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Final Thesis

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Implementation of ISO 9001 Management System process approach in a dairy farm

Presented by :
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In expressing my gratitude, I strive to maintain a humble perspective, recognizing that any achievements or merits are not solely my own. I am but a humble servant, and any positive outcomes are a reflection of the Almighty's blessings and the grace bestowed upon me. It is with a deep sense of humility that I offer my thanks, understanding that true success and fulfillment come from aligning our efforts with the will and wisdom of Allah.

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Declaration on Honor

I, the undersigned, **BOUKHATEM AMEL SABRINE**, declare that I'm fully aware that plagiarism of documents or part of a document published in any form, including on the internet, constitutes a violation of copyrights and an act of fraud. Consequently, I commit to citing all sources that I used to write this thesis.

Signature

Dedication

To my beloved mother, KHATTOU Riala, who is no longer with us. Your unwavering love, guidance, and support continue to inspire me every day. This work is dedicated to your memory, with all my love and gratitude. You are always in my heart.

To my beloved father, thank you for your unwavering encouragement and for compelling me to pursue higher education.

I am forever grateful to my dear aunt for her kindness, generosity, and unconditional love, without which I would not be where I am today.

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To my dear friends, thank you for making these five years of university a truly pleasant and memorable experience.

Finally, I dedicate this work to the Palestinian people, especially those in Gaza, who are enduring the hardships of war and starvation. Your faith and endurance have been a profound inspiration, and I am committed to making food security a top priority, in the hope that I may one day be able to contribute to alleviating your suffering.

Résumé

Les normes de qualité ISO 9001 favorisent une approche orientée processus pour la gestion des systèmes organisationnels, offrant un cadre structuré pour atteindre efficacement les objectifs. Cette méthode implique l'identification et la gestion d'activités interconnectées en tant que processus, optimisant les opérations, assurant une qualité constante, gérant les risques de manière proactive, favorisant l'amélioration continue, renforçant la satisfaction client et facilitant la conformité réglementaire. Elle permet aux organisations de fonctionner en douceur, de s'adapter rapidement aux changements et de poursuivre durablement le succès.

Cette étude a appliqué l'approche processus au sein d'une ferme laitière lors de rotations cliniques rurales à l'ENSV. En utilisant des méthodes d'observation, les pratiques des agriculteurs ont été documentées. Le processus d'approvisionnement en bétail commence par la spécification des besoins des agriculteurs pour les nouveaux bovins, suivie d'activités exhaustives garantissant le bien-être animal, la nutrition, la gestion sanitaire et le contrôle des déchets. Ces pratiques sont cruciales pour le développement sain du bétail, les préparant à la production laitière et à l'élevage des veaux. Le processus de reproduction, essentiel pour la lactation, implique une sélection minutieuse et une gestion soigneuse de l'insémination artificielle. Après le vêlage, les vaches subissent une traite systématique pour collecter le lait. Les nouveau-nés entament un processus d'élevage axé sur le sevrage, les mâles étant vendus par commercialisation.

Nos conclusions ont identifié des opportunités d'amélioration en matière de bien-être animal, de nutrition, de gestion sanitaire et de contrôle des déchets. Nous avons proposé des ajustements abordables et des pratiques de gestion pour atteindre les normes minimales de qualité. L'application de l'approche processus facilite l'identification des lacunes de gestion et soutient les efforts d'amélioration continus dans les opérations de la ferme.

Mots clés : ISO 9001, approche processus, bien-être animal, processus de traite, gestion de ferme

Abstract

ISO 9001 quality standards promote a process-oriented approach to managing organizational systems, offering a structured framework for efficient goal attainment. This method involves identifying and managing interconnected activities as processes, optimizing operations, ensuring consistent quality, managing risks proactively, fostering continuous improvement, enhancing customer satisfaction, and facilitating regulatory compliance. It enables organizations to operate smoothly, adapt swiftly to changes, and sustainably pursue success.

This study applied the process approach within a dairy farm during rural clinical rotations at ENSV. Using observational methods, farmers' practices were documented. The Cattle Procurement Process begins with farmers specifying requirements for new cattle, followed by comprehensive activities ensuring animal welfare, nutrition, health management, and waste control. These practices are crucial for the healthy development of cattle, preparing them for milk production and calf rearing. The breeding process, essential for lactation, involves meticulous selection and careful management of artificial insemination. Post-calving, cows undergo systematic milking to collect milk. Newborn calves enter a rearing process focused on weaning, with males sold through commercialization.

Our findings identified opportunities for improvement in animal welfare, nutrition, health management, and waste control. We proposed affordable adjustments and management practices to achieve minimum quality standards. Employing the process approach facilitates identifying management gaps and supports ongoing improvement efforts in farm operations.

Key words: ISO 9001, process approach, animal welfare, milking process, farm management

ملخص

تعزز معايير جودة ISO 9001 نهجًا موجهًا نحو العمليات لإدارة الأنظمة التنظيمية، مما يوفر إطارًا منظمًا لتحقيق الأهداف بكفاءة. تشمل هذه الطريقة تحديد وإدارة الأنشطة المترابطة كعمليات، مما يحسن العمليات، ويضمن الجودة المتسقة، ويدير المخاطر بشكل استباقي، ويعزز التحسين المستمر، ويعزز رضا العملاء، ويسهل الامتثال التنظيمي. يمكن للمنظمات أن تعمل بسلاسة، وتتكيف بسرعة مع التغييرات، وتسعى بشكل مستدام نحو النجاح.

طبقت هذه الدراسة نهج العملية داخل مزرعة أبقار حيث يقوم الطلاب في المدرس العليا للبيطرة بدوراتهم التدريبية .باستخدام أساليب المراقبة، تم توثيق ممارسات المزارعين. يبدأ عملية شراء الماشية بتحديد متطلبات المزارعين للماشية الجديدة، تليها أنشطة شاملة تضمن رعاية الحيوانات، والتغذية، وإدارة الصحة، والتحكم في النفايات. هذه الممارسات أساسية للتنمية الصحية للماشية، مما يعد استعدادها لإنتاج الحليب وتربية العجول. عملية التربية، الأساسية للرضاعة الطبيعية، تتضمن اختيار دقيق وإدارة متقنة لإجراءات التلقيح الصناعي. بعد الولادة، تخضع الأبقار لحلب منتظم لجمع الحليب. يدخل العجول الحديثة الولادة عملية تربية متمركزة على الفطام، حيث يتم بيع الذكور من خلال التسويق.

كشفت نتائجنا عن فرص للتحسين في مجالات مثل رعاية الحيوانات، والتغذية، وإدارة الصحة، والتحكم في النفايات. اقترحنا تعديلات ميسرة وممارسات إدارية لتحقيق الحد الأدنى من معايير الجودة. يسهل تطبيق نهج العملية التعرف على الثغرات الإدارية ويدعم الجهود المستمرة للتحسين في عمليات المزرعة.

كلمات مفتاحية : ISO 9001 ، نهج العملية، رعاية الحيوانات، عملية الحلب، إدارة المزرعة

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Introduction

Emerging challenges in animal health protection, food production from animals, welfare standards, and environmental conservation necessitate that developing countries adopt international regulations, standards, and procedures. This adoption serves as a foundation for enhancing competitiveness, achieving inclusion, and ensuring survival in the global market.

ISO 9001 is a globally recognized standard that defines the requirements for a Quality Management System (QMS), helping businesses establish processes to consistently deliver products and services that meet customer and regulatory demands. Certification to ISO 9001 underscores a company's dedication to quality, efficiency, and ongoing improvement. For businesses in developing countries, obtaining ISO 9001 certification offers significant advantages. It enhances credibility and fosters trust with international partners and customers, facilitating entry into new markets that prioritize quality assurance and promoting operational excellence. Moreover, ISO 9001 certification supports sustainable development by encouraging adherence to global best practices in management and production processes.

The process approach, which is the foundation for implementing a QMS, was introduced formally in ISO 9001 with the release of the ISO 9001:2000 version. This evolution shifted the focus from a procedural approach to quality management towards emphasizing organizational processes. The process approach highlights the systematic identification and management of interconnected activities as integral to achieving organizational effectiveness and efficiency in meeting objectives. This methodology has been refined in subsequent revisions, including ISO 9001:2015, to further optimize performance and adaptability.

How can the process approach be implemented in a dairy farm? What are the steps to effectively document processes in a dairy farm?

ISO: International organization for standardization

The International Organization for Standardization (ISO), established in 1947, is a globally recognized federation comprising national standards bodies from 170 countries. Each member country is represented by its own national standards body. The primary objective of ISO is to facilitate collaboration among its members in the development and promotion of international standards across various domains including technology, scientific testing processes, working conditions, societal issues, and more.

The ISO's General Assembly is its decision-making body. It consists of representatives from the members and elected leaders called principal officers. The organization has its headquarters in Geneva, Switzerland, where a central secretariat oversees and coordinates operation **(International Organization for Standardization. About ISO. Retrieved July 6, 2024, from https://www.iso.org/about-us.html)**

ISO 9001:2015

The ISO 9000 family defines seven quality management principles including a strong customer focus and continual improvement. Within the family, ISO 9001 is the most widely adopted quality management standard worldwide, being the sole standard eligible for certification (although certification remains optional)

ISO 9001 is a globally recognized standard for quality management. Its requirements define the framework for establishing, implementing, maintaining, and continually improving a quality management system (QMS).It helps organizations of all sizes and sectors to improve their performance, meet customer expectations and demonstrate their commitment to quality. Implementing ISO 9001 means the organization has put in place effective processes and trained staff to consistently deliver impeccable products or services.**(International Organization for Standardization.ISO 9000: Quality management. Retrieved July 6, 2024, from https://www.iso.org/iso-9001-quality-management.html)**

The ISO 9000 series comprises of the following standards:

ISO 9000:2015 Quality management systems – Fundamentals and vocabulary

ISO 9001:2015 Quality Management Systems – Requirements

ISO 9004:2018: Quality Management Systems – Managing for the sustained success of an organization (continuous improvement)

History of ISO 9001 2015

The history of ISO 9001 2015 Quality Management System can be traced back to the 1950's with US and UK government departments establishing standards for military procurement. Large organisations which supplied government procurement agencies had to adhere to various quality assurance standards for each contract awarded which led the defence industry to adopt mutual recognition of NATO AQAP, MIL-Q and Def Stan standards.

BS5750, published in 1979 was the first specific 'quality management system' standard applicable to industry as a whole. Building on the success of BS5750, the ISO 9001 standard was developed by the International Standards Organisation (ISO) to broaden the scope of Quality Management to an international audience. This was agreed and adopted, and first published in 1987.

