

# MINISTRY OF AGRICULTURE, LIVESTOCK & FISHERIES



SMALLHOLDER DAIRY COMMERCIALIZATION PROGRAMME

## MODULE III



# QUALITY ASSURANCE GUIDE FOR MILK BULKING AND COOLING CENTERS



This guide is intended to assist milk bulking and cooling centres to receive, handle and deliver quality and safe raw milk that complies with regulatory and market requirements through the application of Quality Assurance Systems in milk bulking and cooling.

Like any other business, milk bulking and cooling centers 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

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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.

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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% to and 4.5% of 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.

Milk production 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. There are approximately 465 dairy farmer groups in Kenya that undertake collection and bulking of raw milk.

Adoption of Good Manufacturing Practices (GMP) and Quality Assurance Systems (QAS) in milk collection and bulking is essential in improving the quality and safety of 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 bulking and cooling centers 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>CIP</b>	Cleaning In Place
<b>DTI</b>	Dairy Training Institute
<b>GDP</b>	Gross Domestic Product
<b>GOK</b>	Government of Kenya
<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 Development
<b>QA</b>	Quality Assurance
<b>QAM</b>	Quality Assurance Manual
<b>QAP</b>	Quality Assurance Practices
<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 bulking and cooling centers to receive, cool and market quality and safe chilled raw milk that meets regulatory requirements for milk processing. These requirements include the physical, chemical and microbiological specifications for raw milk as provided by the relevant Kenyan standards.

The guide will provide a framework for good milk handling practices including establishing preventive and control mechanisms and maintaining proper documentation during milk collection and bulking.

## 1.2 Objectives

The guide will enable milk bulking and cooling centers to handle and market quality and safe chilled raw milk through:

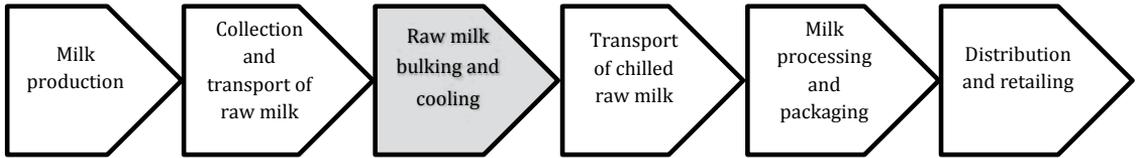
- (a) Identification of the requirements for milk bulking and cooling
- (b) Adoption of best practices in milk bulking and cooling
- (c) Identification of the causes of poor quality milk
- (d) Determination and implementation of preventive and corrective actions for quality management
- (e) Establishment and administration of quality assurance self-assessment tool
- (f) Proper documentation

## 1.3 Scope

This guide covers bulking and cooling of raw milk, from reception to cooling and dispatch to the market. 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**

This guide is presented in four chapters covering the following in bulking, cooling and dispatch of milk:

- (a) Introduction to Quality Assurance Systems
- (b) Quality and safety requirements in milk bulking
- (c) Application of Quality Assurance in milk bulking
- (d) Self-assessment guidelines to evaluate Quality Assurance Practices in quality and safe milk bulking, cooling and dispatch

# **CHAPTER TWO: INTRODUCTION TO QUALITY ASSURANCE SYSTEMS IN MILK BULKING AND COOLING**

## **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 immediate cooling of raw milk to four degrees centigrade will maintain the integrity of the raw milk. Good handling practices to minimize contamination of the milk are required and should be implemented.

## **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 bulking, cooling and dispatch, Quality Assurance entails identification, implementation and documentation of relevant activities that will lead to acceptance, cooling and dispatch of quality and safe milk that complies with statutory and market requirements.

## **2.3 What is 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 bulking, cooling and dispatch, such a system will help in establishing methods and practices essential for assuring the quality and safety of incoming raw milk and dispatch of quality and safe chilled milk that consistently complies with statutory and market requirements.

