

**MINISTRY OF AGRICULTURE,  
LIVESTOCK & FISHERIES**



**SMALLHOLDER DAIRY COMMERCIALIZATION PROGRAMME**

**MODULE II**



**QUALITY ASSURANCE GUIDE  
FOR MILK TRANSPORTERS**



This guide is intended to assist milk transporters to collect and transport quality and safe raw milk that complies with regulatory and market requirements through the application of Quality Assurance Systems in milk production.

Like any other business, milk transporters should aim at meeting or surpassing their customers' expectations by providing high quality and safe raw milk that can be handled and processed into high quality and safe milk and milk products.



## ACKNOWLEDGEMENTS

The development and production of this guide was made possible by the Smallholder Dairy Commercialization Programme (SDCP) which is a joint development project between the Government of Kenya (GOK) and the International Fund for Agricultural Development (IFAD). The emphasis of the programme is on commercialization of dairy and dairy products through the Market Oriented Dairy Enterprises (MODE) approach.

The programme covers nine counties namely Nakuru, Trans Nzoia, Uasin Gishu, Bomet, Nandi, Bungoma, Kakamega, Nyamira and Kisii. The goal of the programme is to increase the incomes of poor rural households that depend substantially on production and trade of dairy products for their livelihoods by:

- Improving the financial returns of market oriented production and trade activities by small-scale operators, through improved information on market opportunities, increased productivity, cost reduction, value adding and more reliable trade relations
- Enabling more rural households to create employment through, and benefit from, expanded opportunities for market-oriented dairy activities, as a result of strengthened farmer organizations.

Through the facilitation of SDCP, Kenya Dairy Board (KDB), a statutory organization established by an Act of Parliament, the Dairy Industry Act Cap 336, and in partnership with the Kenya Industrial Research and Development Institute (KIRDI) and Dairy Training Institute (DTI) developed this guide to assist dairy farmers to establish and benefit from a Quality Assurance System (QAS) in milk production.

The following institutions are acknowledged for their participation and contribution to the development of this guide:

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# PREFACE

Kenya has a large dairy industry with an estimated production of 5.2 billion liters of milk per year. This is derived from a dairy herd population of approximately 4.2 million improved dairy animals, 9 million zebus, 12 million goats, and 900,000 camels (Ministry of Agriculture, Livestock & Fisheries, 2016). Cattle account for approximately 88% of the production.

The dairy industry in Kenya contributes approximately 14% and 4.5% to the country's agricultural and National Gross Domestic Products (GDP) respectively. It also provides livelihoods for approximately 1.8 million smallholder dairy farmers. The dairy value chain creates approximately 750,000 direct jobs at milk production, transport, bulking, cooling, processing and marketing. The support service industry generates an additional 500,000 jobs.

Raw milk collection and transportation is an integral and important step in the dairy value chain. The bulking of raw milk from the smallholder dairy farmers facilitates the efficient marketing of quality raw milk to milk processing companies and other buyers. Transporting quality and safe of raw milk is critical to the processing of quality and safe dairy products that comply with regulatory requirements and meet the requirements of consumers.

Adoption of Good Hygienic Practises (GHP), Good Manufacturing Practices (GMP) and Quality Assurance Systems in the transportation of raw milk will benefit the transporters and the entire dairy value chain through production of quality and safe milk and milk products

The Government of Kenya has continued to support the development of the Kenyan dairy industry. A robust policy and regulatory framework has been developed to motivate stakeholders in the dairy industry to invest in milk production, bulking, cooling,

processing and marketing. Specifications for raw milk and processed milk products have been developed to guide the industry towards compliance and enhanced market access.

IFAD has continued to be a key partner in the development of the Kenyan dairy industry. Their support and goodwill have contributed to increased productivity of milk, better organization and efficiency of stakeholders and increased value addition by the Kenyan dairy industry.

We hope that this guide will be of value to milk transporters and other stakeholders in adopting best practices and Quality Assurance Systems that will lead to improvement in the quality and safety of our milk and milk products.

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# ABBREVIATIONS

<b>DTI</b>	Dairy Training Institute
<b>GDP</b>	Gross Domestic Product
<b>GOK</b>	Government of Kenya
<b>GHP</b>	Good Hygienic Practises
<b>GMP</b>	Good Manufacturing Practices
<b>IFAD</b>	International Fund for Agricultural Development
<b>KDB</b>	Kenya Dairy Board
<b>KIRDI</b>	Kenya Industrial Research and Development Institute
<b>MODE</b>	Market Oriented Dairy Enterprises
<b>QA</b>	Quality Assurance
<b>QAM</b>	Quality Assurance Manual
<b>QAS</b>	Quality Assurance System
<b>SDCP</b>	Smallholder Dairy Commercialization Programme
<b>SOP</b>	Standard Operating Procedures

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# CHAPTER 1: INTRODUCTION

## 1.1 Purpose

The purpose of this guide is to assist milk transporters to collect and transport quality and safe raw milk that meets regulatory requirements to collection centers, cooling centers or processing plants. These requirements include the physical, chemical and microbiological specifications for raw milk as provided by the relevant Kenyan standards.