Overtime, the standard has undergone periodic reviews by the ISO technical committee every 5 to 8 years to ensure it is relevant to the evolving demands of global business, thus demonstrating its own continual improvement cycle. The timeline below provides an overview of the history of ISO 9001 with the significant changes: **(SPEDAN. (n.d.). A short history of ISO 9001 quality management. Retrieved July 6, 2024, from https://spedan.co.uk/blog/iso-9001-quality/a-short-history-of-iso-9001-quality)**

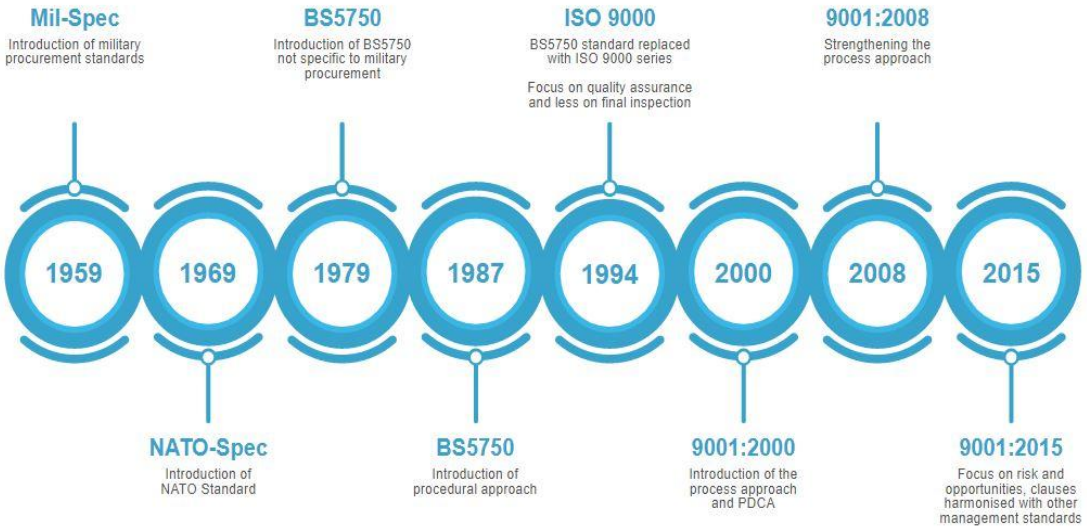

Figure 1 an overview of the history of ISO 9001 (SPEDAN. (n.d.). A short history of ISO 9001 quality management. Retrieved July 6, 2024, from https://spedan.co.uk/blog/iso-9001-quality/a-short-history-of-iso-9001-quality)

The principles of ISO 9001

ISO 9001 is a quality management standard consist of 7 principles as follows

1. Customer focus: This principle focuses on satisfying customers and fostering loyalty by understanding and meeting their expectations, thereby ensuring that products or services consistently meet their requirements.

2. Leadership: There should be a unity of purpose and direction within the organization, beginning with leaders at all levels defining clear objectives and outlining the means to achieve them.

3. Engagement of people: Staff must be qualified, recognized, and continuously developed in their personal skills. Engaged individuals at all levels are crucial for enhancing and improving the organization as a whole.

4. Process approach: It involves managing activities and resources within the organization as processes. In this model, each process uses input data and generates output data, facilitating interconnected operations and achieving objectives more efficiently and effectively.

5. Improvement: The organization must continuously focus on improving itself by consistently striving to enhance customer satisfaction and process performance. Additionally, addressing risks, seizing opportunities, and rectifying non-conformities are vital avenues for improvement.

6. Evidence-Based Decision Making: Decisions should be based on thorough analysis of data and information. By investigating causes to understand their effects, organizations can mitigate the inherent uncertainties involved in decision-making processes, increasing accuracy and optimizing resource allocation.

7. Relationship management: Effective communication among stakeholders regarding their requirements plays a pivotal role in enhancing organizational performance and creating value. When interested parties successfully convey their needs and expectations, it fosters clarity, alignment, and collaboration, ultimately driving operational excellence and delivering meaningful outcomes. ***(Abuhav, I. 2017.*** **ISO 9001: 2015 - A complete guide to quality management systems.** ***)***

Figure 2 the 7 principles of quality management (https://www.qualitiso.com/en/the-7-principles-of-quality-management/)

The objective of ISO 9001

The primary objective of ISO 9001 is to assist organizations in guaranteeing that their customers consistently receive high-quality products and services, which in turn bring many benefits, including satisfied customers, management, and employees.**(ASQ. (n.d.). ISO 9001. Retrieved July 6, 2024, from https://asq.org/quality-resources/iso-9001)**

Business benefits of ISO 9001

- Customer confidence: ISO 9001 guarantees that organizations have a vigorous quality control processes in place, leading to increased customer trust and satisfaction.
- Effective complaint resolution: the standard offers clear guidelines for addressing customer complaints efficiently, contributing to timely and satisfactory problem-solving.

- Process improvement: ISO 9001 aid in the identification and elimination of inefficiencies. It reduces waste, streamline operations, and promote informed decision-making, resulting in cost savings and better outcomes.
- Ongoing optimization: through the regular audits and reviews encouraged by ISO 9001,the organizations are able to continually refine their quality management systems, stay competitive, and achieve long-term success. **(International Organization for Standardization. (n.d.). ISO 9001:2015 - Quality management systems -- Requirements. Retrieved July 6, 2024, from https://www.iso.org/standard/62085.html)**

Process approach:

The ISO 9001:2000 first introduced the use of process approach to develop implement and enhance the effectiveness of a quality management system, in order to improve customer satisfaction by meeting their requirements

a. Process definition:

A process is defined as a set of interrelated or interacting activities that transforms inputs into outputs. Each process uses resources to deliver results and can be managed to achieve desired outcomes, consistent with the organization's quality policy and strategic objectives ***(Ernoul, R. (2013)*** **. Le grand livre de la qualité.** ***AFNOR Éditions)***

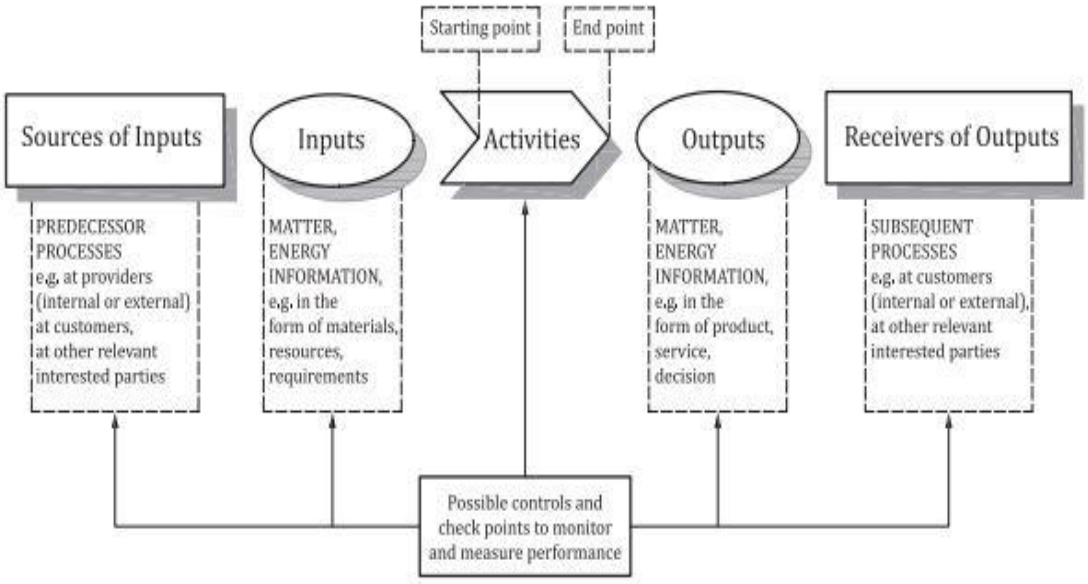

Figure 3 a schematic representation f the elements of a single process (ISO 9001:2015)

b. Steps in the process approach:

According to ISO 9001 requirements, the following series of actions illustrates how an organization might opt to develop and manage its quality management system processes. While respecting the plan-do-check-act cycle. (**The Process Approach. Retrieved July 6, 2024, from https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso9001-2015-process-appr.pdf)**

1. 1. Define the context of the organization

The organization must identify its responsibilities and engage with all relevant stakeholders to clearly define its objectives. This involves gathering, analyzing, and understanding both external and internal responsibilities to meet requirements and fulfill expectations. Additionally, ongoing communication with relevant parties is essential to ensure a continuous understanding of their needs and expectations.

1.2. Define the scope, objectives and policies of the organization

The top management should define the scope of the quality management system by specifying its application boundaries, objectives, and relevant policies. These decisions should be based on a thorough analysis of the market and the requirements of interested parties.

1.3. Determine the processes in the organization

The management should identify the key processes necessary for achieving objectives and policies, and producing the intended results. These processes include management, resources, operations, analysis, measurement, and improvements.

1.4. Determine the sequence of the processes

After defining processes, it is necessary to determine their flow sequences and the various interactions that occur. When describing these, the following points should be taken into consideration:

- The inputs and outputs of each process.
- Process interactions and interfaces that processes depend on or enable.
- The ideal efficiency and effectiveness of the sequence.
- Predicting risks to the effectiveness of process interactions.

Tools such as diagrams, models, and flowcharts can be used to visualize complex process interactions effectively.

1.5. Define the people who take process ownership and accountability

The management should assign ownership for each process by granting responsibility and authority to ensure competence and effectiveness.

1.6. Define the need for documented information

Determine the processes that need to be formally defined and decide how they should be documented. This decision should be based on risk-based thinking. Processes can be formally documented using various methods, such as graphical representations, user stories, written instructions, checklists, flowcharts, visual media, or electronic methods including graphics and systemization.

1.7. Define the interfaces, risks and activities within the process

It's essential to determine the activities required to achieve the intended outputs at both the beginning and end of each process. This ensures that the steps are properly sequenced, interact effectively, and are executed precisely and efficiently. Additionally, all significant risks should be assessed and addressed by the organization.

1.8. Define the monitoring and measurement requirements

Identify the specific points within the processes where monitoring and measurement should be applied to ensure both control and improvement. This involves assessing which stages of the process need oversight, determining the appropriate metrics to use, and establishing methods for collecting and analyzing data. By doing so, you can ensure that each process operates efficiently and produces the desired outputs. Additionally, continuous monitoring allows for timely adjustments and improvements, ultimately enhancing overall process performance and product quality.

1.9. Implement

Implement the actions necessary to achieve planned activities and results. The organization should execute activities, monitor progress, measure performance, and apply controls to the defined processes and procedures. This includes overseeing outsourcing and utilizing other methods required to achieve the desired outcomes.

1.10. Define the resources needed

Identify the resources required to ensure each process operates effectively. This includes personnel, materials, equipment, and any other necessary resources essential for achieving optimal process performance and desired outcomes.

1.11. Verify the process against its planned objectives

Verify the effectiveness of the process and ensure that its characteristics align consistently with the organization's goals. The organization should compare outputs against objectives to confirm that all requirements are satisfactorily met. This ensures that the process not only functions effectively but also contributes directly to achieving the organization's overarching purpose.

1.12. Improvement

Modify processes to maintain the delivery of intended outputs. Take action based on findings to enhance process effectiveness. Corrective actions following process failures should focus on identifying and eliminating root causes of issues.