In practice, there are several types of QAS that are applicable in milk bulking and cooling such as:

- ISO 9001 Quality Management System
- ISO 22000 Food Safety Management System
- Hazard Analysis Critical Control Points (HACCP)
- Good Agricultural Practises (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
- Continious improvement

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

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

The components of a QA system in in milk bulking, cooling and dispatch can be grouped into three levels, namely;

- (a) The top level commitment by bulking and cooling center to meet statutory and market requirements in handling and marketing of raw milk.
- (b) The operational level which involves establishing, implementing and documenting methods and practices for assuring quality and safe raw milk is received, cooled and dispatched.
- (c) The assessment stage where the effectiveness of the QA System in meeting the desired goals is evaluated and remedial actions to improve the system 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 the 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 being provided under the QAS and provides an understanding of the processes affecting quality of the product.

The manual also describes:

- The organization
- The scope of the QAS
- The organization's quality policies which shows that the organization is committed to providing quality products

- The product and its specifications
- The processes involved in the production of the product

The QAM for a milk cooling and bulking center will among other things provide a brief profile of the organization, the commodity addressed (raw milk in this case), the product quality objectives (which is to receive, cool and dispatch quality and safe milk that meets regulatory and market requirements) and the processes involved in receiving, handling, cooling and dispatch of the product.

**(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 bulking and cooling of raw milk, QAP may be required for the following processes among others;

- Reception and cooling of milk
- Dispatch 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 a milk bulking and cooling center ensure personnel follow the correct procedures in bulking and cooling of raw milk and may cover the following activities among others

- Milk sampling and testing
- Milk Chilling
- Cleaning of cans, containers and equipments

- Tanker loading and dispatch

#### **(d) Quality Records:**

Are the documented evidences that processes are executed according to the QA plan and requirements. Such records include:

- Raw milk analytical and test results
- Cleaning and sanitization records
- Equipment maintenance records
- Customer complaints
- Product recalls
- Approved supplier records
- Pest management records
- Staff training records
- Equipment maintenance and calibration records
- Building maintenance records

#### **Figure 3: Benefits of record keeping in milk bulking**



#### **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 bulking, cooling and dispatch**

A well designed and implemented QA system at milk bulking, cooling and dispatch 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 market 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) Establish traceability and recall mechanism for the product where necessary
- (j) Overall contribute to increased operational efficiency and profitability of the enterprise

# **CHAPTER THREE: QUALITY AND SAFETY REQUIREMENTS AT MILK BULKING AND COOLING CENTERS**

## **3.1 Quality and safety objectives in milk bulking, cooling and dispatch**

The objective of a milk bulking and cooling center is to receive, cool and dispatch quality and safe chilled raw milk to the market. This refers to raw milk obtained from healthy animals that has been produced, handled and delivered to the bulking and cooling center under hygienic conditions. It is:

- (a) Wholesome, has no added water, preservatives, or other added substances, nor is any proportion of a natural constituent 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 bacteria 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

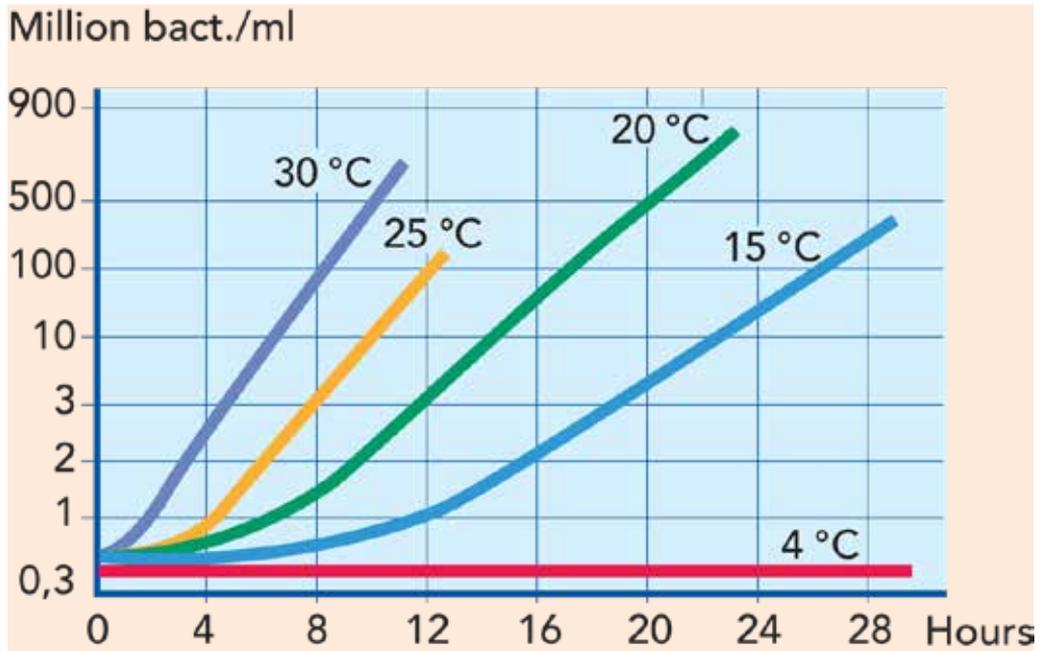
Raw milk should be received, cooled and dispatched to the market in a manner that avoids the introduction of contaminants and minimizes the growth of micro-organisms in the milk.