The Quality Assurance framework provided in this guide will assist milk transporters to implement hygienic milk transportation practices, establish preventive and control mechanisms, undertake self-assessment of their operations and maintain proper quality records.

## 1.2 Objectives

The guide will enable milk transporters to collect and convey quality and safe raw milk by:

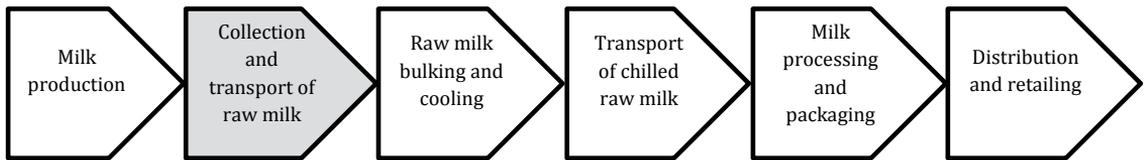
- (a) Understanding the quality and safety requirements in raw milk collection and transportation
- (b) Adopting best practices in the transportation of raw milk
- (c) Understanding the causes of poor quality raw milk
- (d) Determining and adopting preventive and corrective actions for quality management
- (e) Establishing and administrating quality assurance self-assessment tools
- (f) Undertaking proper documentation

## 1.3 Scope

This guide covers handling and conveyance of raw milk from farmers, collection and bulking points to cooling centers and processing plants. Aspects related to good milk handling practices, personnel, equipment,

containers, vessels, vehicles and records requirements are addressed where relevant to the quality and safety of raw milk.

**Figure 1: The Dairy Value Chain**



#### **1.4 Structure**

The guide is presented in four chapters covering the following in transportation of raw milk:

- (a) Introduction to Quality Assurance Systems
- (b) Quality and safety requirements in milk transportation
- (c) Application of Quality Assurance in milk transportation
- (d) Self-assessment guidelines to evaluate Quality Assurance practices in milk transportation

# **CHAPTER TWO: INTRODUCTION TO QUALITY ASSURANCE SYSTEMS IN MILK PRODUCTION**

## **2.1 What is quality?**

Quality is the totality of features and characteristics of a product or service to satisfy the stipulated needs and requirements of the users.

Raw milk is primarily intended for processing into dairy products which meet specified standards. Therefore, the quality and safety of raw milk is a key requirement in the processing of high quality milk products. Transportation of raw milk under hygienic conditions is an important step in the dairy value chain.

## **2.2 What is Quality Assurance?**

Quality assurance (QA) is a management method that is defined as “all those planned and systematic actions needed to provide adequate confidence that a product, service or result will satisfy given requirements for quality and be fit for use” (ISO 1994).

In milk handling and transportation, Quality Assurance entails identification, implementation and documentation of relevant activities that will lead to collection, conveyance and delivery of quality and safe milk that complies with statutory and market requirements.

## **2.3 What is a Quality Assurance System?**

Quality Assurance system is a tool to help enterprises to operate more effectively and efficiently and comply with product or service specifications and requirements. They help to ensure that at every step of operation a minimum standard of defined quality is met for a product or service.

In raw milk handling and transportation, such a system will help in establishing methods and practices essential for delivery of quality and

safe milk that consistently complies with statutory and market requirements.

In practice, there are several types of QAS that are applicable in dairy farming such as:

- ISO 9001 Quality Management System
- ISO 22000 Food Safety Management System
- Hazard Analysis Critical Control Points (HACCP)
- Good Agricultural Practices (GAP)
- Total Quality Management (TQM)

These systems have basic principles of Quality Assurance which include:

- Design and scope of the system
- Management commitment and responsibility
- Systematic analysis and systematic action
- Process approach
- Customer focus
- Record keeping and documentation
- Continuous improvement

This guide has adopted these principles to present a simple QAS that can be adopted and implemented in the transportation of raw milk.

## **2.4 Components of a Quality Assurance System**

The components of a QA system in in milk handling and transportation can be grouped into three levels, namely;

- (a) The top level commitment by the transporter to meet statutory and market requirements in collection and conveyance of raw milk.
- (b) The operational level which involves establishing, implementing and documenting methods and practices for ensuring conveyance of quality and safe raw milk.