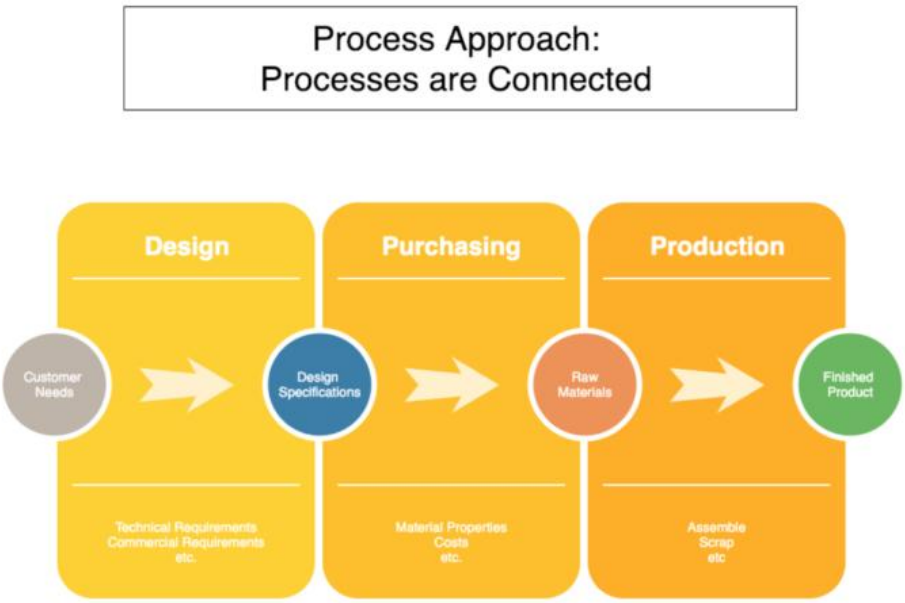

Figure 4 Process approach: Processes are connected retrieved on July 06 2024 (https://the9000store.com/iso-9001-2015-requirements/iso-9001-2015-context-of-the-organization/what-is-a-process-approach/)

c. The benefits of the process approach

- Emphasizing high-risk processes and their outputs
- Enhancing understanding, definition, and integration of interdependent processes
- Systematic management of planning, implementation, checks, and process improvements within the overall management system
- Optimal resource utilization and increased accountability
- Consistently achieving policies, objectives, intended results, and overall performance
- Facilitation of management system implementation through a process approach
- Improved customer satisfaction by meeting requirements
- Enhanced organizational confidence

Implementing Process approach in a dairy farm

Implementing Quality Management Systems in Dairy Farming

ISO 9001:2015 has been developed to help companies gain recognition for their quality management and demonstrate this to their customers. The ISO 9001 standards are applicable to any type of industry and organizations of all sizes, aiding them in providing consistent products and services that lead to customer satisfaction, regulatory compliance, and continual improvement.

Dairy farming is a complex agricultural system that involves the production, processing, and distribution of milk and dairy products. While practices and scales can vary significantly among dairy farms, the fundamental processes remain similar to any other food manufacturing operation: sourcing, purchasing, accepting at delivery, preparing, processing, packaging, and dispatching raw materials. This similarity underscores why dairy farms can benefit from implementing ISO 9001.

Implementing a quality management system in dairy farms focuses on producing safe and high-quality milk through the creation of preventive measures and control points. A crucial step in this process is the process approach defined by ISO 9001. The farm must first identify the key processes used throughout the entire production line, define standards for each process, select measurement methods, and document the whole process. By doing so, the farm can manage operations more efficiently and cost-effectively, while quickly and easily detecting non-conformities. The process approach forms the foundation of a quality management system**. (Cerf, Olivier & Gautier, (2010). Quality assurance schemes on the dairy farm)**

Quality assurance is especially critical when it comes to milk. As a nutritious food, milk supports the growth of microorganisms due to its neutral pH and high water activity. Therefore, good manufacturing and hygiene practices must be adopted at all stages of the dairy production chain.

During a detailed investigation of farm operations conducted through rural clinical rotation, we were able to document all the processes used **(ISO. (2015). *Documented information: Guidance.* ISO 9001:2015**). The findings are as follows:

I. Cattle Procurement Process
II. Animal welfare (Building construction)
III. Nutrition
IV. Animal health process
V. Breeding Process
VI. Milking Process VIII. Waste Management IX. Commercialization process

I. Cattle Procurement Process

1. Objective

To procure new cattle for the farm, ensuring quality, health, and suitability of the livestock, while maintaining cost efficiency and compliance with regulatory standards.

2. Scope

This document covers the entire procurement process from initial planning to the final acquisition and integration of the new cattle into the farm's existing herd.

3. Responsibilities

- **Farm Manager:** Overall responsibility for procurement process.
- **Importer:** Conduct market research, liaise with vendors, and handle purchasing logistics.

4. Requirement:

-The cattle breed: Montbéliarde

-Gender: Female.

-Age: a fully matured female at around 14 months with younger ages being preferable

-The female should be healthy.

-The female should be in her first gestation between the fourth and fifth month

5. Process Overview

- The owner assesses the current herd size, determines the number of cattle needed, and specifies requirements.
- Establish a budget based on available funds.
- The farmer communicates his needs and requirements with the importer.
- The importer conducts market research to identify and select the best-suited vendor based on livestock quality and health standards, including inspecting living conditions and considering prices.
- The importer verifies health records, vaccination status, and overall conditions, ensuring all necessary health certificates and legal documents are in order.
- After ensuring the quality, the final price and payment terms, and the delivery schedule are negotiated, and a contract outlining all terms is signed.
- Plans for safe transportation are made and implemented.
- Once arrived in Algeria, the cattle are quarantined in a lazaret for a minimum of 15 days, where they undergo health monitoring and analysis to prevent diseases such as IBR, Brucellosis, and Tuberculosis.

- Once approved, the owner schedules the transportation of the imported cattle to his farm, where they are gradually integrated into the existing herd and acclimated to the new environment while minimizing stress.

6. Inputs:

- Budget allocation
- Specific cattle requirements
- Legal documents
- Market research data
- Vendor information

7. Outputs

- Acquired cattle that meet specified requirements
- Health certificates and legal documentation
- Contract with agreed terms

8. Process criteria

- Quality of cattle (breed, age, health, gestation)
- Compliance with health and legal standards
- Cost efficiency
- Timeliness of procurement and transportation
- Successful integration and acclimation of cattle into the herd

9. Process Activity map

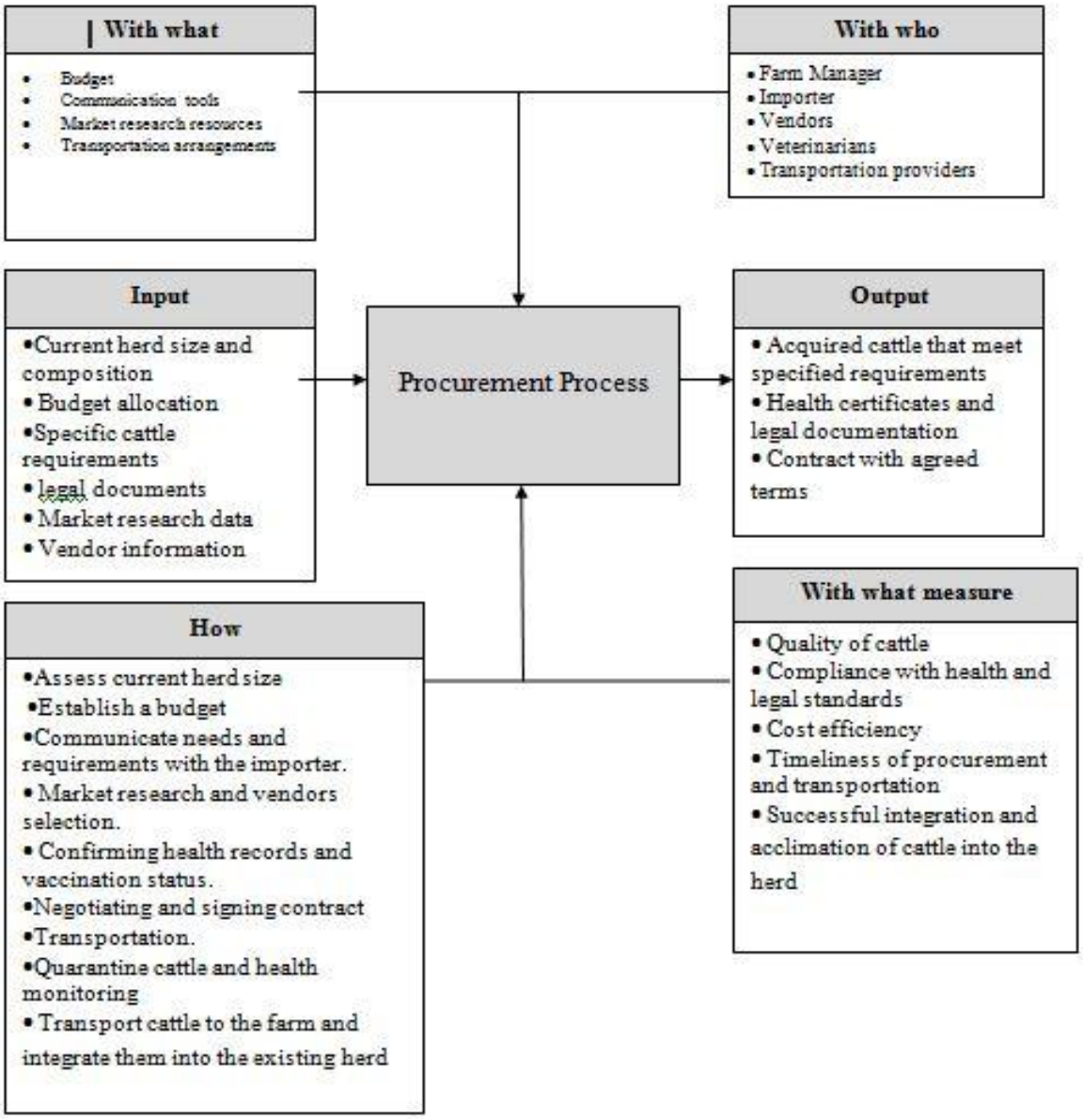

Figure 5 Procurement process map

II. Animal welfare (Building construction)

1. Objectives

The objective is to protect animals from extreme weather conditions and provide a safe environment.

2. Scope

- This document covers the design of the farm animal housing.

3. Responsibilities

- **Farm Owner:** Oversees the overall design.
- **Regulatory Bodies:** Ensure compliance with agriculture ministry requirements.
- **Construction Workers:** Handle all construction-related work.
- **Veterinarian:** Ensures animal health and welfare.

4. Process Overview

- **Farm Location:** Situated in a residential area with easy road access.
- **Utilities:** Water and electricity are readily available.
- **Animal Housing:** Consists of two sections separated by wood: one for heifers and cows (holds up to 8 cattle) and the other for calves.
- **Flooring:** Made of cement, which is slippery and lacks bedding.
- **Walls:** Approximately 2 meters high, made of bricks and cement, painted white.
- **Ventilation:** Small and narrow windows with low ventilation effect
- The roof is made of iron metal sheets
- **Feeder:** Made of cement with a short height.
- **Waste Management:** Wastewater passageway located opposite the feeder.
- **Doors:** Narrow in width.
- **Feed Storage:** A corner of the barn is designated for storing a portion feed for easy access.

