Award
			Theory	Practical			
1. Hygienic milk production	Small-scale milk traders knowledgeable and skilled on factors influencing quality of milk at farm level	Factors influencing milk quality - Feeding - Animal health - Milking practices	1 hour		Lectures Discussions Questions & answers Participatory adult learning techniques	End of course theoretical written or oral test End of course practical test	Pass or fail
		Animal and udder health - zoonoses - mastitis	45 min				
		Hygienic milking	45 min	2 hours			
2. Hygienic milk handling	Small-scale milk traders knowledgeable and skilled in hygienic milk handling	Factors contributing to milk spoilage	½ hour		Lectures Discussions Questions & answers Participatory adult learning techniques		
		Types of milk handling & storage equipment	½ hour				
		Cleaning and sanitation agents	½ hour				
		Cleaning & sanitation of equipment	½ hour	1 hour			
3. Milk quality control and testing	Small-scale milk traders knowledgeable and skilled in milk quality control and testing	- Sight and smell (organoleptic) - Alcohol - Clot on boiling - Lactometer	1 hour	3 hours	Lecture Discussion Demonstration Hands-on testing		
4. Hygienic milk storage, preservation and transportation	Small-scale milk traders knowledgeable on various hygienic milk storage, preservation and transportation methods	Appropriate milk storage vessels	½ hour		Lecture Discussion Demonstration Overhead projector Flip chart Chalkboard Felt pens		
		Appropriate milk transportation equipment	½ hour				
		Cleaning and sanitation of milk transportation equipment	½ hour	2 hours			
		Appropriate milk preservation methods	½ hour	2 hours			
			7 hr	10 hr	End of course theoretical (½ hr) and practical (1 hr) test	Certificate in basic hygienic milk trading	

Note: After completing 1-2 days' training in hygienic milk handling and passing both theoretical and hands-on evaluation, milk traders will be issued with a certificate of competency by the BDS provider. Trained traders will be expected to use approved milk containers. The certification and use of approved containers will be pre-requisites for licensing. The training may be spread over one to two weeks, divided into 2-3 hour sessions/units per day, to fit in with the traders' daily work schedules.



3.5 Small-scale dairy processors

Many farmer groups have started small-scale processing in order to add value to raw milk and thus earn more from the milk they produce. Successful informal milk traders are also gradually becoming small-scale processors. New entrants into the arena of milk processing need hands-on training to enable them acquire the basic knowledge and skills that will enable them transform milk into nutritious and safe products. The small-scale dairy processor should demonstrate competence in Good Manufacturing Practice (GMP) and manufacture wholesome and safe dairy products.

Small-scale dairy processors should therefore be able to:

- Carry out basic quality tests on raw milk and processed dairy products
- Distinguish between poor and good quality milk
- Handle and process milk hygienically
- Maintain and operate milk processing equipment
- Carry out milk processing operations in line with Good Manufacturing Practice
- Produce wholesome and safe dairy products that meet set standards for quality and safety
- Keep accurate records and know basic aspects of book-keeping

For small-scale dairy processors to develop minimum competencies to handle and process milk safely, they need to be knowledgeable and skilled in the following subject areas:

- Milk quality control and testing
- Factors that influence the quality and safety of milk and dairy products
- Good hygienic practices during handling, transportation and processing of milk
- Hygienic processing of specific dairy products



- Cleaning, sanitation and preventive maintenance of dairy processing equipment
- Quality assurance of dairy products, including written protocol for product recall
- Personal hygiene and code of hygienic practices
- Dairy records and accounting

These topics can be covered in a 1-2 day residential or outreach training programme, which may be tailored for specific processed dairy products. Table 5 shows the training curriculum that may be used for this purpose.



Table 5: Training curriculum and minimum competencies for small-scale milk processors