- (c) The assessment stage where the effectiveness of the QA system in meeting the desired goals is evaluated and remedial actions taken to improve the system are instituted.

## **2.5 Steps in implementation of Quality Assurance Systems**

Generally, the implementation of a QA system in the food industry entails the following steps

- (a) Identification of the quality and safety goals of a product
- (b) Identification of the activities required to produce and meet the stated quality and safety goals of the product
- (c) Identification of the most likely problems that may occur and which may affect the quality and safety of the product
- (d) Establishment of control mechanisms to reduce the likelihood of the problem occurring
- (e) Identification and implementation of remedial actions to manage the problems if they occur
- (f) Establishment of documentation and records requirements
- (g) Identification and implementation of the assessment mechanism

## **2.6 Documentation requirements in a Quality Assurance System**

Documentation is any written text document used to explain some attributes of an object, procedure or process. Documentation is an essential part of the QAS system. It provides the control measures and actions that need to be implemented and also documents the various activities undertaken in the production of a good or service, their inter-relationship, characteristics and operating parameters.

The documents required in a QAS are summarized in figure 2 below

**Figure 2: Documents required in a QAS**



**(a) The Quality Assurance Manual (QAM):** Is the first level of documentation in a Quality Assurance System. The QAM clearly identifies the product and the processes that affect the quality of the product.

The manual also describes:

- The business
- The scope of the QAS
- The organization's quality policies and commitment to produce quality products
- The product and its specifications
- The processes involved in the production of the product

The QAM for milk transporter will among other things provide a brief profile of the organization, the commodity handled (raw milk), the product quality objectives and the processes involved in raw milk collection and transportation.

## **(b) Quality Assurance Procedures**

Quality Assurance Procedures (QAP) are vital in a Quality Management System. They establish processes that identify the activity, establish what to look for in that activity based on a certain reference, acceptance criteria and the records to keep. They are simplified step-by-step sequence of activities or course of action that must be followed in the same order to correctly perform a task

In a transportation of raw milk, QAP are required for the following actions among others;

- Testing and collection of raw milk
- Transportation of milk
- Control of non-conforming products
- Control of records

## **(c) Standard Operating Procedures (SOP):**

Are step-by-step instructions compiled to help workers carry out routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance. SOP's in milk collection and conveyance ensure personnel follow the correct procedures and cover the following activities among others

- Testing of raw milk
- Handling and transportation of milk
- Cleaning of equipment, containers and utensils

**(d) Quality Records:** Are the documented evidences that processes are executed according to the QA plan and requirements. Such records for a milk transporter include:

- Milk suppliers and quality records
- Equipment maintenance records
- Staff training records

**Figure 3: Importance of quality records**



**Records in a dairy business are important for the following reasons**

- Accountability of operations
- Compliance with legislative requirements
- Quality improvement
- Management planning and decision making
- Communication to stakeholders

**2.7 Importance of QA systems in milk handling and transport**

A well designed and implemented QA system in milk collection and conveyance will have the following benefits:

- (a) Increase confidence of customers on the quality and safety of the product
- (b) Establish reliable and premium markets that facilitate value addition of high quality milk and milk products
- (c) Protect consumers from possible hazards or risks associated with poor milk handling practices including adulteration with water and other prohibited substances
- (d) Demonstrates management commitment to convey quality and safe raw milk that meets customer requirements
- (h) Reduces post-harvest losses of raw milk resulting from spoilage and rejections by buyers
- (i) Establishes traceability mechanism for the product where necessary
- (j) Contributes to increased operational efficiency and profitability of the enterprise

# CHAPTER THREE: QUALITY AND SAFETY REQUIREMENTS IN MILK TRANSPORTATION

## 3.1 Quality and safety objectives in milk handling and transportation

Raw milk is generally transported in milk cans or bulk tankers. These should be suitably designed for effective cleaning and sanitization. Generally, milk from small-scale milk producers is transported in cans and is normally not cooled. It's of primary importance to ensure such milk is delivered within good time to the cooling centre. Bulked raw milk, usually from collection centers, is preferably transported in bulk tankers. As milk tankers are insulated, the milk is still cool when it arrives at its destination.