- **Facility management:** light cleaning every four days

5. Inputs

- Design specifications
- Construction materials
- Utility connections
- Regulatory guidelines
- Animal welfare standards

6. Outputs

- Completed animal housing
- Compliance certification
- Improved animal welfare
- Enhanced protection from extreme weather

7. Process Criteria

- Compliance with regulatory standards
- Quality of construction materials and techniques
- Effectiveness of ventilation and waste management systems
- Animal comfort and safety
- Protection from extreme weather conditions

8. Process map

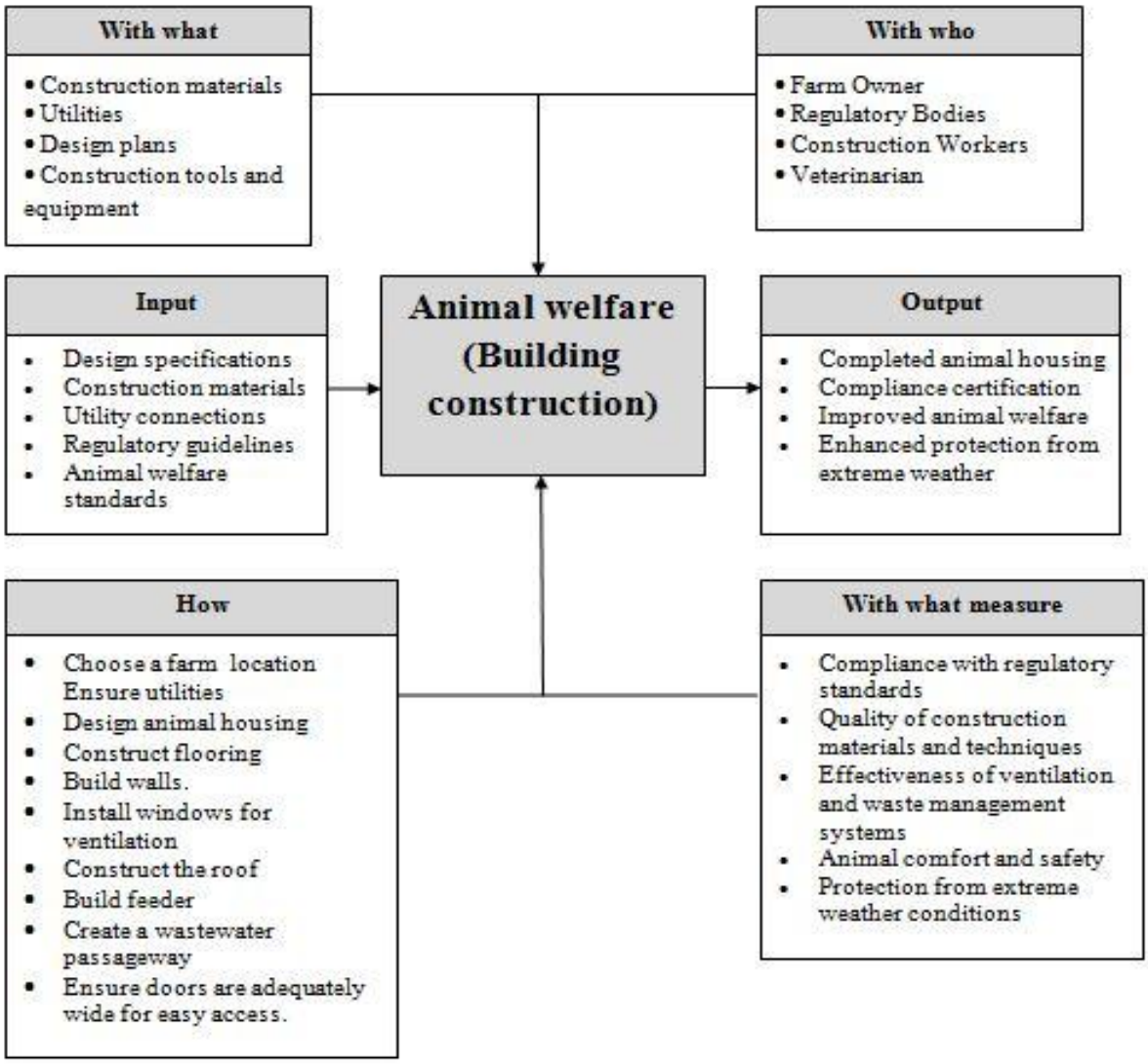

Figure 6Animal welfare process (Building construction)

Figure 7 The inside of the barn

Figure 8 Roof made with iron sheets and narrow window

Figure 9 Narrow entry

III. Nutrition (Feed and Water) Process

1. Objective

To ensure the cattle receive the appropriate feed and water necessary for optimal health, productivity, and milk production.

2. Scope

This document covers all aspects of nutrition management of this farm, including feed selection, preparation, distribution, and water provision for dairy cattle.

3. Responsibilities

- **Farm Owner:** Overall responsibility for nutrition management.
- **Veterinary:** Monitor nutrition-related issues recommend balanced diet plan

4. Process Overview

Feed

- The owner determines nutritional requirements based on cattle age and lactation level, occasionally consulting with a veterinarian.
- The farmer selects feed based on seasonal availability and price, often producing feed on approximately two hectares of owned land.
- Purchased feed is stored in clean, dry, and well-ventilated areas to prevent spoilage and contamination.
- Feeding occurs three times daily, manually distributed at 6 am, 12 pm, and 6 pm, without monitoring feed intake.
- The ration includes roughage, concentrates, and necessary supplements like vitamins and minerals.
- Ration quantity is adjusted based on milk yield or veterinary recommendations following assessments.
- During spring, cattle graze pastures between meals.

Water

- Water is offered after each meal or whenever cattle gather at the water tank.

- The farm ensures continuous access to clean water through the use of an on-site well.

- The cattle are not supervised while drinking water.

5. Inputs

- Nutritional requirements based on cattle age and lactation level
- Seasonal feed availability and price
- Veterinarian recommendations
- Milk yield data
- Feed and water quality standards

6. Outputs

- Well-nourished cattle
- Optimized milk production
- Reduced nutritional deficiencies
- Efficient feed and water utilization

7. Process Criteria

- Quality and nutritional content of feed
- Frequency and consistency of feed and water distribution
- Monitoring of milk yield
- Health assessments and dietary adjustments based on veterinarian recommendations

8. Process map

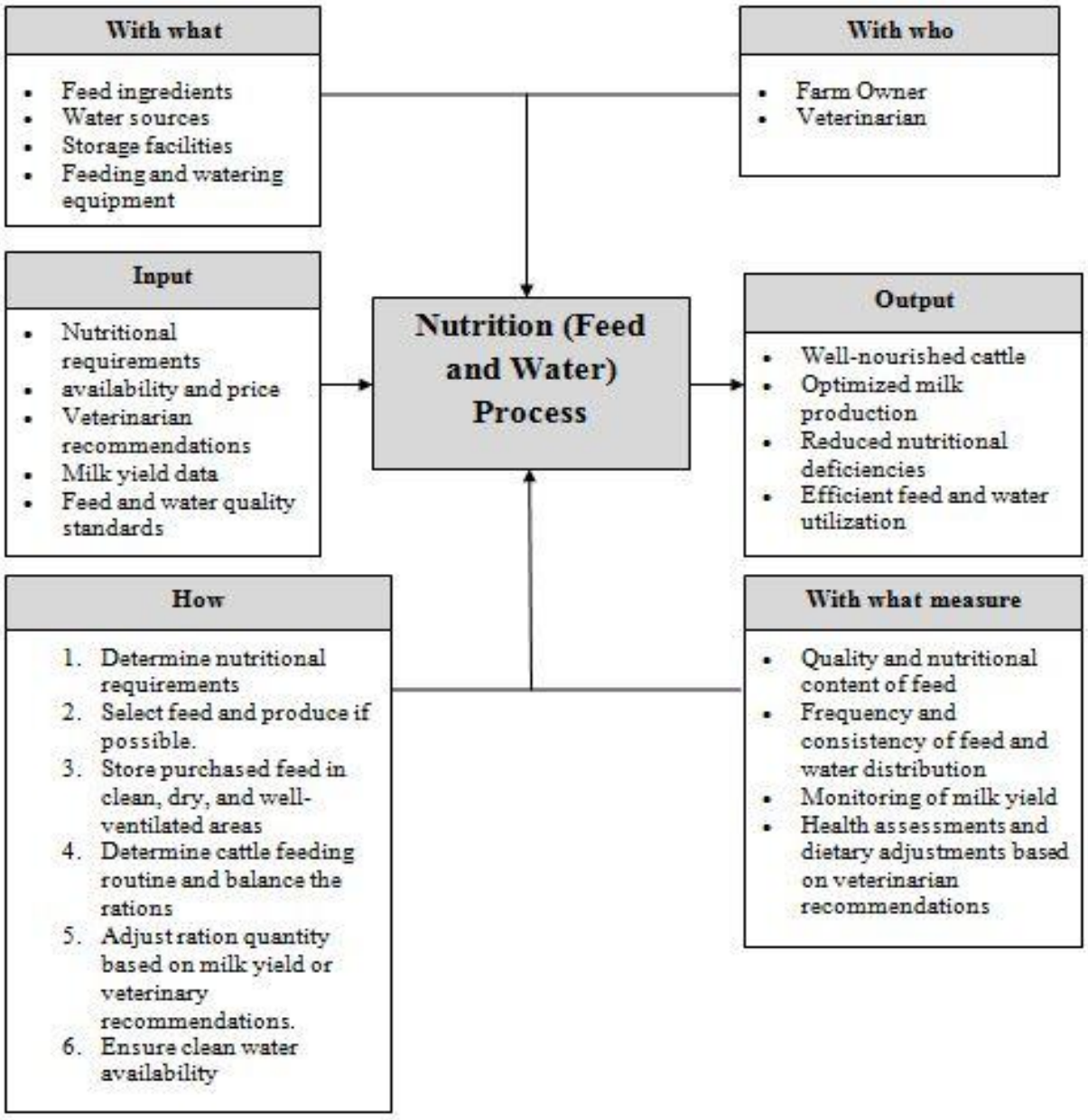

Figure 10 Nutrition process map

Figure 11 Water tank right outside the barn

Figure 12 Feed at one corner of the housing

IV. Animal health process

1. Objectives:

The objectives is of to enhance animal welfare, promptly detect diseases, ensure high productivity and milk quality, and make informed management decisions.

2. Scope

- This document covers all activities practiced within the farm related to cattle health.

3. Responsibilities

- **Farm Owner:** Oversees the implementation of health protocols.
- **Veterinarian:** Provides medical care and health assessments.

4. Process Overview

- Veterinarian visits are not regular but scheduled based on observed health changes.
- Health Check-ups are conducted when vaccination, gestation diagnosis, or when other health concerns arise.
- Issues requiring vet visits include reproductive or nutritional problems and regional disease outbreaks.
- Veterinarian prescribes solutions during farm visits.
- Farm owner administers medication as prescribed by the veterinarian.
- Subsequent Visits are made if no improvement is seen, the veterinarian conducts a follow-up visit.