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

- (a) Avoiding or minimizing contamination at the various stages of handling raw milk

- (b) Reducing the growth and activity of the micro-organisms in raw milk.

**Figure 4: Bacteria rapidly multiply when milk is stored under high temperatures**



### **3.2 Regulatory requirements for raw milk bulking and cooling**

The requirements for raw milk bulking and cooling 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

(e) Animal Disease Act Cap 364

## **II. Standards and codes of practice**

Of relevance to milk bulking and cooling 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 bulking and cooling center to observe or comply with the following requirements:

### **(a) Hygienic milk bulking and cooling**

Raw milk should be handled, cooled and dispatched 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 hygiene 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
- Scarlet fever
- 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 shall not contain added water, preservatives, or other added substances, nor shall any proportion of a natural constituent be removed.

Raw milk should comply with the following specifications among others (it should be noted that standards are dynamic and may change from time to time. Milk dealers are advised to keep abreast with revisions of the relevant standards).

- 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 200,000 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 and be free from off flavors and taints
- Be free of objectionable matter
- Not coagulate on the clot on boiling test
- Test negative to the alcohol test
- Test negative for presence of hydrogen peroxide

Cooling of raw milk to four degrees centigrade preserves the integrity of the milk by retarding microbiological and chemical changes. Instant cooling is preferable. Batch milk coolers should be efficient in cooling the raw milk to the desired temperatures within a short time.

### **Figure 6: Requirements of batch milk coolers**



#### **Requirements for batch milk coolers**

- Product contact surfaces should be of food grade material, easy to clean and corrosion resistant
- Provide agitation of the raw milk
- Have a temperature monitoring device
- Installed and protected from possible sources of contamination such as overhead utility lines
- Piping should be of food grade material and self-draining
- Provided with CIP or easily accessible for manual cleaning

#### **(d)Licensing of milk bulking and cooling**

Milk bulking and cooling centers are required to obtain relevant licenses and permits from the relevant authorities before commencement of business. These include those issued by Kenya Dairy Board and County Governments.

Persons in charge of milk bulking and cooling centers are required to have a minimum qualification of a certificate in a dairy related field and licensed to manage the facility by Kenya Dairy Board.

**Figure 7: Importance of licensing of milk bulking and cooling centers**



#### **Why registration and licensing of milk bulking and cooling centers?**

- For compliance
- Facilitates periodic inspection of production facility
- For traceability of products
- For certification of products
- Builds consumer confidence in product

# **CHAPTER FOUR: IMPLEMENTATION OF QUALITY ASSURANCE IN MILK BULKING AND COOLING CENTER**

## **4.1 Background**

The quality and safety of raw milk handled by bulking and cooling centers is influenced by many factors including environment, personnel, equipment, containers, utensils, cleaning and sanitization procedures and time taken to dispatch the milk to the market.