The objective of a milk transporter is to collect, convey and deliver quality and safe raw milk. This refers to raw milk obtained from healthy animals that has been produced, handled and delivered to the transporter under hygienic conditions. It is:

- a) Wholesome, has no added water, preservatives, or other added substances, nor shall any proportion of a natural constituent be removed
- b) Free of extraneous matters like dust, dirt, flies and manure.
- c) Has a normal composition, possesses a natural milk sensory attributes such as flavor and color
- d) Is low in bacterial counts
- e) Is free from hazardous residues such as toxins and veterinary drugs and chemical contaminants
- f) Has a high keeping quality
- g) Has a high commercial value

**Figure 4: Basic platform tests during milk collection from farmers**



The common tests conducted during collection of milk are:

- (a) Organoleptic test
- (b) Density (lactometer) test
- (c) Alcohol test

Raw milk should be collected, transported and delivered without undue delay in a manner that avoids the introduction of contaminants and minimizes the growth of micro-organisms in the milk.

The safe handling of raw milk is based universally on the following two principles:

- I. Avoiding or minimizing contamination at the various stages of handling raw milk
- II. Reducing the growth and activity of the micro-organisms in raw milk.

### **3.2 Regulatory requirements for raw milk handling and transportation**

The requirements for raw milk handling, conveyance and delivery are stipulated in various Kenyan food legislations which include:

#### **i. Laws and regulations**

- a) Public Health Act Cap 242
- b) Dairy industry Act Cap 336
- c) Food, Drugs and Chemical Substances Act Cap 254
- d) Standards Act Cap 496

## ii. Standards and codes of practice

Of relevance to milk production are the following Kenyan standards and code:

- a) Raw cow milk specifications - KS EAS 67:2007
- b) Standard specifications for drinking (potable water) - KS EAS 12
- c) Code of hygienic practice for milk and milk products - KS 1552: 2015

In general, the above laws, regulations and standards require a milk transporter to observe or comply with the following requirements:

### **(a) Hygienic milk handling, conveyance and delivery**

Raw milk should be handled, conveyed and delivered under conditions that minimize contamination from the environment, personnel, vehicle, equipment, containers and related facilities.

### **(b) Certification of milk handlers**

Milk handling personnel should observe good personal hygiene that minimizes the likelihood of contaminating the milk. They should be free from communicable diseases and medically certified. The milk handlers should undergo some basic training on milk testing and hygienic milk handling.

### **Figure 5: Diseases that can be transmitted from milk handlers through milk**



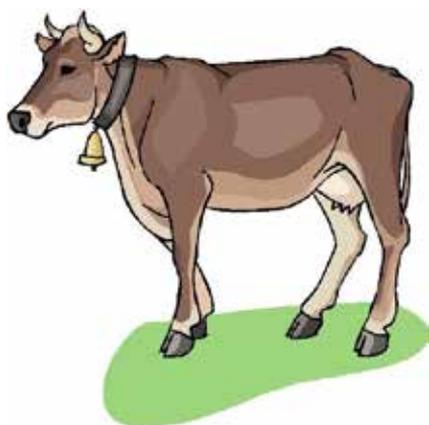
**Milk handlers can contaminate milk with pathogenic micro-organisms which cause the following diseases in humans**

- Typhoid fever
- Hepatitis
- Diarrhea

### (c) Wholesomeness of raw milk

Raw milk is the normal, clean and fresh secretion extracted from the udder of a healthy cow, properly fed and kept, but excluding that got during the first seven days after calving. It should not contain added water, preservatives, or other added substances, nor shall any proportion of a natural constituent be removed.

#### Figure 6: Zoonotic diseases that can be transmitted to humans through milk



The health of dairy animals is a very important consideration because a number of diseases of cattle can be transmitted to milk either directly from the udder or indirectly through the infected body discharges, which may drop, splash or be blown into milk. These include:

- Tuberculosis
- Brucellosis
- Salmonellosis
- Staphylococcal and streptococcal infections

Raw milk shall comply with the following among others

- Minimum of 3.25 % milk fat and 8.50 % milk solids not fat.
- Density at 20 °C shall be within the range of 1.028 g/ml – 1.036 g/ml
- Low bacterial counts not exceeding 2,000,000 CFU/ml
- Low coliform counts not exceeding 50,000 cfu/ml
- Low somatic cell count not exceeding 300 000 per ml
- Be free from pesticides and veterinary drugs residues
- Be free from toxins e.g. aflatoxin M1

In addition, the raw milk should:

- Have a characteristic creamy – white color, free from off flavors and taints
- Be free of objectionable matter
- Not coagulate in the clot on boiling test
- Test negative to the alcohol test
- Test negative for presence of hydrogen peroxide

It should be noted that the standards are dynamic and may change from time to time. Milk dealers are advised to keep abreast with revisions of relevant standards.

