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Ministry of Labor and Skills

ANIMAL PRODUCTION

LEVEL-IV

Based on March 2022, Version-4 Occupational Standard



Module Title: Handling and Processing Animal Products and By-Products

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Ministry of Labor and Skills

Table of Contents

Introduction to Module 2

LO #1 Identify animal products and by products handling and processing requirements 3

Instruction sheet 3

Information sheet-1 4

Self check-1 22

Operation Sheet-1 23

LAP TEST-1 24

Performance Test 24

LO #2 Determine animal product and by product handling and processing systems 25

Instruction sheet. 25

Information sheet-2 26

Self check-2 45

Operation Sheet-2 46

LAP TEST-2 47

Performance Test.2 47

LO #3 Install and operate animal products and by products handling and processing equipment 48

Instruction sheet. 48

Information sheet-3 49

Self check-3 68

Operation Sheet-3 69

LAP TEST-3 70

Performance Test 70

REFERENCE 67

Introduction to Module

This module covers the knowledge, skills and attitude required to identify animal products and by products, determine animal product and by product handling systems, install and operate animal products and by products handling equipment. The meaning of the term ‘animal products’ or ‘animal by-products’ is usually not fully understood or not really thought about though we consume or have used these products from time to time. This unit will introduce and describe to you what animal products/animal by-products are from different perspectives, depending on customs, traditions and beliefs.

Sanitary Design and Implement sanitary design principles to facilitate effective cleaning and prevent contamination. Use smooth, non-absorbent, and easily cleanable surfaces for walls, floors, and equipment. Install proper drainage systems to prevent water accumulation. This is robust food safety practices to prevent contamination and ensure product quality. Establish standard operating procedures (SOPs) for cleaning and sanitizing equipment, proper storage of animal products, and maintaining hygiene during processing.

Developing a comprehensive quality control program to monitor product quality and safety throughout the processing system may involve sampling and testing protocols, adherence to regulatory standards, and regular inspections. Then Ensure compliance with local, national, and international regulations governing the handling and processing of animal products. Stay updated on regulations related to food safety, animal welfare, labeling, and transportation.

It is crucial to consult industry experts, regulatory agencies, and food safety specialists during the design process to ensure adherence to best practices and compliance with relevant regulations to avoid product wastage and to avoid food born disease.

LG #18	LO #1 Identify animal products and by products handling and processing requirements

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Designing animal products and by products handling and processing system
- Comparing animal products and by products handling and processing system
- Measuring and recording flow of animal products and by products
- Legislation of OHS and human health
- Carrying out materials and equipment selection
- Applying tests on animal products handling equipment and materials

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Design animal products and by products handling and processing system
- Compare animal products and by products handling and processing system
- Measure and record flow of animal products and by products
- Legislate OHS and human health
- Carry out materials and equipment selection
- Apply tests on animal products handling equipment and materials

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets: Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the Self-checks which are placed following all information sheets.
5. Perform Operation Sheets
6. Do the “LAP test”
7. Ask from your trainer the key to correction key answers

Information sheet-1

1.1.Designing animal products and by products handling and processing system

Designing an animal product and by-product processing system involves careful planning and consideration of various factors. Here is a step-by-step guide to help you design an effective system:

Identify the Products: Determine the specific animal products and by-products you will be processing. This can include meat, dairy, eggs, hides, feathers, bones, and other related materials. Understand the characteristics and requirements of each product to guide the design process. Identifying the necessary processing steps for each product may include cleaning, sorting, cutting, grinding, cooking, pasteurization, separation, packaging, and labeling. Consider the specific requirements for each step and the desired final product characteristics.

Design the layout of your processing facility and consider factors such as workflow, product flow, and separation of different processing areas to prevent cross-contamination. Plan for the optimal arrangement of equipment, storage and personnel movement. Ensure compliance with food safety and hygiene regulations and Choose appropriate equipment for each processing step. This may involve selecting machinery such as slicers, grinders, mixers, cookers, separators, packaging machines, and labeling systems. Consider factors such as production capacity, efficiency, hygiene standards, and product-specific requirements.