Target Group	Course Title	Type of course & location		Course units (sessions)			
Small-scale milk processors	Hygienic small-scale milk processing	On-site		Milk production			
Subunits	Objectives (Competency sought)	Course content	Duration		Training method/materials	Evaluation	Award
			Theory	Practical			
1. Hygienic milk production	Small-scale milk processors knowledgeable and on factors influencing quality of milk at farm level	Factors influencing milk quality - Feeding - Animal health - Milking practices	1 hour		Lectures Discussions Questions & answers Participatory adult learning techniques	End of course theoretical written or oral test End of course practical test	Pass or fail
		Animal and udder health - zoonoses - mastitis	45 min				
		Hygienic milking	45 min	2 hours			
2. Hygienic milk handling	Small-scale milk processors knowledgeable and skilled in hygienic milk handling	Factors contributing to milk spoilage	½ hour		Lectures Discussions Questions & answers Participatory adult learning techniques	End of course theoretical written or oral test End of course practical test	Pass or fail
		Types of milk handling & storage equipment	½ hour				
		Cleaning and sanitation agents	½ hour				
		Cleaning & sanitation of equipment	½ hour	1 hour			
3. Milk quality control and testing	Small-scale milk processors knowledgeable and skilled in milk quality control and testing	- Sight and smell (organoleptic) - Alcohol - Clot on boiling - Lactometer	1 hour	3 hours	Lecture Discussion Demonstration Hands-on testing	End of course theoretical written or oral test End of course practical test	Pass or fail
4. Milk quality grading and payment systems	Small-scale milk processors knowledgeable and skilled in milk quality grading and payment	- Resazurin test - Methylene blue dye reduction test - Butterfat test	1 hour	3 hours	Lecture Discussion Demonstration Hands-on testing	End of course theoretical written or oral test End of course practical test	Pass or fail
5. Hygienic milk storage, preservation and transportation	Small-scale milk processors knowledgeable on various hygienic milk storage, preservation and transportation methods	Appropriate milk storage vessels	½ hour		Lecture Discussion Demonstration Overhead projector Flip chart Chalkboard Felt pens	End of course theoretical written or oral test End of course practical test	Pass or fail
		Appropriate milk transportation equipment	½ hour				
		Cleaning and sanitation of milk handling and processing equipment	½ hour				
		Appropriate milk preservation methods	½ hour				



Subunits	Objectives (Competency sought)	Course content	Duration		Training method/ materials	Evaluation	Award
			Theory	Practical			
6. Maintenance of milk handling and cooling equipment	Small-scale milk processors knowledgeable on maintenance of milk coolers, milk handling equipment, transportation carriers and processing equipment	Maintenance of milk coolers	½ hour				
		Characteristics and maintenance of milk handling/ processing equipment	½ hour				
		Importance of milk carrier maintenance	½ hour				
		Legal requirements for milk transportation vessels and carriers	½ hour				
7. Dairy effluent management systems	Small-scale milk processors knowledgeable and skilled in environmental sanitation and dairy waste management	Types of dairy waste	½ hour		Lectures Discussions		
		Dairy effluent disposal systems, recycling and utilisation	½ hour				
		Municipal regulations on food industry waste management	½ hour				
8. Code of hygienic practices	Small-scale milk processors knowledgeable about code of hygienic practices and Good Manufacturing Practices (GMP)	Dairy premises, siting and location	½ hour		Lecture Discussion		
		Personnel hygiene	½ hour				
		Good Manufacturing Practices (GMP)	½ hour				
9. Hygienic processing of dairy products	Small-scale milk processors knowledgeable on hygienic production of specific dairy products	Theory of procedure for production of specific dairy product	1 hour				
		Practical production of specific dairy product		4 hours			
			14.5 hr	13 hr	End of course theoretical (½ hr) and practical (1 hr) test	Certificate in basic hygienic milk handling and processing	

Note: Training of dairy processing personnel should be a pre-requisite for licensing. For supervisors, certificate- or diploma-level training in dairy processing is essential. Dairy processors should employ only those operational personnel who have successfully undertaken basic training that is specific to the dairy products they are employed to process. This would lead to certification as a competent butter maker, cheese maker, milk processor, ice cream maker, etc. As an example, refer to the 5-day DTI Naivasha training modules on cheese, butter and cultured milk products. Products such as cheese may require longer residential training (up to 4 weeks) coupled with industrial attachments (1-2 months) leading to the qualification of “certified cheese maker”.



3.6 Dairy business management for small-scale dairy farmers, milk traders, transporters and processors

Dairy farmers, milk traders, transporters and processors need to carry out their activities in a business-wise manner. To do so, they need to be equipped with basic business management and planning skills. Short of that, their businesses may not be profitable. A generic dairy business module will serve the needs of all dairy operators who need to have the following competencies:

- Basic marketing and business management
- Preparing a business plan
- Product marketing and distribution
- Customer care
- Keeping of dairy records

To develop the competencies listed above, dairy operators need to master the following subjects:

- Fundamentals of business planning
- Marketing fundamentals
- Essential financial and dairy records

Table 6 presents a 2-3 day training module that can impart the required competencies for basic small-scale dairy business management.