Raw milk should be handled, cooled and dispatched under conditions that minimize microbial growth. Further, the milk should be handled under conditions that minimize exposure to dust, dirt, flies, insects and other sources of contamination. The design and type of the cooling system should ensure that the temperature of the raw milk is brought to 4 degrees centigrade within two hours and that the properties and integrity of the milk is not compromised. Instant chillers, where possible, are recommended.

Training of personnel involved in milk bulking and cooling and farmer extension and advisory services is key in developing the necessary skills to support the implementation of a Quality Assurance System.

Adoption of a robust QAS will therefore focus on the whole milk bulking and cooling process which can be categorized into three broad stages:

- (a) Preparatory stage
- (b) Milk reception, bulking and cooling
- (c) Chilled raw milk dispatch

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

## 4.2 Preparatory stage

Milk bulking and cooling centers should adequately prepare the required equipments, containers, testing equipments and reagents and records among others before reception of raw milk. It is important that the milk testing equipment is calibrated as required and reagents standardized for accuracy of test results.

### Figure 8: Requirements for milk bulking and cooling premises



#### Premises used to bulk and cool milk are required to:

- Be suitably located from potential sources of contamination
- Have self-draining impervious floors
- Walls to be finished in a smooth easily cleanable surface material
- Have adequate lighting and ventilation
- Have adequate supply of potable water
- Be adequately protected from vermin and rodents
- Have adequate sanitary facilities including toilets and hand washing and sanitizing facilities

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.

The water used to clean equipments, containers and facilities should be adequate and meet the requirements for potable water. The choice of the cleaning and sanitizing agent and the cleaning program should be well considered to eliminate possibility of residues which may contaminate the product and render it unwholesome.

**Table 1: Recommended QA practices in preparatory stage of milk bulking and cooling**

Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action if requirements are not met	Records
1 Containers and vessels	Contamination of the milk	Surfaces of milk 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  Rinse and swab tests of product contact surfaces	Replace affected containers and vessels	Rinse and swab test results
		Immediate cleaning and disinfection of the containers after unloading of the milk	Physical inspection  Rinse and swab tests of product contact surfaces	Provide container and vessel cleaning facilities after unloading of milk	Rinse and swab test results
2 Milk receiving and cooling system	Contamination of the milk	The milk receiving and cooling system in contact with milk will be easy to clean and disinfect, corrosion resistant and not capable of transferring harmful substances to the milk	Physical inspection  Rinse and swab tests of product contact surfaces	Maintain, repair and replace affected parts or units	Rinse and swab test results

<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>
		The cooling media should be food grade and should not come into contact with the milk	Physical inspection  Test for leakages of the refrigerant	Repair leakages of the refrigerant	Maintenance records
<b>3</b> Cleaning and sanitization programs	Contamination of the milk	The cleaning and disinfecting agents should be effective, safe and easily rinsed.	Physical inspection  Rinse and swab tests of product contact surfaces  Cleaning efficiency tests	Replace reagents  Review cleaning and sanitization program	Rinse and swab test results  Results of cleaning efficiency tests
<b>4</b> Personnel	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 milking personnel  Medical examination of milk handlers by a certified medical examiner	Relieve infected personnel from milk handling duties	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 personal hygiene rules for milk handlers  Relieve affected milk handlers from milk handling duties  Provide adequate and appropriate attire and sanitary	Personal hygiene rules for milk handlers

<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>
				facilities	
<b>5</b> Water	Contamination of the milk	Adequate and clean potable water for cleaning of equipments, facilities, utensils and containers which complies with Kenyan specification for potable water	Physical inspection of water sources for absence of foreign matter  Testing the quality of the water	Water treatment including sedimentation, filtration and chlorination  Protect water sources from possible contamination  Source water from approved suppliers	Water treatment records  Water quality test results
<b>6</b> Premise	Contamination of milk	Premise should be suitably located from sources of contamination	Physical inspection of premise and surroundings	Take appropriate action to manage the source of contamination  Relocate the premise	-
		The floors, walls and ceilings should be impervious, easy to clean and sanitize	Physical inspection	Renovate as required	-
		The premise should have adequate and protected lighting and ventilation	Physical inspection	Renovate as required	-
		Premise has adequate hand washing and sanitization facilities	Physical inspection	Install hand washing and sanitization facilities  Provide consumables such as soap and sanitizers	-
		Adequate and clean toilet and sanitary facilities should provided	Physical inspection	Provide adequate facilities as required	-

Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action if requirements are not met	Records
		Premise should be designed to prevent cross contamination of milk	Physical inspection	Control of human movement  Provision of footbaths, screens and other protective measures  Segregation of areas for different activities	-
7 Waste management	Contamination of milk and spread of contagious and infectious diseases	Liquid and solid waste should be treated and disposed in accordance with the relevant regulations	Physical inspection	Comply with the relevant regulations	Waste treatment and disposal records

**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

### 4.3 Milk reception, bulking and cooling

Every milk bulking and cooling center should be adequately equipped to test the quality of raw milk at the first point of delivery to quickly determine the suitability of the milk for cooling and processing. The tests include the assessment of the extent of abnormalities and adulteration in the milk including water, preservatives or inhibitory substances.

The center should have competent person to carry out the necessary tests for quality assessment of incoming milk.

#### **Figure 10: Common tests during milk reception at bulking and cooling centers**



Milk bulking and cooling centers should be equipped to test for the quality of incoming raw milk. It is very important that the sampling of milk is done correctly and hygienically to ensure that sample is representative of the bulk milk. Common platform tests conducted during milk reception are:

- Organoleptic test
- Density (lactometer) tests
- Alcohol test
- 10 minute resazurin test

Testing for preservatives, contaminants and residues in milk should be routinely conducted, internally or externally. Rapid testing kits can be used for this purpose.

**Table 2: Recommended QA practices at milk reception, bulking and cooling stage**

<b>Factors to consider</b>	<b>Risk element</b>	<b>Requirements</b>	<b>Monitoring mechanism</b>	<b>Remedial action</b>	<b>Records</b>
<b>1</b> Grading	Poor quality of milk	Milk should be tested for wholesomeness before acceptance	Conduct platform tests including; <ul style="list-style-type: none"> <li>- Organoleptic tests</li> <li>- Density test-</li> <li>- Alcohol test</li> <li>- Peroxidase test</li> <li>- Titratable acidity</li> <li>- 10 minute resazurin test</li> <li>- Sediment tests</li> <li>- ph test</li> <li>- Tests for preservatives and antibiotics</li> </ul>	Rejection of poor quality milk  Extension follow-up for affected suppliers	Test records  Milk rejection records
<b>2</b> Weighing	Contamination of the milk	Weighing process should not introduce contaminants into the milk	Physical inspection	Review the weighing process and implement preventive and corrective actions	-
<b>3</b> Bulking and cooling	Contamination and spoilage of the milk	Bulking process should not contaminate good quality milk	Physical inspection	Review the bulking process and implement preventive and corrective actions	-
		Bulked milk should be traceable to the individual farmer	Audit of the milk bulking process	Establish traceability system	Documented traceability system
		Cooling of the bulked milk to four degrees centigrade within two hours	Temperature and time records analysis	Repair or replace the milk cooling system  Calibration of temperature and time measuring devices	Temperature and time records  Calibration records

Factors to consider	Risk element	Requirements	Monitoring mechanism	Remedial action	Records
		Maintain the milk at four degrees centigrade	Temperature and time monitoring  Routinely monitor the quality of the milk	Repair or replace the milk cooling system  Dispose poor quality milk	Milk quality tests results  Temperature records  Milk disposal records

**Table 3: Platform tests for milk during reception**

Type of test	Procedure	Judgement
<p><b>(a) Organoleptic test</b></p> <p>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>- Inspect the can and lid for cleanliness</li> </ul>	Discard milk that has abnormal smell and has visible dirt
<p><b>(b) The Lactometer test</b></p> <p>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. The lactometer test is designed to detect for changes in the density milk.</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. For each degree centigrade above the calibration</li> </ul>	Discard milk that has a density below 1.028g/ml and that above 1.036g.ml