Implement food safety and hygiene practices throughout the processing system. This includes proper sanitation procedures, pest control measures, and adherence to hygiene protocols for staff. Ensure the facility has appropriate ventilation, drainage, and waste management systems. Then developing a comprehensive quality control system to ensure product safety and consistency. Implement quality checks, inspections, and testing procedures at various stages of processing. This can include visual inspection, sensory evaluation, laboratory testing, and adherence to quality standards. During animal product and by product handling and processing packaging and labeling is the main part of work which need appropriate packaging materials and techniques for each product. Consider factors such as product protection, shelf life, and regulatory requirements. Ensure the packaging materials are suitable for the product and meet relevant

safety and labeling standards. animal product handling or processing alone not enough. So, traceability and documentation implemented batch or lot identification, recording of production dates, and tracking of ingredients or raw materials. Maintain accurate records of processing steps, quality control checks, and product distribution.

To ensure the quality of product and safety of worker staff Training Provide comprehensive training to your staff on processing procedures, food safety protocols, and quality control measures. Ensure they understand and follow standard operating procedures (SOPs) to maintain consistency and product integrity.

Continuous Improvement means regularly evaluate and improve your processing system. Seek feedback from customers, conduct internal audits, and stay updated with industry advancements. Continuously optimize processes to enhance efficiency, product quality, and profitability.

Remember to comply with relevant regulations and standards applicable to your region and industry. Consult with experts, equipment manufacturers, and regulatory bodies to ensure your processing system meets all necessary requirements. (https://youtu.be/k4lN80r22mc)

It provides general advice for farmers on safe handling of dairy product like milk and milk product such as cheese, butter, yogurt, and others to minimize farm product wastage and to increase income. The design of animal products and by product handling system should consider the product and productivity level of the farm and the environmental condition.

Designing an animal product and by-product processing system involves careful planning and consideration of various factors. Here is a step-by-step guide to help you design an effective system:

Cheese making is a complex process that involves several steps. Here is a simplified overview of that trainer should know the following point before go to laboratory:

A. Milk Selection: Start by selecting high-quality milk, which can come from various animal sources such as cows, goats, or sheep. The milk should be fresh and free from any contaminants.

B. Milk Pasteurization (Optional): Pasteurization involves heating the milk to kill harmful bacteria and pathogens. Some cheeses, like raw milk cheeses, may skip this step.

C. Coagulation: Warm the milk to the desired temperature and introduce a coagulating agent, such as rennet or starter cultures. Rennet helps to coagulate the milk proteins, while starter cultures introduce beneficial bacteria that contribute to flavor development and texture.

D. Curd Formation: Allow the milk to coagulate, forming a gel-like substance called curds. The curds contain the solid components of the milk, such as proteins and fats.

5. Cutting the Curds: Cut the curds into smaller pieces to facilitate the separation of the whey (liquid) from the curds. The size and shape of the curd pieces depend on the desired type of cheese.

E. Heating and Stirring: Heat the curds while gently stirring them. The heating and stirring process helps to expel whey, further consolidating the curds.

F. Draining and Pressing: Drain the whey from the curds and transfer the curds into molds. Apply pressure to consolidate the curds and shape the cheese. The duration and intensity of pressing depend on the desired texture and moisture content.

G. Salting: Apply salt to the surface of the cheese, which enhances flavor, aids in preservation, and helps to control moisture levels. Salting can be done through dry salting or brining.

H. Ripening and Aging: Place the cheese in a controlled environment with appropriate temperature and humidity conditions. This allows the cheese to develop its characteristic flavor, texture, and aroma over time. Aging periods can vary from a few weeks to several months or even years, depending on the type of cheese.

I. Packaging: Once the desired aging period is complete, the cheese is typically wrapped in appropriate packaging material to protect it and maintain its quality during storage and transportation.

It's important to note that the cheese making process can vary significantly depending on the type of cheese being produced, as different cheeses require specific variations in ingredients, techniques, and aging processes. The steps outlined above provide a general overview, but the specific details of each step can vary widely.

Cheese making requires various materials, tools, and equipment to ensure proper production and handling. Here are some commonly used items:

I. Materials:

- Milk: The primary ingredient for cheese making. It can be sourced from cows, goats, sheep, or other animals.
- Cultures and Starter Cultures: These are used to introduce specific bacteria or fungi into the milk to aid in fermentation, flavor development, and curd formation.
- Coagulating Agents: Rennet, microbial or vegetable-based coagulants, or acidifying agents like lemon juice or vinegar are used to coagulate the milk proteins and form curds. Salt: Used for salting the cheese, enhancing flavor, and aiding in preservation.
- Other Ingredients: Herbs, spices, molds, or additional flavorings can be added to create specific types of cheeses.