#### **(d)Licensing of milk transporters**

Milk transporters are required to be registered and issued with relevant permits where applicable such as the milk carriage permit by Kenya Dairy Board

**Figure 7: Benefits of licensing milk transporters**



#### **Why registration and licensing for milk transporters?**

- For compliance
- Facilitates periodic inspection of conveyance facilities
- For traceability of products
- For certification of products
- Builds consumer confidence in product

## CHAPTER FOUR: APPLICATION OF QUALITY ASSURANCE IN MILK TRANSPORTATION

The quality and safety of raw milk during transportation is influenced by many factors including environment, personnel, equipment, containers, utensils, cleaning and sanitization procedures and time taken to convey the milk to the intended user.

Raw milk should be collected, transported and delivered with minimum alteration of the physical, chemical and microbiological properties. It should be delivered under conditions that minimize exposure to direct sunlight, dust, dirt, flies, insects and other sources of contamination. The design and type of vehicle should ensure that the properties and integrity of raw milk is not compromised during conveyance and delivery.

### Figure 8: Design of milk transport vehicles



#### Design of a milk collection truck

The truck should be open on the sides to facilitate movement of air but should be covered on the top to protect the milk from direct sunlight. This will minimize heating up of the milk which leads to rapid spoilage.

In a closed up carriage, the temperature of the milk rapidly rises leading to spoilage.

In a carriage with no roof the milk is not protected from the warming effects of direct sunlight

Training of personnel involved in milk collection, handling, conveyance and delivery is key in developing the necessary skills to support the implementation of a Quality Assurance System.

Adoption of a robust Quality Assurance System will therefore focus on the whole conveyance process which can be categorized into four broad stages:

- (a) Preparatory stage
- (b) Milk grading, weighing and bulking
- (c) Raw milk conveyance
- (d) Raw milk delivery

In each of the three areas, the following Quality Assurance Practises are recommended.

#### **4.1 Preparatory stage**

Milk transporters should adequately prepare the required containers, testing equipments and reagents and records among others before commencement of the milk collection process. It is important that the milk testing equipment is calibrated as required and reagents standardized for accuracy of test results.

The personnel involved in milk grading and handling should be trained and equipped with the appropriate work attire to minimize chances of contaminating the milk.

**Figure 9: Requirements for milk handling personnel**



**Milk handlers must take all reasonable measures not to compromise the safety and suitability of milk. They should;**

- Report if suffering or suspecting to be suffering from foodborne disease(s)
- Not engage in milk handling if suffering or suspecting to be suffering from food borne disease(s)
- Ensure clothing is of a level of cleanliness that is appropriate for the handling of milk
- Not sneeze, blow or cough over unprotected milk or surfaces likely to come into contact with milk
- Not to spit, smoke or use tobacco or similar preparations in areas in which milk is handled
- Wash hands always before handling milk

On transport, it is important to have a well maintained vehicle to ensure timely delivery of milk.

**Figure 10: Requirements of a bulk raw milk transport tanker**



**Bulk raw milk transport tankers should be appropriately designed, constructed and insulated. The raw milk contact surfaces should be made of stainless steel. It should be cleaned and sanitized before use. Other requirements include:**

- All external valves must be provided with a means of protection against dust, dirt, and road debris
- Cleaning and bactericidal treatment is undertaken of all product contact surfaces including valves, hoses, covers, connections, appurtenances, pumps, and pump compartment before use
- Tanker should be used for the transportation of milk only and appropriately labelled as such
- Permits and licenses are obtained from the relevant authorities

**Table 1: Quality Assurance practices in preparatory storage**

<b>Factors to consider</b>	<b>Risk element</b>	<b>Requirements</b>	<b>Monitoring mechanism</b>	<b>Remedial action (if requirements are not met)</b>	<b>Records</b>
<b>1. Containers and vessels</b>	Contamination of the milk	Surfaces of milk transport containers intended to come in contact with milk should be easy to clean and disinfect, corrosion resistant and not capable of transferring harmful substances to the milk	Physical inspection of containers and vessels	Replace affected containers and vessels	-
<b>2. Personnel</b>	Contagious diseases	Milk handlers should be free of contagious or infectious diseases which may be transferred through the milk or affect the quality of the milk	Physical inspection of milk handling personnel  Medical examination by a certified medical examiner	Relieve infected personnel from milking and milk handling duties  Undertake routine medical examination of milk handlers	Valid medical certificate
	Contamination of the milk	Milk handling personnel should observe personal hygiene, wear suitable protective attire and avoid undesirable behavior during milk handling	Physical inspection of milk handling personnel	Develop and implement a code of conduct or personal hygiene rules for milk handlers  Relieve affected milk handlers from milk handling duties  Provide adequate and appropriate attire	Code of conduct or personal hygiene rules for the milk handlers
<b>3. Transport vehicles</b>	Contamination of the milk	Milk transport vehicles to be conspicuously inscribed with the name and address of the licensed transporter	Physical inspection of milk transport vehicle	Inscribe the name and address of the transporter	-

Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action (if requirements are not met)	Records
		Milk transport vehicles should only carry milk and should have a visible inscription <b>“milk”</b> displayed on lateral sides of the vehicle	Physical inspection of milk transport vehicle	Inscribe the word “milk” as required	-
		Vehicles transporting milk in cans should be designed to allow circulation of air and provide protection from direct sunlight	Physical inspection of milk transport vehicle	Replace or Redesign the vehicle as required	-
		Milk tankers should be insulated, easily cleaned and sanitized and allow for complete drainage	Physical inspection of milk transport vehicle  Rinse and swab tests of the milk contact surfaces	Replace or redesign the vehicle as required	Rinse and swab tests results  Cleaning and sanitization records
		Milk cans, transport tankers should be cleaned and disinfected using approved agents	Physical inspection of cleaning and sanitization process  Rinse and swab tests of milk contact surfaces	Repeat cleaning and sanitization  Review cleaning and sanitization schedule	Cleaning and sanitization records

**Figure 11 Effective hand washing procedure**



**Effective hand washing procedure**

- (a) Moisten hands with water and apply soap
- (b) Rub hands together vigorously until a soapy lather appears, and continue for at least twenty seconds
- (c) Rub areas between fingers, around nail beds, under fingernails, and back of hands.
- (d) Rinse hands under running water, until they are free of soap and dirt.
- (e) Dry hands with the clean, disposable paper or single use cloth towels

**4.2 Milk grading, weighing and bulking**

Milk grading is important as dairy products are only as good as the raw materials from which they were made. It is important that dairy personnel have a knowledge of sensory perception and evaluation techniques.

**Table 2: Quality assurance practices in milk grading, weighing and bulking**

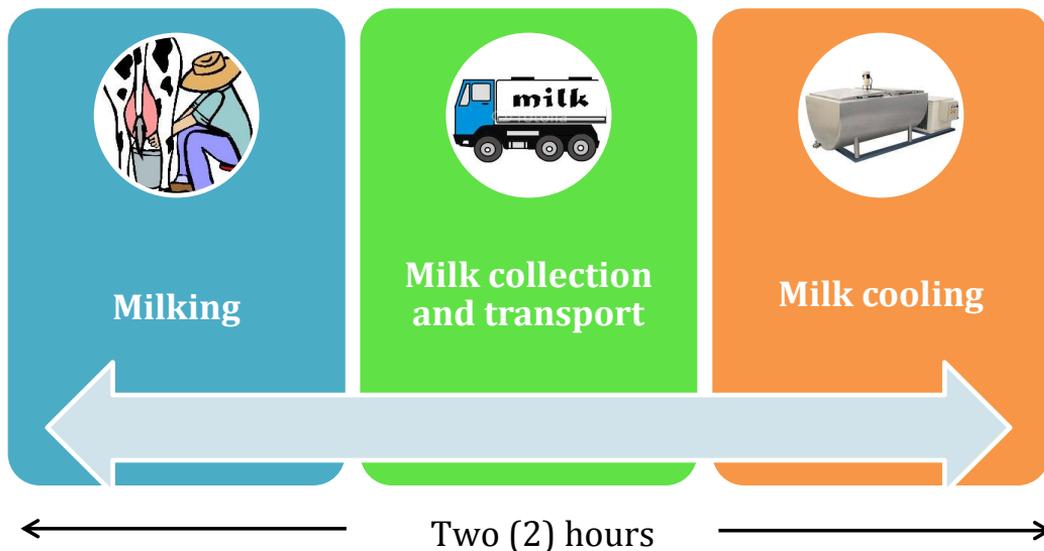
Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action (if requirements are not met)	Records
<b>1 Grading</b>	Poor quality milk	Milk should be tested for wholesomeness before acceptance	Conduct basic platform tests such as <ul style="list-style-type: none"> <li>• Organoleptic test</li> <li>• Density (lactometer)</li> </ul>	Rejection of poor quality milk	Test records for milk

Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action (if requirements are not met)	Records
			reading) <ul style="list-style-type: none"> <li>• Alcohol test</li> <li>• Peroxidase test</li> </ul>		
<b>2 Weighing</b>	Contamination of the milk	Weighing process should not introduce contaminants into the milk	Physical inspection of weighing process	Review the milk weighing process	-
<b>3 Bulking and loading</b>	Contamination of the milk	Bulking process should not contaminate good quality milk	Physical inspection of milk bulking and loading process	Review the bulking process	-
		Bulked milk should be traceable to the individual farmer	Audit of the milk bulking process	Establish traceability system	Supplier and traceability records
	Adulteration of milk	Integrity of the bulk milk should be maintained	Verify that all bulk milk containers are sealed	Seal the bulk milk containers	Sealing records

### 4.3 Raw milk conveyance

Transportation of raw milk should not alter the natural constituents of milk. Care is therefore required in terms of the conditions and time taken from receiving to delivery of the milk. It is emphasized that raw milk should be cooled to four degrees (4 °c) centigrade within two (2) hours of milking; as such, milk collection and transportation should be timed and scheduled to conform to this requirement. Further, transportation distances should be minimized as much as possible. Adequate protection should be provided when the milk is being conveyed to the intended users. These include protection from the physical elements such as direct sunlight, heat and dust.

**Figure 12: Raw milk should be cooled within two hours of**



**Table 3: Quality Assurance Practices in raw milk conveyance**

Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action (if requirements are not met)	Records
<b>1 Time and temperature combination</b>	Milk spoilage	Raw milk should be conveyed to a cooling center within two hours of milking	Time and temperature analysis	Subject the milk to necessary tests and reject if requirements are not met  Review collection schedules and mode of conveyance  Protect the milk from direct sunlight during collection and transportation	Time and temperature records  Milk collection schedule
		Raw milk pre-cooled at the farm should be conveyed to the cooling center without delay	Time and temperature analysis	Subject the milk to necessary tests and reject if requirements are not met  Review collection schedules and mode of conveyance	Time and temperature records  Milk collection schedule

Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action (if requirements are not met)	Records
				Use insulated transport vessels where possible	
<b>2 Environment</b>	Milk spoilage	Milk should be protected from dust, dirt, direct sunlight and other contaminants	Physical inspection of the environment during milk collection and transportation	Subject the milk to necessary tests and reject if requirements are not met  Implement relevant measures to protect the milk from environmental sources of contamination	-

#### 4.4 Raw milk delivery and unloading

The transporter should ensure that the raw milk delivered to the cooling center is intact before unloading. For bulk milk transport vessels, the transporter should verify that the seals are intact. The milk should be tested and received at the cooling center as quickly as possible. In case of unavoidable delays, all possible measures should be taken to protect the milk including parking in the shade while awaiting delivery.

**Table 4: Quality Assurance Practices in raw milk delivery and unloading**

Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action (if requirements are not met)	Records
<b>1. Raw milk is unloaded without delay</b>	Milk spoilage	Raw milk should be unloaded without delay at the cooling centre	Time taken to unload the milk	Protect the raw milk from direct sunlight if there are delays in unloading  Review milk collection and delivery schedules to ensure milk is timely unloaded at the cooling centre	Time and temperature records  Milk collection schedule

## 4.5 Milk testing

Milk testing and quality control is an essential component in the dairy value chain.

**Table 5: Tests that can be conducted at the farm**

Type of test	Procedure	Judgement
<p><b>(a) Organoleptic test</b> Permits rapid segregation of poor quality milk. No equipment is required, but a good sense of sight, smell and taste.</p>	<ul style="list-style-type: none"> <li>• Open a can of milk</li> <li>• Immediately smell the milk</li> <li>• Observe the appearance of the milk</li> <li>• Look at the can lid and the milk can to check cleanliness</li> </ul>	<p>Discard milk that has abnormal smell and has visible dirt</p>
<p><b>(b) The Lactometer test</b> Milk has a specific gravity. When it's adulterated with water or other materials the density of milk changes from its normal value to abnormal.</p>	<ul style="list-style-type: none"> <li>• Mix the milk sample gently and pour it gently into a measuring cylinder</li> <li>• Let the Lactometer sink slowly into the milk.</li> <li>• Read and record the last Lactometer degree (°L) just above the surface of the milk.</li> <li>• If the temperature of the milk is different from the calibration temperature of the lactometer (usually 20 degrees centigrade), calculate the temperature correction</li> <li>• For each degree centigrade above the calibration temperature add 0.2°L; for each degree centigrade below calibration temperature subtract 0.2 °L from the recorded lactometer reading</li> </ul>	<p>Discard milk that has a density below 1.028g/ml and that above 1.036g.ml</p>
<p><b>(c) The Alcohol Test</b> The test is quick</p>	<ul style="list-style-type: none"> <li>• Mix equal amounts of milk and 68% of ethanol solution in a small bottle or test</li> </ul>	<p>If milk is of good quality, there will be no coagulation,</p>