Type of test	Procedure	Judgement
	temperature add 0.2°L; for each degree centigrade below calibration temperature subtract 0.2 °L from the recorded lactometer reading	
<b>(c) The Alcohol Test</b>  The test is quick and simple. It is based on instability of the milk proteins	<ul style="list-style-type: none"> <li>- Mix equal amounts of milk and 68% of ethanol solution in a small bottle or test tube.</li> <li>- Observe the milk for coagulation</li> </ul>	If milk is of good quality, there will be no coagulation, clotting or precipitation,
<b>(d) 10 minute resazurin test</b> Used to test for the hygiene and the potential keeping quality of raw milk.	<ul style="list-style-type: none"> <li>- The solution of Resazurin as prepared by adding one tablet to 50 mls of distilled sterile water. Rasazurin solution must not be exposed to sunlight, and it should not be used for more than eight hours.</li> <li>- Add one ml of resazurin solution to a sample of the milk in a clean test tube and mix gently</li> <li>- Incubate the milk and resazurin mixture in a water bath for 10 minutes</li> <li>- Record the readings using a lovebird comparator</li> </ul>	Accept milk with resazurin reading of between 4 and 6
<b>(e) Titratable acidity</b> The titratable acidity test is used for quantifying the acidity in milk.	<ul style="list-style-type: none"> <li>- Pipette 9 ml of sample into a porcelain dish.</li> <li>- Add 3 drops of phenolphthalein indicator into the milk</li> <li>- Carefully add 0.1 n sodium hydroxide solution drop by drop from the burette while agitating the milk until a pink colour appears.</li> </ul>	<ul style="list-style-type: none"> <li>- Divide the reading by 10, which give the result in % of lactic acid.</li> <li>- If the reading is above 0,16%, reject the milk</li> </ul>

Type of test	Procedure	Judgement
	<ul style="list-style-type: none"> <li>- Read off from the column of the burette the volume of sodium hydroxide solution consumed.</li> </ul>	

#### 4.4 Dispatch of chilled raw milk

Upon chilling, the raw milk is ready for dispatch to the market. The method and manner of loading and dispatch should maintain the integrity of the milk by preventing post cooling contamination and without breaking the cold chain. Dispatching the chilled milk using bulk milk transport vessels is recommended as it will minimize chances of contamination during loading and transit.

Bulk milk transport vessels should be designed so that they can effectively be cleaned and disinfected and completely drainage. They should be used exclusively to transport milk and labelled as such. Drivers of such vehicles should observe time, personnel hygiene and undergo routine medical examination

**Figure 11: Requirements for flexible hoses used in transferring milk during loading**



Flexible hoses used to transfer raw milk during loading and unloading should be sanitary and made of food grade material. They should be properly cleaned and sanitized using a Cleaning in Place (CIP) system

**Table 4: Recommended QA practices at milk reception, bulking and cooling stage**

<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>
1. Milk tankers and containers	Contamination of milk	The tankers and containers should be clean and sanitized	Physical inspection of milk tankers and containers  Refer to cleaning records for tankers and containers	Clean, disinfect and rinse the milk tankers and containers	Cleaning records
2. Loading of chilled milk	Contamination of milk	Loading process should not contaminate the milk	Physical inspection	Review and improve the milk loading process	-
		Milk transfer hose should be clean and made of food grade material	Physical inspection  Rinse and swab tests for the transfer hose	Clean, disinfect and rinse the hose  Replace with a food grade hose or piping	Rinse and swab tests results

**Figure 11: Requirements for bulk milk tankers**



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 should be obtained from the relevant authorities and displayed at all times

# CHAPTER FIVE: SELF-ASSESSMENT GUIDELINES FOR MILK BULKING AND COOLING CENTERS

In order to evaluate whether the milk bulking and cooling 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 QAS in place. This evaluation will also provide a framework and input to regulatory surveillance and support. It also provides a mechanism for continuous improvement of QAS.

The tool promotes confidence build up for market access and elevates the profile of the milk bulking and cooling center as a reliable source of quality and safe chilled raw milk.