II. Tools and Equipment:

- Stainless Steel or Food-Grade Containers: Used for heating, cooling, and storing milk and curds. Stainless steel is preferred due to its non-reactive nature.
- Cheese Vat or Pot: A large pot or vat used for heating and curd formation.
- Thermometer: To monitor and control the temperature throughout the cheese making process.
- Cheese Molds: Containers or molds used to shape and press the curds, giving the cheese its final shape and size.
- Cheese Press: A device used to apply pressure to the curds during pressing to expel whey and consolidate the cheese.
- Cheese Cloth or Cheesecloth: A fine-woven cloth used for draining the whey from the curds and shaping the cheese.
- Curd Cutter or Curd Knife: Used to cut the curds into desired sizes during the cheese making process.
- Cheese Mat: A mat or surface where the cheese is aged, allowing proper air circulation and moisture control.
- Cheese Aging Cave or Refrigerator: A controlled environment with specific temperature and humidity conditions for aging the cheese.

- Cheese Wax or Vacuum Sealer: Used for packaging and sealing the cheese during storage and transportation.

Additionally, depending on the specific cheese-making process and techniques, other equipment such as cheese presses, curd mills, cheese hoops, pH meters, cheese molds, and brining containers may be required.

It's important to ensure that all tools and equipment used in cheese making are clean, sanitized, and suitable for food contact to maintain food safety and product quality (https://youtu.be/k4lN80r22mc).

1.1.1. Designing animal products and by products handling system

Designing an efficient and effective animal products and by-products handling system involves careful planning and consideration of various factors. Here is a step-by-step guide to help you design such a system:

Assess Product Characteristics we should have to understand the specific characteristics of the animal products and by-products you will be handling. Consider factors such as perishability, temperature sensitivity, hygiene requirements, and packaging considerations.

Determine the flow of materials within the handling system. Identify the points of origin, processing stages, storage areas, and distribution points. Design an organized and streamlined flow that minimizes cross-contamination and ensures traceability.

Plan appropriate storage and ware housing facilities for the animal products and by-products. Consider factors such as temperature control, humidity, ventilation, and space utilization. Separate storage areas may be needed to prevent cross-contamination.

Select suitable handling equipment based on the nature of the products and the required handling processes. This may include equipment such as forklifts, conveyors, pallet jacks, scales, and specialized lifting tools. Ensure the equipment is safe, efficient, and capable of handling the specific products.

Implement rigorous hygiene and sanitation practices throughout the handling system. Establish cleaning protocols, provide hand washing stations, and ensure proper waste disposal. Regularly clean and sanitize equipment, storage areas, and handling surfaces to maintain a safe and hygienic environment.

Determine appropriate packaging materials and techniques for the animal products and by-products. Consider factors such as product protection, shelf life, and regulatory requirements. Ensure proper labeling with accurate information, including product identification, batch numbers, and expiration dates.

Develop robust quality control measures to ensure product integrity and safety. Implement inspections, sampling, and testing procedures at various stages of the handling system. Establish traceability systems to track the movement and origin of the products.

Provide comprehensive training to personnel involved in the handling system. Educate them on proper handling techniques, safety protocols, good manufacturing practices, and hygiene standards. Ensure they are trained to identify and address potential risks and hazards associated with handling animal products and by-products.

Establish an effective waste management system to handle by-products generated during processing. Implement procedures for recycling, composting, or proper disposal in compliance with environmental regulations. Minimize waste generation and ensure safe handling and containment of any potentially hazardous by-products.

Ensure that the handling system complies with relevant regulations and standards for animal products and by-products. Stay updated with local, national, and international regulations related to food safety, hygiene, and environmental requirements. Regularly review and update the system to maintain compliance. (https://youtu.be/vr1Y5bjrBlY)

Remember to continuously monitor and evaluate the handling system to identify areas for improvement and address any emerging issues. Adapt the system as needed based on changes in product requirements, regulations, and industry best practices.