<b>Type of test</b>	<b>Procedure</b>	<b>Judgement</b>
and simple. It is based on instability of the milk proteins	tube. <ul style="list-style-type: none"><li data-bbox="474 215 790 277">• Observe the milk for coagulation</li></ul>	clotting or precipitation,

## CHAPTER 4: SELF-ASSESSMENT GUIDELINES FOR SAFE TRANSPORTATION OF RAW MILK

In order to evaluate whether the milk transportation Quality Assurance System is effectively in place and working as desired, it is critical to routinely conduct a self-assessment.

Self-assessment is a rapid tool for internal appraisal that can give reliable results on the level of achievement of the Quality Assurance System in place. This evaluation will provide a framework and input to regulatory surveillance and support. It also provides a mechanism for continuous improvement of the QAS. The tool promotes confidence build up for market access and elevates the transporter's profile as a reliable purveyor of quality and safe milk.

This can be done using a simple checklist as recommended below.

**Table 6: Self-assessment guideline for milk bulking and cooling centers**

Consideration	Requirements	Assessment criteria	Requirements met?	
			Yes	No
<b>1. Preparatory stage of milk collection, conveyance and delivery</b>				
<b>1.1 Containers and vessels</b>	Milk containers and vessels are easy to clean and disinfect, corrosion resistant and do not transfer harmful substances to the milk	Physical inspection of containers and vessels		
<b>1.2 Personnel</b>	Milk handlers are free of contagious or infectious diseases	Physical inspection of milk handlers		
		Medical examination of milk handlers		
	Milk handling personnel observe personal hygiene, wear suitable protective attire and avoid undesirable behavior	Physical inspection of milk handlers		
<b>1.3 Transport vehicles</b>	Milk transport vehicles are conspicuously inscribed with name and address of the transporter	Physical inspection of milk transport vehicles		
	Milk transport vehicles carry milk	Physical inspection		

Consideration	Requirements	Assessment criteria	Requirements met?	
			Yes	No
	only and have a visible inscription “milk” displayed on lateral sides of the vehicle	of milk transport vehicles		
	Vehicles transporting milk in cans allow circulation of air and provide protection from direct sunlight	Physical inspection of milk transport vehicles		
	Milk tankers are insulated and can be easily cleaned, sanitized and allow complete drainage	Physical inspection of milk tankers		
	Milk containers, vessels and utensils are cleaned and disinfected using approved agents	Physical inspection of cleaning process		
		Rinse and swab tests of milk contact surfaces are conducted		
<b>2. Milk weighing, grading and bulking</b>				
2.1 Grading	Milk is tested for wholesomeness before acceptance	Organoleptic test conducted		
		Density test conducted		
		Alcohol test conducted		
		Peroxidase test conducted		
		PH test conducted		
2.2 Weighing	Weighing process does not contaminate the milk	Physical inspection of weighing process		
2.3 Bulking and loading	Bulking process does not contaminate the milk	Physical inspection of bulking and loading process		
	Bulked milk is traceable to the individual farmer	Audit of the bulking process		
	Integrity of the bulk milk is maintained	Bulk milk in tankers is sealed		
<b>3. Raw milk conveyance</b>				
3.1 Time and temperature combination	Raw milk conveyed to a cooling center within two hours of milking	Time and temperature record analysis		
	Raw milk pre-cooled at the farm should be conveyed to the cooling center without delay	Time and temperature record analysis		
3.2 Environment	Milk protected from dust, dirt, direct sunlight and other contaminants	Physical inspection of the environment		

Consideration	Requirements	Assessment criteria	Requirements met?	
			Yes	No
<b>4. Raw milk delivery</b>				
3.3 Raw milk delivery	Integrity of the milk is verified before off-loading	Seal verification		
<b>5. Customer feedback</b>				
<b>5.1 Handling of customer feedback and complaints</b>	There is a mechanism to receive and respond to customer complaints or feedback	Physical verification		
	Customer complaints are addressed on time	Physical verification		

## REFERENCES

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Ministry of Agriculture  
Livestock and Fisheries



Investing in rural people



Smallholder Dairy Commercialization Programme (SDCP) is a jointly funded programme by the Government of the Republic of Kenya (GOK) and the International Fund for Agricultural Development (IFAD) and beneficiary communities.

The Overall goal of the programme is to increase the income of poor rural households that depend substantially on production and trade of dairy products for their livelihood.