5. Inputs

- Observed health changes in cattle
- Vaccination schedules
- Diagnostic data for gestation and health concerns
- Reports of regional disease outbreaks

6. Outputs

- Health assessments and records

- Prescribed treatments and medications
- Improved animal health and productivity
- Follow-up action plans

7. Process Criteria

- Frequency and thoroughness of health check-ups
- Accuracy of health assessments
- Effectiveness of prescribed treatments
- Rate of recovery and improvement in cattle health

8. Process map

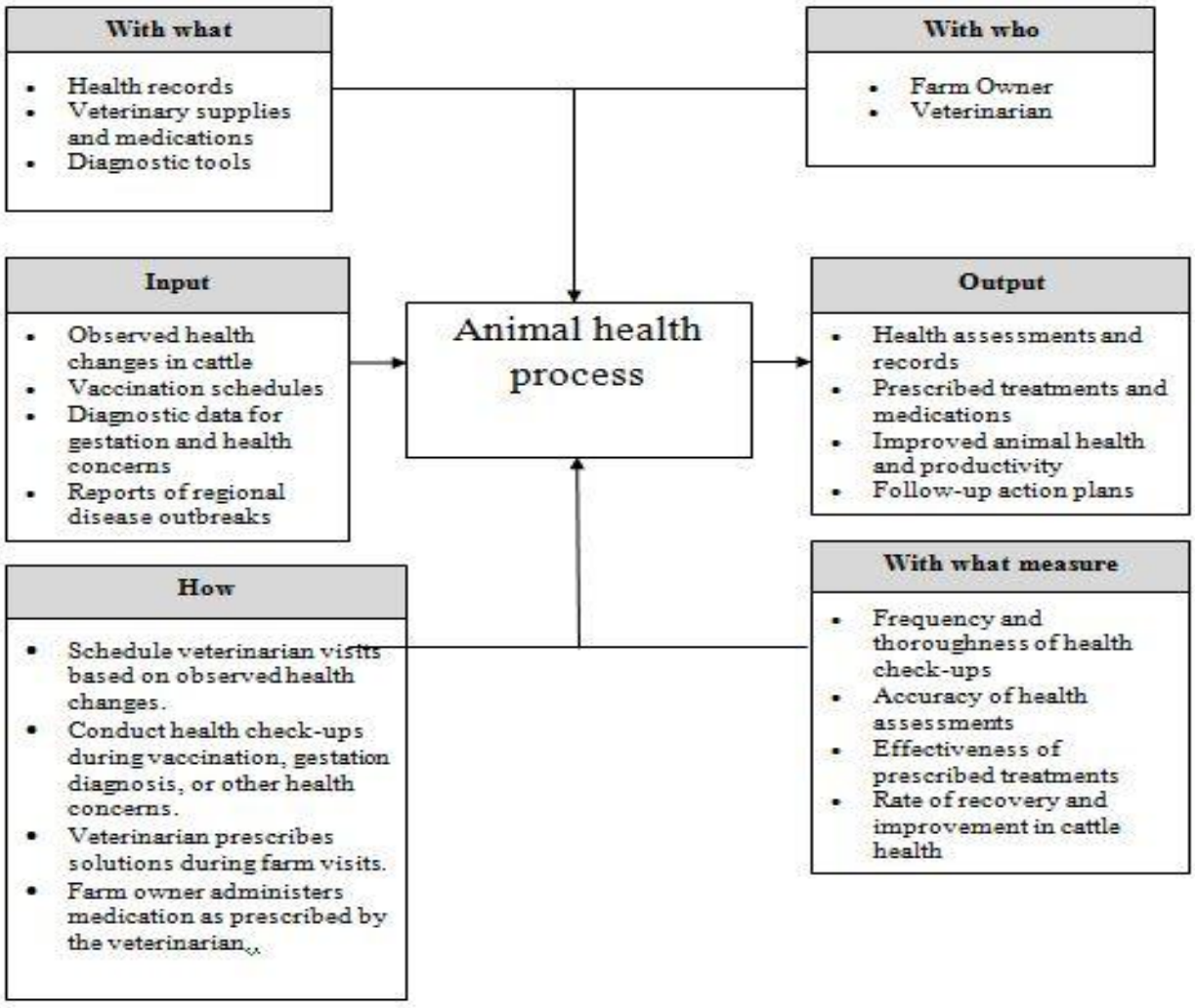

Figure 13 Animal health process map

V. Breeding Process

1. Objective

Ensure successful breeding, optimal reproductive health, and genetic improvement of livestock while enhancing also milk production.

2. Scope

This document covers all aspects of the breeding process, including heat detection, insemination, and follow-up.

3. Responsibilities

- **Farm Owner:** Overall responsibility for managing the breeding program.
- **Veterinarian:** Monitoring reproductive health, managing breeding-related health issues, and assisting with artificial insemination or difficult births.
- **Artificial Insemination Technician:** A certified technician is required to perform the insemination procedure.

4. Requirements:

- Priority for females with good genetics for milk production.
- Males with acceptable meat quality.

5. Process Overview

- **Breeding Method:** The breeding method used on this farm is artificial insemination. The semen undergoes a thorough assessment at the National Center for Artificial Insemination and Genetic Improvement (CNIAAG) to choose genetically superior bulls and ensure proper handling and storage in liquid nitrogen.
- Detecting heat signs in mature cattle is performed daily by the farmer through visual observation. Signs include:
    - Standing to be mounted.
    - Mounting other cows.
    - Restlessness, increased activity, and vocalization.

- Swollen and red vulva with clear mucus discharge.
- Sniffing and licking other cows.
- Decreased feed intake.
- Temporary drop in milk production.

- After confirming estrus, the farm owner contacts the inseminator. The cow is inseminated 12 hours after observing standing heat.
- Upon arrival at the farm, the inseminator evaluates the genital tracts. If no abnormalities are detected, the artificial insemination procedure is performed.
- One month later, a veterinarian inspects and confirms the gestation. If the cow is not pregnant, the same process is repeated. If the cow fails to conceive after multiple attempts, it is culled.
- The pregnancy is carefully monitored throughout its duration. This includes adjusting rations to meet increased nutritional needs and performing health follow-ups to ensure timely vaccinations, a smooth birth, and a healthy calf.
-

6. Inputs

- Cows with good genetics for milk production
- Semen from males with acceptable meat quality
- Visual observations of heat signs
- Health and reproductive assessments
- Nutritional requirements for pregnant cows

7. Outputs

- Successful inseminations
- Confirmed pregnancies
- Improved genetic quality of livestock
- Increased milk production
- Healthier calves

8. Process criteria

- Success rate of inseminations

- Pregnancy confirmation rates
- Genetic improvement metrics
- Milk production levels
- Health and birth outcomes for cows and calves

9. Process map

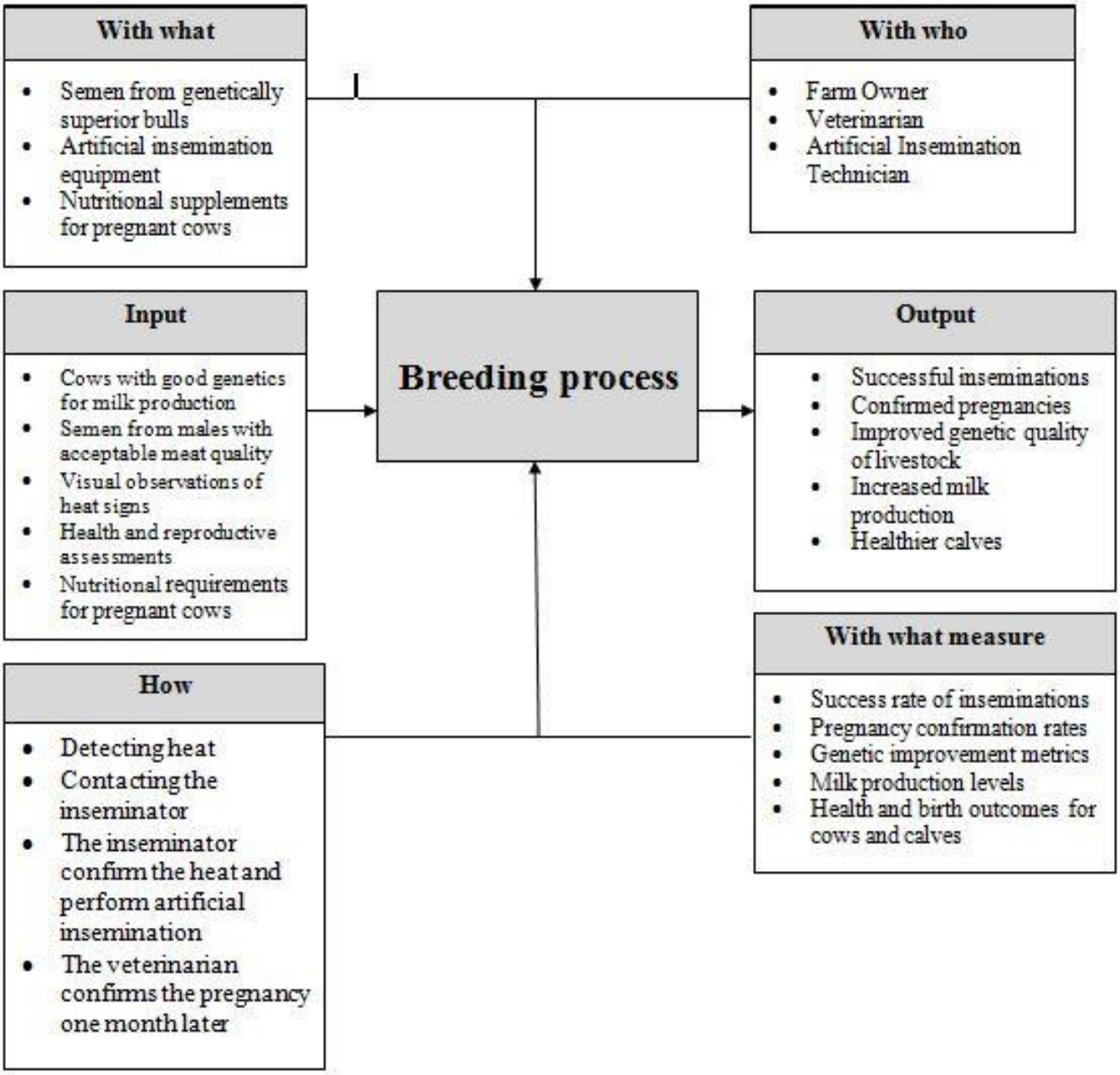

Figure 14 Breeding Process map

VI. Milking Process

1. Objective

The objective of the milking process in dairy farming is to efficiently and hygienically extract high-quality milk from dairy cows while ensuring their welfare, maintaining strict hygiene standards, and maximizing production yields to meet consumer demand for safe and nutritious dairy products.