Table 6: Training curriculum on dairy business management for small-scale dairy farmers, traders, transporters and processors

Target Group	Course Title	Type of course & location	Course units (sessions)				
Small-scale farmers, milk traders, transporters, processors	Fundamentals of marketing and dairy business management	Residential/on-site/outreach	Feasibility studies and business plan preparation				
Subunits	Objectives (Competency sought)	Course content	Duration		Training method/materials	Evaluation	Award
			Theory	Practical			
1. Feasibility study	Dairy operators knowledgeable on fundamentals of feasibility study preparation	Types of businesses (sole proprietor, cooperative society, partnership, limited company)	1 hour		Lectures Discussions Questions & answers Participatory adult learning techniques	End of course theoretical written or oral test End of course practical test	Pass or fail
		Principles of conducting a feasibility study	1 hour				
2. Business plan preparation	Dairy operators knowledgeable on fundamentals of business plan preparation	Basic elements of a business plan	½ hour		Lectures Discussions Questions & answers Participatory adult learning techniques		
		Organisational plan	½ hour				
		Management plan	½ hour				
		Financial plan	½ hour				
		Marketing plan	½ hour				
3. Distribution and retailing of dairy products	Dairy operators knowledgeable on costing and pricing, distribution and retailing of dairy products	Costing and pricing of dairy products	1 hour		Lecture Discussion Demonstration		
		Marketing skills	½ hour				
		Distribution skills	½ hour				
4. Record keeping	Dairy operators knowledgeable and skilled in record keeping and credit management	Types of records: - Farm records - MCC records - Milk transporter records - Milk trader records - Milk processor records - Milk distributor/retailer records	2 hours		Lecture Discussion Demonstration Overhead projector Flip chart Chalk board Felt pens etc.		
		Credit management	1 hour				
			9.5 hr		End of course theoretical (1 hour) and practical (1 hour) test	Certificate in basic marketing and dairy business management	



Appendix 1: Sample Pre-Evaluation Questionnaire

Name of institution _____

Name of course _____

Dates of training course _____

Dear participant,

Welcome to the course on QUALITY ASSURANCE IN MILK COLLECTION. In order to enable us to serve you better we would like to get some background information about each participant. This is necessary to enable us fine tune our training to meet your needs and those of the group as a whole. Please take a few minutes to fill in your answers to the questions below. The purpose of this questionnaire is to learn more about your experiences, skills and interests in the dairy enterprise activities.

Name: _____

Name of your business: _____

Type of business (Circle or tick the appropriate answer):

Own Family enterprise Private firm Government Institution Other

(If "other", please specify) _____

Number of years worked in the business: _____

Your present duties in the business: _____

1. How important is training to your present duties?

- a. Critical
- b. Very important
- c. Important
- d. Marginal
- e. Not at all

2. Have you previously participated in other training programmes designed to improve your skills?
(Circle or tick the appropriate answer)

Yes No



If yes, indicate the title of the course(s) and duration(s):

i. _____

ii. _____

iii. _____

- a. What did you find useful in the courses?
- b. What skills from the courses have you used in your business?
- c. What did you dislike about the courses?
- d. What skills from the courses have you **not** used in your business?

3. Please list what you feel are the most important elements in good and successful training (list no more than five).

4. Do you believe that this training can be used to improve your:

- a. Physical skills?
- b. Intellectual skills?
- c. Attitudes?

Which is most important-----?

Which is least important-----?

5. Give reasons why you think **quality and safety** is important in the milk business:

- a) _____
- b) _____
- c) _____

6. Do you have specific things you would particularly like to learn that would make this short training worthwhile to you and/or your employer? (Please specify)



Appendix 2: Sample Post-Evaluation Questionnaire

Name of institution

Name of course

Dates of training course

Dear course participant:

Having attended the training course in, please take a few minutes to complete this form:

Name: _____

Name of business: _____

Type of business (Circle or tick the appropriate answer):

Own Family enterprise Private firm Government Institution Other

(If "other", please specify)

Number of years worked in the business: _____

Your present duties: _____

Briefly indicate your responses to the following:

1. Which topics did you find most informative and useful?
2. Which topics did you find unnecessary?
3. What other topics, if any, would you like to be included in the training?
4. What is your opinion on the teaching methods used during the training?
5. Was the duration of the training adequate? Would you like it to be retained, increased or reduced?
6. How far have the objectives of the training been fulfilled? What is your overall impression about the course?
7. What improvements would you suggest for future training courses?
8. General remarks or comments