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

**Table 5: Self-assessment guideline for milk bulking and cooling centers**

Consideration	Requirements	Assessment criteria	Requirements met?	
			Yes	No
<b>1. Preparatory stage of milk bulking and cooling</b>				
<b>1.1 Milk containers and cans</b>	Milk tankers and containers are easy to clean and disinfect, corrosion resistant and do not transfer harmful substances to the milk	Physical inspection		
	Facilities for cleaning and sanitizing the milk tankers and containers are provided	Physical inspection		

Consideration	Requirements	Assessment criteria	Requirements met?	
			Yes	No
<b>1.2 Milk reception and cooling system</b>	The system is easy to clean and disinfect, corrosion resistant and not capable of transferring harmful substances to the milk	Physical inspection		
	The cooling media does not come into contact with the milk	Physical inspection		
<b>1.3 Cleaning and sanitization programs</b>	The cleaning and disinfecting agents are effective, safe and easily rinsed	Physical inspection		
		Rinse and swab tests are conducted		
		Cleaning efficiency tests are conducted		
<b>1.4 Personnel</b>	Milk handling personnel observe personal hygiene, wear suitable protective attire and avoid undesirable behavior	Physical inspection		
		Medical examination of milk handlers is done		
	The personnel in charge of the cooling center is competent and licensed to manage the facility	Dairy manager's license has been issued by Kenya Dairy Board		
<b>1.5 Water</b>	Adequate and clean potable water for cleaning is available	Physical inspection		
		Water quality is routinely testing		
<b>1.6 Premise</b>	Premise is suitably located from sources of contamination	Physical examination		
	The floors, walls and ceilings are impervious, easy to clean and sanitize.	Physical inspection		

Consideration	Requirements	Assessment criteria	Requirements met?	
			Yes	No
	The premise has adequate and protected lighting and ventilation	Physical inspection		
	Premise has adequate hand washing and sanitization facilities	Physical inspection		
	Premise has adequate and clean toilet and sanitary facilities	Physical inspection		
	Premise designed to prevent from cross contamination of milk	Physical inspection		
	Liquid and solid waste is treated and disposed in accordance with the relevant local regulations	Physical inspection		
<b>2. Milk reception, bulking and cooling</b>				
<b>2.1 Grading</b>	Milk is tested for wholesomeness before acceptance	Organoleptic test		
		Density test - lactometer test		
		Alcohol test		
		Peroxidase test		
		Titrateable acidity		
		The 10 minute resazurin test		
		The sediment test		
		Determination of PH		
		Determination of preservatives and antibiotics		
<b>2.2 Weighing</b>	Weighing process does not introduce contaminants into the milk	Visual inspection		

Consideration	Requirements	Assessment criteria	Requirements met?	
			Yes	No
<b>2.3 Bulking and cooling</b>	Bulking process does not contaminate good quality milk	Physical inspection		
	Bulked milk is traceable to the suppliers	Audit of the bulking process		
	Bulked milk is cooled to four degrees centigrade within two hours	Temperature and time monitoring		
	Bulk milk is maintained at four degrees during storage and routinely sampled for quality	Temperature and time monitoring		
		Testing of the milk is conducted routinely		
<b>3. Dispatch of raw milk</b>				
<b>3.1 Milk tankers and containers</b>	The milk tankers and containers are clean and sanitized	Physical inspection		
<b>3.2 Loading of chilled milk</b>	Loading process does not contaminate the milk	Physical inspection		
	Milk transfer hose is clean and made of food grade material	Physical inspection		
		Rinse and swab tests are routinely conducted		
<b>4. Customer feedback</b>				
<b>4.1 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

- (a) Public Health Act Cap 242, laws of Kenya
- (b) Food, Drugs and Chemical Substances Act Cap 254, laws of Kenya
- (c) Dairy Industry Act Cap 336, laws of Kenya
- (d) Draft Dairy Regulations 2017
- (e) Standards Act Cap 496, laws of Kenya
- (f) Kenyan Specifications for raw cow milk, KS EAS 67:2007
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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.