2. Scope

This document covers all aspects from preparing cows for milking to storing the milk 88888

3. Responsibilities

- **Farm Owner:** Overall responsibility for nutrition management.

4. Process Overview

The milking process takes place in the living quarter as there is no specific room designated solely for milking. Here's how the process unfolds:

Milking routine: approximately twice daily, around 6 AM and 6 PM.

Pre-milking:

- Cattle are fed before the operation begins.
- The health of the udder is checked.
- The udder is cleaned with room temperature water.
- The udder is dried with a clean towel.

Milking:

- Milking equipment is attached or milking is done manually.
- The milking process is monitored closely.

After Milking:

- The quantity of milk is measured.
- Milk is stored in containers.

- Equipment is cleaned with water after milking all cows, often with the addition of bleach.

5. Inputs

- Dairy cows ready for milking
- Milking equipment or tools
- Cleaning supplies
- Storage containers

6. Outputs

- High-quality milk
- Measured quantities of milk
- Cleaned equipment

7. Process criteria

- Milk quality and hygiene standards
- Volume of milk produced
- Condition of milking equipment
- Cleanliness of udder and equipment

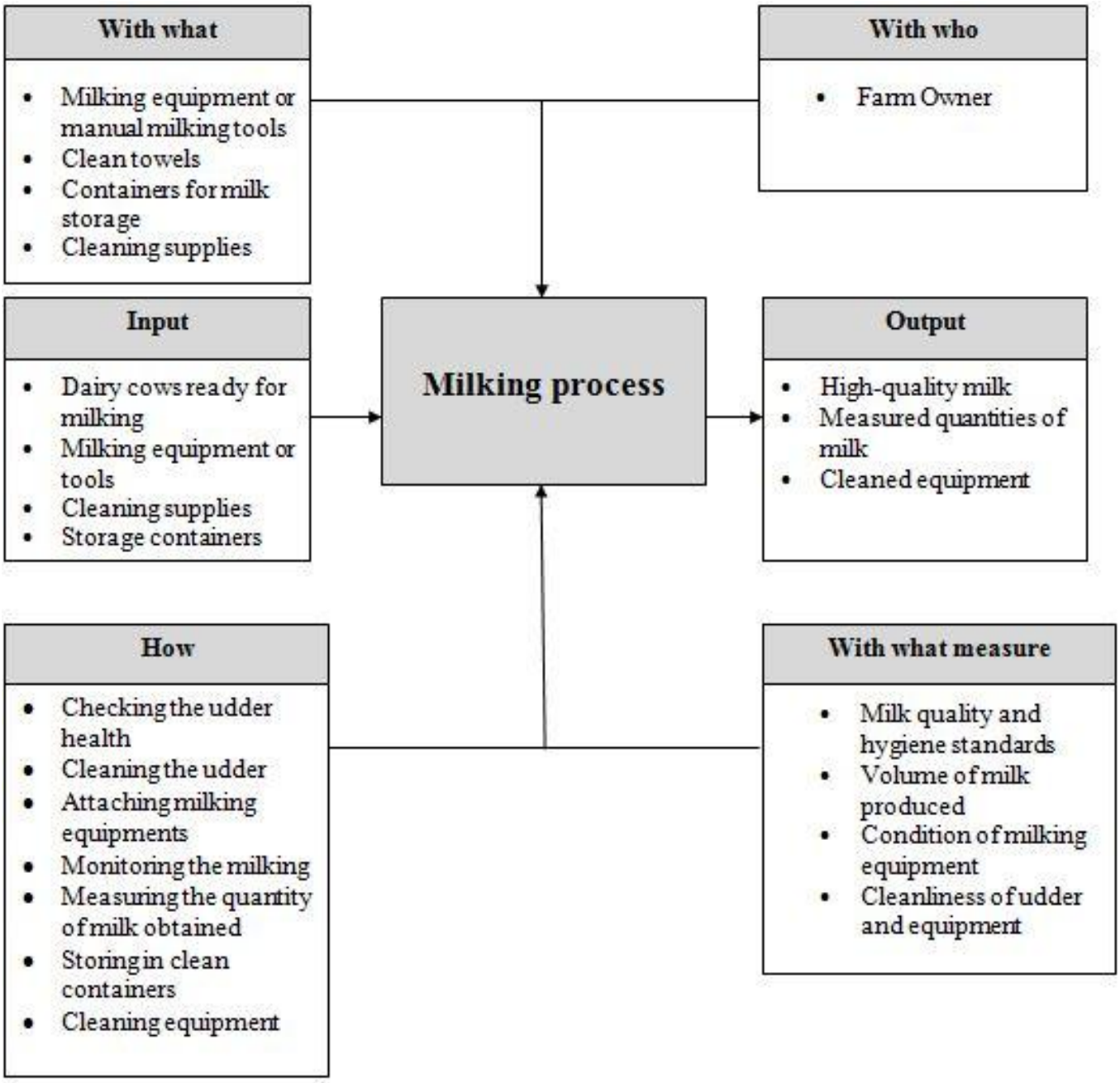

Figure 15 Milking process map

Figure 16 Milking equipment

Figure 17 Milking equipment teat cut submerged in cleaning solution

VII. Calves Rearing Process

1. Objective

Achieve optimal growth, health, and welfare of calves through a structured care approach.

2. Scope

This document covers all aspects of housing, feeding, and health management from before birth until weaning.

3. Responsibilities

- **Farm Owner:** Overall responsibility for nutrition management.
- **Veterinarian:** Intervening in cases of dystocia and follow-up treatment.

4. Process Overview

Before Birth:

- **Preparation of the Mother:** Drying off the mother to prepare for the upcoming calving.
- **Nutritional Adjustments:** Gradually increasing the ration two weeks before calving to prepare for colostrums production.
- **Vaccinations:** Vaccinating against diseases prevalent in the area to ensure high-quality colostrums and a healthy calf.
- **Stress Management:** Avoiding all forms of changes that can cause stress in the few weeks leading to calving.

During Birth:

- **Calving Environment:** Calving usually happens in the living quarters; there is no designated room for calving.
- **Monitoring:** Closely monitoring the calving process.
- **Intervention in Dystocia :** The owner personally intervenes to facilitate birthing; if the problem persists, the veterinarian is called to ensure the birth of a healthy calf.

Postpartum:

- **Separation and Housing:** The new calf is separated from the mother and placed in a specified box for calves, which is prepared with thorough cleaning and new bedding.
- **Cleanliness:** The calves' box is cleaned regularly at intervals of every three days.

- **Feeding:** In the next few hours, the farmer will feed the maximum amount of colostrum to the newborn and continue feeding with mother's milk solely for the next 3 to 5 days.
- **Health Monitoring:** Calves are sensitive to diseases during this period; daily health monitoring is necessary. If changes in eating behaviour or signs of health deterioration are noted, the veterinarian is immediately called to diagnose the problem.
- **Treatment Follow-Up:** Follow-up of treatment and administration of medications if needed.

Weaning:

- **Weaning Duration:** The shorter the weaning duration, the better.
- **Milk Substitution:** The farmer prefers using powdered milk due to cost-effectiveness.
- **Gradual Transition:** After 10 days of milk diet only, gradual changes to the ration are made by introducing solid feed and slowly diminishing milk quantity.
- **Completion of Weaning:** When the calf can go without milk, the weaning process is considered complete.
- **Post-Weaning Management:** Male calves are fed to attain a certain weight before selling them, while female calves are kept, grown, and later introduced to start their careers as reproductive cattle.

5. Inputs

- Pregnant cows
- Colostrum and mother's milk
- Powdered milk and solid feed
- Clean bedding materials
- Health monitoring and vaccination protocols

6. Outputs

- Healthy, well-fed calves
- Successful weaning
- Disease-free environment
- Efficient transition to solid feed
- Productive future reproductive cattle

8. Process criteria

- Growth rate and weight gain
- Health and disease monitoring
- Quality and quantity of colostrum and milk intake
- Successful weaning rates
- Post-weaning health and development

9. Process map

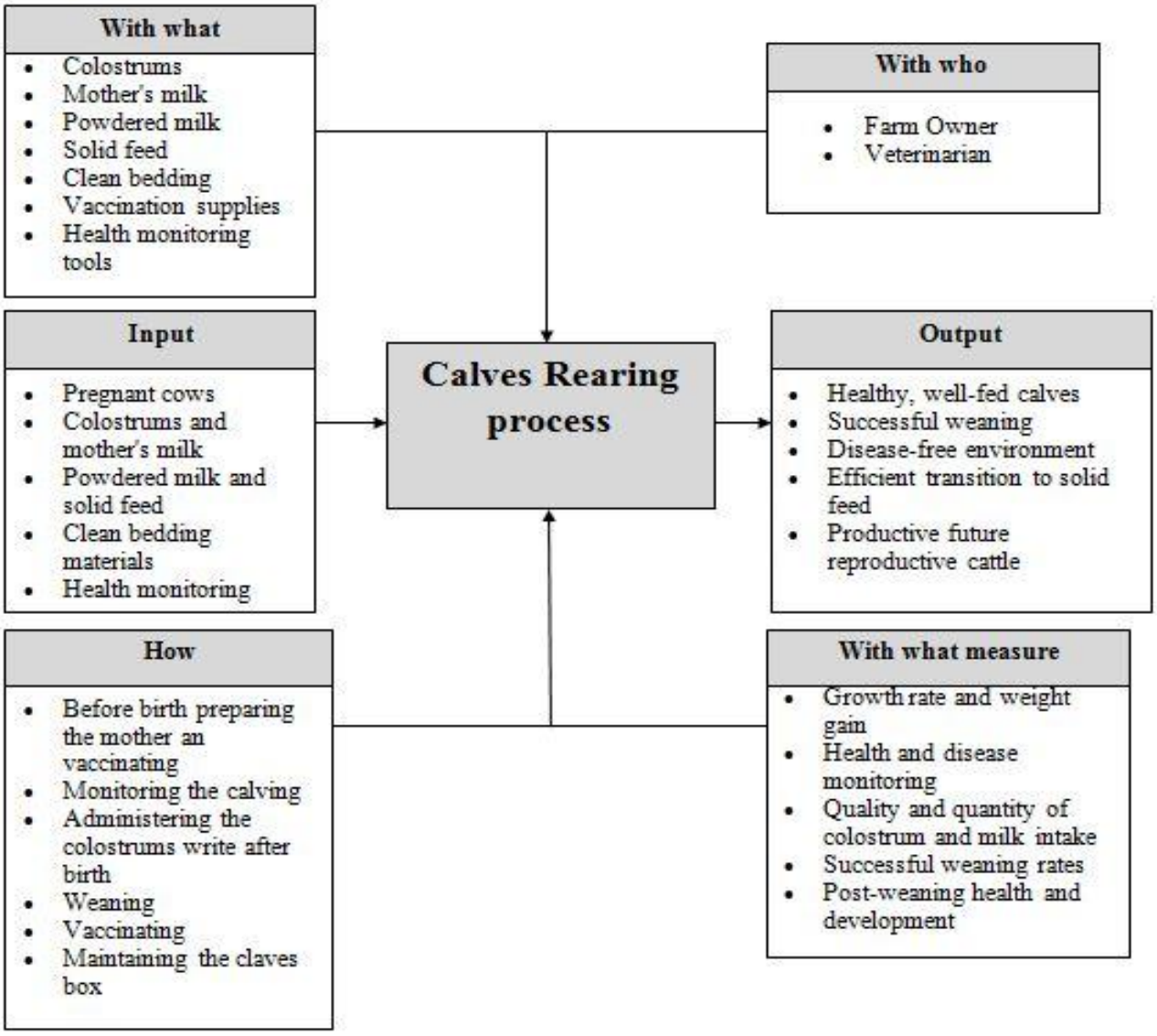

Figure 18 Calves rearing process

Figure 19 Calves rearing box

Figure 20 Calf drinking water from a bucket

VIII. Waste Management

1. Objectives

Maintain a clean housing and healthy environment for cattle.