I. Handling and storage animal product

A. Equipment

Slaughtering equipment, particularly for smaller-scale operations, need not be elaborate and expensive. the amount of equipment will depend on the slaughtering procedures employed. if possible, all equipment should be made of stainless steel or plastic, be rust resistant and easily cleaned and sanitized. equipment which does not get in contact with the meat (e.g. overhead rails, working platforms, knocking pen) is usually made of galvanized steel.

B. Handling of meat

Chilled meat must be kept cold until it is sold or cooked. If the cold chain is broken, condensation forms and microbes grow rapidly. The same rules about not overloading, leaving space for air circulation, opening doors as little as possible and observing the highest hygiene standards when handling the meat apply. An ideal storage temperature for fresh meat is just above its freezing point, which is about - 1°C (- 3°C for bacon because of the presence of salt). The expected storage life given by the International Institute of Refrigeration of various types of meat held at these temperatures is as follows:

Type of meat	Expected storage life at - 1°C
Beef	up to 3 weeks (4–5 with strict hygiene)
Veal	1–3 weeks
Lamb	10–15 days
Pork	1–2 weeks
Edible offal	7 days

Table: Expected storage life at -1°C

Under commercial conditions, meat temperatures are rarely kept at - 1°C to 0°C, so actual storage times are less than expected. The times would also be reduced if RH were greater than 90 percent. Meat should be placed in the refrigerator immediately following receipt. Any parts which show signs of mould growth or bacterial slime should be trimmed off and destroyed. Hands must be thoroughly washed after handling such trimmings and knives must be sterilized in boiling water. The refrigerator should be thoroughly cleaned after finding such meat and should also be cleaned on a regular basis.

Carcasses, quarters and large primals should not be cut into smaller portions before it is necessary as this will expose a greater surface area for bacteria to grow. Freshly cut surfaces are moist and provide a better medium for bacterial growth than the desiccated outer surfaces of cuts that have been stored for some time. An accurate thermometer should be placed in the refrigerator and checked regularly. The temperature should remain within a narrow range (0° to + 1°C).

C. **Transport of meat**

Vehicles for transporting meat and carcasses should be considered as an extension of the refrigerated storage. The object must be to maintain the meat temperature at or near 0°C. Meat should be chilled to 0°C before loading. Meat should hang on rails, not on the floor. If stockinet's are put on carcasses they must be clean. Meat trucks should not carry anything other than meat.

The refrigeration is usually produced by injecting liquid nitrogen or carbon dioxide (CO_2) into the compartment or by blowing air over CO_2 chunks (dry ice). The temperature in these vans can be set and controlled to minimize the temperature rise and to avoid condensation on the meat surface. Insulated vans without refrigeration may be refrigerated by adding dry ice. While this is a reasonably good alternative to the refrigerated truck it does not allow the temperature to be controlled.

Uninsulated vans and open trucks should not be considered as suitable transport for meat, particularly in hot climates. In addition to the temperature abuse, condensation will occur when the meat goes back into refrigeration, and in open trucks the meat is exposed to attack from insects. Loading and unloading should be done quickly. If there are any unavoidable delays then dry-ice blocks should be placed in the partly filled van.

II. Milk and milk product handling

A. Pasteurization

It is the heating of milk or other dairy products to a temperature which destroys nearly all of the microorganisms present in that product without seriously affecting the composition or properties of the product. It should be followed by immediate cooling of the product to a temperature sufficiently low to check the growth of the microorganisms which are resistant to the temperature used.

B. Ultra-heat treatment (UHT)

UHT involves the flow heating of milk (like HTST) but it is heated to at least 132^{o}c for one second before cooling.

C. Sterilization

Milk is heated in the sealed airtight container in which it is sold. The temperature is usually in the range 105- 115^{o}c for around 30 minutes.

D. Homogenization

The process of making a stable emulsion of milk fat and milk serum by mechanical treatment is homogenization.

E. Cream separation

Cream means that portion of milk which is rich in milk fat



Figure 1: Electrical cream separator

F. churner

Churner is used to separate Butter from Whey



Figure 2: Electrical churner

G. Meat grinder



Figure 3: Electrical meat grinder

1.2.Comparing animal products and by products handling and processing system

When comparing animal products and by-products handling and processing systems, several factors should be considered. Here are some key aspects to compare:

Evaluate how the systems handle and store animal products and by-products. Consider factors such as temperature control, proper ventilation, prevention of cross-contamination, and appropriate storage conditions to maintain product quality and safety.