2. Scope

This process covers the collection and disposal of all waste generated on the dairy farm, including manure and wastewater.

Waste Identification and Categorization:

- **Types of Waste:**
  - Manure
  - Wastewater
  - Feed waste
  - Bedding material

3. Responsibilities

- **Farm Owner:** Responsible for collecting and disposing of wastes.

4. Process Overview

Manure:

- The farmer collects manure daily using a shovel and a hand wheelbarrow.
- The collected manure is transported to a designated area right outside the barn near the exterior walls.
- The manure is either left to dry or used as fertilizer for producing feed.

Wastewater:

- Wastewater is collected using a drainage system.
- The collected wastewater is channelled to an adjacent field outside the barn.

Bedding:

The bedding is changed every four days, and the used bedding is disposed of in the same location as the manure.

5. Inputs

- Manure
- Wastewater
- Used bedding
- Feed waste

6. Outputs

- Collected and properly disposed waste
- Clean and healthy living environment for cattle
- Fertilizer for feed production

7. Process criteria

- Frequency of waste collection and disposal
- Cleanliness of cattle housing
- Effective use of manure as fertilizer
- Proper functioning of the drainage system

8. Process map

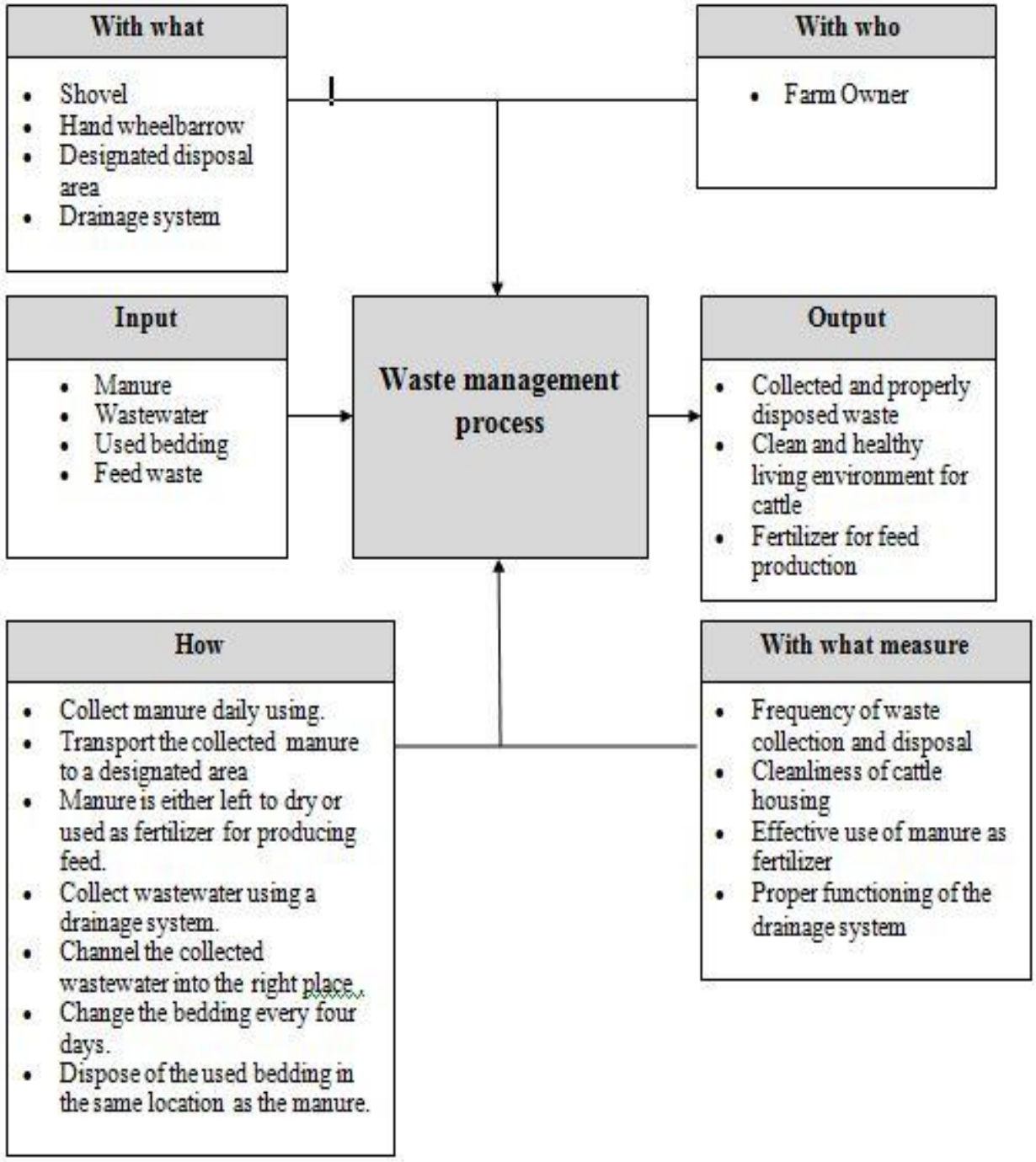

Figure 21 Waste management process

Figure 22 Waste water drainage

XI. Commercialization process

1. Objectives: The primary objectives of selling calves and milk in a dairy farm are to generate revenue, optimize resource use, expand market presence, maintain herd health and genetics, meet consumer demand, ensure sustainability, and contribute to the local economy.

2. Scope

- This process covers from the market research and product development to promoting and selling the product .

3. Responsibilities

Farm Owner: Oversees overall farm operations and strategic decisions. Ensures alignment with business goals and regulatory compliance

Veterinarian: Oversees herd health and management.

4. Process overview

Milk:

After milking, the milk is stored in plastic or metal containers until collected by the milk collector. It is then transported to the government-owned milk processing factory, where it undergoes pasteurization before being sold to consumers.

Calves:

After weaning and reaching a target body weight, calves are either sold through direct connections or transported to the weekly market. In some cases, potential buyers contact the farm owner specifying their requirements such as age and body weight, along with health certifications. The calves are sold to the best offer after price negotiation and determining transportation arrangements. Typically, deals are made verbally without formal documentation.

Cows:

As cows age and their performance declines, they are sent to the slaughterhouse for meat processing. In cases where health issues persist despite veterinary treatment, the cow may also be sent for processing after consultation with the veterinarian.

5. Inputs:

- Dairy cows producing milk.
- Milk containers
- Newborn calves for raising and eventual sale.
- Feed, water, and veterinary care for calf rearing.
- Cows reaching the end of their productive life.
- Veterinary care and management

6. Outputs

- Pasteurized milk ready for sale to consumers.
- Sold calves for breeding or meat production.
- Potential income from calf sales.
- Meat products from cows processed at the slaughterhouse.
- Potential income from meat sales.

7. Process criteria

- Financial metrics
- Resource efficiency
- Market share
- Health indicators
- Consumer feedback.

8. Process map

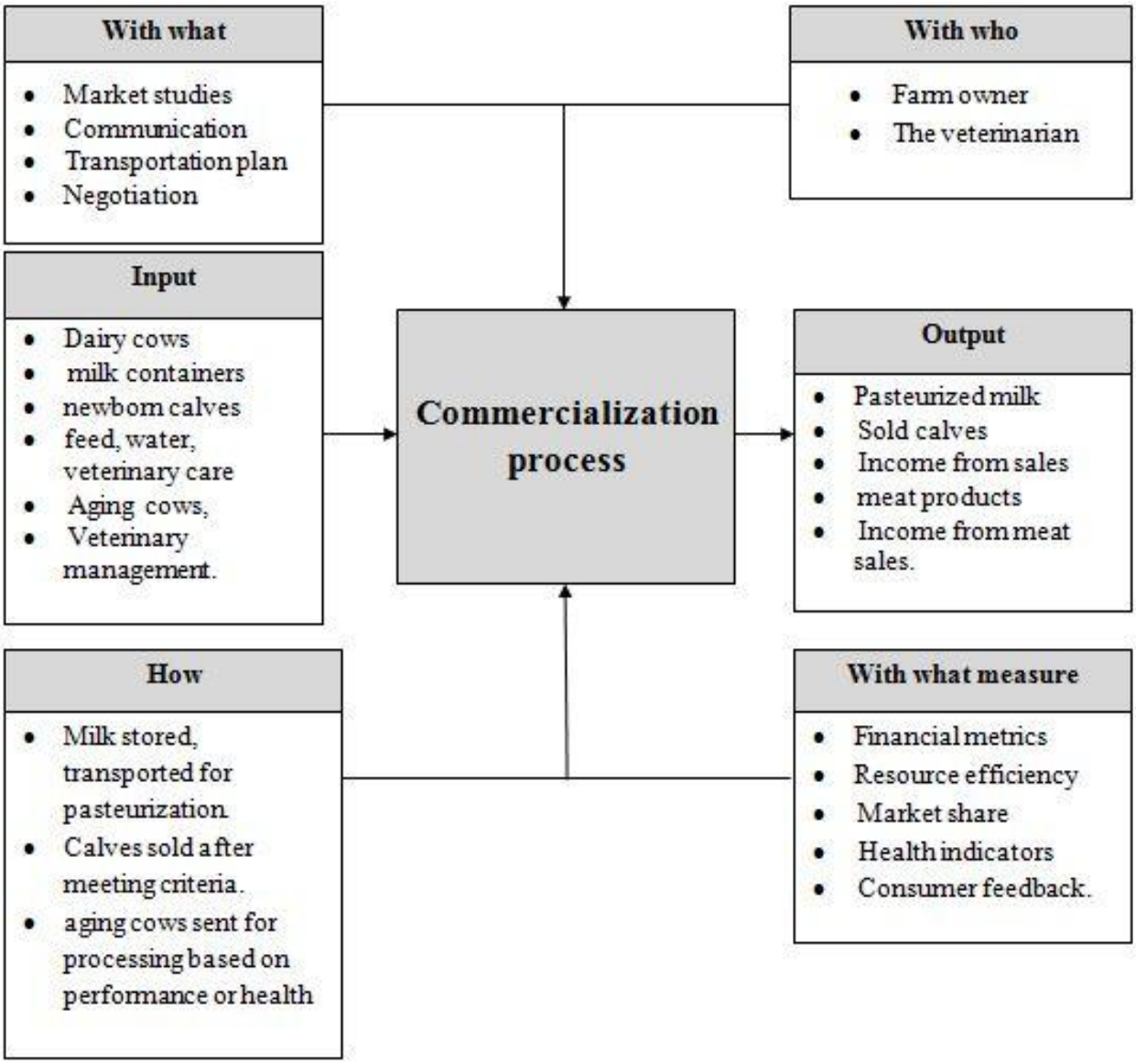

Figure 23 Commercialization Process

Results and discussion

By applying the process approach as defined in ISO 9001, we can evaluate how the processes on the farm work and interact, and identify areas for improvement in the farmer's management of farm animals and other activities necessary to ensure animal welfare and productivity. In the following points, we will recommend some enhancements to the processes we deem crucial and easily fixable, drawing from good practices in dairy farms.

1. Animal welfare (Building construction)

Since the construction phase has concluded, any modifications will be complex and require meticulous planning and significant financial resources to ensure they are seamlessly integrated into the existing structure. We recommend:

- **Improving Ventilation**: Widening the windows is proposed to enhance air circulation within the facility. This improvement aims to create a healthier environment for the cattle, optimizing their comfort and well-being.
- **Optimizing Space Usage**: By removing the feed area located in a corner, the space can be repurposed into a dedicated zone for milking or calving. This transformation not only facilitates efficient management practices but also promotes cleanliness and hygiene within the facility.
- **Feed Storage Management**: Establishing a separate area for storing feed, away from the animals' access, ensures better control over their nutrition intake. This measure helps in maintaining feed quality and reduces the risk of contamination or spoilage.
- **Managing Cattle Numbers**: Given the limited space available, it is advisable to carefully manage the number of cattle housed to prevent overcrowding. This approach does not allows for natural behavioural patterns like dominance hierarchies to develop, which can reduce stress levels and minimize the likelihood of disease outbreaks.
- **Enhanced Hygiene Protocols**: Implementing rigorous hygiene practices involves more frequent cleaning of the floor and feeders than previously done. This proactive approach is crucial for maintaining cleanliness standards, mitigating health risks, and ensuring a hygienic environment conducive to animal health.
- **Roofing Material Upgrade**: Changing the roof material is recommended to mitigate overheating issues during periods of elevated temperatures. This adjustment aims to regulate

internal temperatures more effectively, enhancing comfort and welfare for the cattle housed within the facility. **(International Dairy Federation.2019. The IDF guide to good animal welfare in dairy production 2.0.)**

2. Nutrition process

Individualized Ration Plans:

- It is crucial that not all cattle are given the same ration. Each animal's diet should be tailored based on its specific phase of life, weight, and level of production. This ensures that each animal receives the appropriate nutrients required for its particular needs, promoting optimal health and productivity.
- Segregate cattle into different groups based on their nutritional requirements. For instance, high-producing dairy cows will need a higher energy and protein diet compared to dry cows or young heifers.

Consistent Monitoring During Feeding:

- Close and consistent monitoring during feeding times is necessary to identify and address any issues such as dominance behaviours. Dominance can result in some cows not getting enough feed, leading to nutritional imbalances and decreased productivity.
- Implement strategies such as providing sufficient feeding space and using feed barriers to minimize competition and ensure all animals have equal access to food.

Professional Evaluation and Adjustment of Rations:

- Rations should be evaluated regularly by a specialist or veterinarian. These professionals can assess the nutritional adequacy of the feed and make necessary adjustments to meet the changing needs of the cattle.
- Regular evaluations help in identifying any deficiencies or excesses in the diet, ensuring that cattle receive balanced nutrition that supports their health and productivity.

Constant Water Availability:

- Ensure that water is available to the cattle at all times, not just after meals. Continuous access to clean water is essential for maintaining hydration, aiding digestion, and supporting overall health.

Pasture Evaluation and Preparation for Grazing:

- Before allowing cows to graze, the pasture should be thoroughly evaluated to ensure it does not contain harmful parasites or toxic plants. This step is crucial for preventing health issues that can arise from ingesting contaminated forage.
- Prepare cattle for the grazing season by administering appropriate dewormers and other necessary treatments. This helps in reducing the parasite load and ensures that the cattle are in good health before they start grazing.
- Rotate pastures and implement good grazing management practices to maintain pasture quality and minimize the risk of overgrazing and parasite build-up.

(Food and Agriculture Organization of the United Nations (FAO). (2011). Animal production and health guide to good dairy farming practice).

3. Health process

- Rather than relying solely on calling the veterinarian after noticing signs of illness, it is crucial to plan for regular health check-ups. This proactive approach can significantly improve the early detection of diseases, which often affects the prognosis and treatment outcomes. Additionally, preventive veterinary care helps maintain overall animal health and supports the effective management of the farm based on the specialist's consultation and recommendations.
- Ensure Proper Record-keeping: Maintain detailed records of all veterinary visits, treatments, and outcomes. This information can help identify trends, monitor progress, and guide future decision-making.

Benefits of Regular Veterinary Check-ups

- Early Disease Detection: Regular check-ups allow veterinarians to identify potential health issues in their early stages, before they become more severe or widespread. This increases the chances of successful treatment and minimizes the impact on the herd's productivity.

- Preventive Care: Routine examinations enable veterinarians to implement preventive measures, such as vaccinations, deworming, and targeted disease control programs. This helps reduce the risk of disease outbreaks and improves the overall health and well-being of the animals.
- Optimized Management: Regular veterinary consultations provide valuable insights into the farm's management practices, nutrition programs, and environmental conditions. Veterinarians can offer tailored recommendations to optimize these aspects, leading to enhanced animal performance and productivity.
- Reduced Costs: While regular check-ups may require an initial investment, they can lead to significant cost savings in the long run by preventing costly disease outbreaks, reducing treatment expenses, and improving overall herd health and productivity.

4. Milking process

To ensure optimal udder health and milk quality, we recommend the following practices:

- **Pre-Dip Solution**: Before beginning the milking process, it is essential to use a pre-dip solution to clean and disinfect the udder. This step helps to remove any dirt and bacteria that might be present, reducing the risk of contamination and infection during milking. The pre-dip solution typically contains disinfectants such as iodine or chlorhexidine, which are effective in eliminating pathogens.
- **Post-Dip Solution**: After milking, it is crucial to apply a post-dip solution to the udder. This solution provides a protective barrier that helps to prevent infections and reduces the risk of mastitis. The post-dip solution also contains disinfectants and emollients that help to soothe and protect the skin of the udder.
- **Feeding after Milking**: It is important to feed the cows immediately after milking. This practice encourages the cows to remain standing for an extended period, allowing the teat canals to close properly. If the cows lie down too soon after milking, there is a higher risk of bacteria entering the teat canals, leading to infections. This practice is especially crucial on our farm, as we do not have a specifically designated room for milking, which increases the potential for environmental contamination.
- **Use of CMT (California Mastitis Test)**: We highly recommend the use of the California Mastitis Test (CMT) as part of our regular herd health management. The CMT is a simple, rapid, and cost-effective test that helps detect mastitis, an inflammation of the mammary gland usually caused by infection. By mixing a small sample of milk with a reagent, the

test can identify the presence of elevated somatic cell counts, indicating an infection. Early detection of mastitis i

- s critical for effective treatment and management, leading to a more favorable prognosis.
- **Order of Milking**: Based on the results of the CMT, it is important to prioritize the order of milking. Start with the healthy cows to minimize the spread of infection, and milk the sick cows last. This practice helps to contain the infection and protect the overall health of the herd.
- After milking, the milk should be stored in thermal containers or cooled immediately to prevent the proliferation of microorganisms before the milk collector arrives, ensuring to avoid the use of plastic containers. **(Phil Hasheider - The Family Cow Handbook: A Guide to Keeping a Milk Cow 2011)**

5. Waste management

- To maintain animal health, it is crucial to increase the frequency of manure collection, especially in smaller spaces where bacteria from the digestive tract can proliferate and lead to health problems, particularly hoof afflictions such as podal issues. Regular removal of manure reduces the buildup of pathogens that can harm livestock.
- Additionally, proper storage of manure is essential. Placing manure storage away from barns and areas where animals roam helps minimize the risk of contamination and potential health hazards. Manure, if stored too close to where animals are housed or move freely, can spread diseases and contribute to unhealthy living conditions for the livestock.
- Similarly, the disposal of wastewater should be carefully managed. It is critical to avoid draining wastewater into fields adjacent to the farm. This practice can adversely affect vegetation and disrupt the local ecosystem. Proper drainage and disposal methods ensure that agricultural activities do not harm the environment, maintaining the balance of the ecosystem and supporting sustainable farming practices.

By implementing these practices, farmers can safeguard animal health, reduce environmental impact, and promote a healthier ecosystem surrounding their operations.

The process that hasn't been discussed seems to be performing adequately without any apparent issues. Upon closer inspection, it shows satisfactory outcomes in terms of efficiency, reliability, and effectiveness. There are currently no identified areas where additional inputs or adjustments are necessary to enhance its performance further.

This conclusion is drawn after careful observation and analysis of the process's operations and outputs. Continuous monitoring and periodic evaluations will remain important to ensure that the process maintains its current level of performance and adapts to any future changes or challenges that may arise.

Conclusion

Adopting the process approach marks the initial stage in establishing a robust quality management system and effectively managing all farm operations. By treating each activity as a distinct process, identifying non-conformities becomes simpler, enabling precise pinpointing of areas requiring adjustments and improvements. This systematic approach enhances overall operational efficiency and ensures consistent quality across farm activities. To implement this approach, farmers must identify key processes, define process objectives, develop process documentation, monitor and measure process performance, and foster a culture of continuous improvement. By adopting this approach, farmers can establish a solid foundation for effective quality management, optimize operational efficiency, and drive continuous improvement across all aspects of their farming operations.

By applying the process approach defined in ISO 9001, we gain insights into how farm processes interconnect and function. And drawing from successful practices in dairy farms, we recommend enhancements across several key areas.

- **Animal Welfare (Building Construction):** Ensuring optimal ventilation, optimizing space usage, managing feed storage, and maintaining appropriate cattle numbers are critical steps in promoting a healthy and hygienic environment for livestock.
- **Nutrition Process:** Implementing individualized ration plans, segregating cattle based on nutritional needs, and closely monitoring feeding practices contribute to ensuring each animal receives balanced nutrition essential for health and productivity.
- **Health Process:** Proactively scheduling regular veterinary check-ups, maintaining comprehensive health records, and implementing preventive care measures are essential for

early disease detection, promoting overall herd health, and optimizing farm management practices.

- **Milking Process:** Adhering to strict hygiene protocols, including pre- and post-dipping procedures, proper feeding post-milking, and employing the California Mastitis Test (CMT), helps maintain udder health and milk quality while reducing the risk of infections.
- **Waste Management:** Increasing the frequency of manure collection, ensuring proper storage away from animal areas, and managing wastewater disposal responsibly are crucial for preventing disease spread, minimizing environmental impact, and supporting sustainable farming practices.

By adopting these recommendations, farmers can enhance animal well-being, improve operational efficiency, and contribute to a healthier and more sustainable agricultural ecosystem.

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