Compare the processing techniques used for different animal products and by-products. Assess factors such as cutting, grinding, packaging, cooking, freezing, or dehydration methods. Look for systems that employ efficient and appropriate techniques to preserve product quality and extend shelf life.

Assess the food safety measures implemented in the handling and processing systems. Look for systems that adhere to strict hygiene practices, follow HACCP (Hazard Analysis Critical Control Points) principles, and comply with relevant food safety regulations to ensure the production of safe and wholesome products.

Evaluate the quality control practices integrated into the handling and processing systems. Look for systems that conduct regular inspections, testing, and monitoring to ensure consistent product quality. Consider the implementation of quality management systems such as ISO certifications or other industry-specific standards.

Compare the packaging and labelling practices for different animal products and by-products. Assess the suitability and durability of packaging materials, as well as the accuracy and

completeness of product labelling. Consider factors such as product protection, convenience, and compliance with packaging and labelling regulations.

Evaluate the traceability and documentation capabilities of the handling and processing systems. Look for systems that have robust tracking and recording mechanisms, allowing for accurate traceability of products from farm to market. Consider the availability of batch or lot numbers, production dates, and other relevant information for product identification and recall purposes.

Assess the waste management practices integrated into the handling and processing systems. Look for systems that minimize waste generation, promote recycling or reuse of by-products, and comply with environmental regulations. Consider strategies for proper disposal or treatment of waste materials to minimize environmental impact.

Compare the level of automation and technology utilized in the handling and processing systems. Assess the use of machinery, equipment, and software solutions to enhance efficiency, productivity, and accuracy. Consider systems that incorporate advanced technologies such as robotics, artificial intelligence, or data analytics to optimize operations.

Consider how well the handling and processing systems comply with relevant regulations and standards. This includes animal welfare regulations, food safety regulations, environmental regulations, and any other applicable laws governing the production and processing of animal products and by-products.

Compare the cost-effectiveness of the handling and processing systems, considering factors such as initial investment, operational costs, maintenance requirements, and potential returns on investment. Look for systems that strike a balance between efficiency, quality, and cost.

It's important to consider the specific requirements and priorities of your operation, as well as the characteristics of the animal products and by-products being handled. Evaluating these factors will help you make an informed decision and choose the most suitable handling and processing system for your needs.

1.3.Measuring and recording flow of animal products and by products

Measuring and recording animal products and by-products on a farm is essential for monitoring production, tracking inventory, assessing profitability, and complying with regulations. Here are some common methods for measuring and recording animal products and by-products:

Weighing is a primary method for measuring the weight of animal products. Use scales or weighing equipment to accurately determine the quantity of the product. For example, livestock such as cattle, pigs, or sheep can be weighed individually or in groups to determine their live weight or carcass weight.

In dairy farming, milk production can be measured using milk meters that attach to milking machines. These meters accurately measure the quantity of milk produced by each cow during milking sessions. In poultry farming, automatic egg counters or manual counting methods can be used to measure the number of eggs produced by each hen or a flock over a specific period.

For processed animal products such as meat, yield testing can be performed to determine the percentage of usable meat obtained from a carcass. This involves weighing different cuts of meat and calculating the yield percentage.

In some cases, laboratory analysis is necessary to measure specific characteristics or components of animal products. For example, testing the fat content, protein content, moisture content, or nutritional composition of meat, milk, or other products. Animal products can be graded and sorted based on various criteria such as size, weight, quality, or specific attributes. Grading can be done manually by trained personnel or using automated systems that utilize optical or electronic technologies.

Maintaining accurate records is crucial for tracking the production and utilization of animal products. This includes recording information such as date, quantity, source, and destination of the products or by-products. Manual record-keeping systems or digital record-keeping software can be utilized for this purpose.

Implementing traceability systems allows for tracking animal products and their by-products throughout the supply chain. This involves assigning unique identifiers or codes to individual products or batches and recording relevant information such as origin, processing, and distribution. Radio Frequency Identification (RFID) tags or barcode labels can be used to track and record animal products and by-products. These technologies enable automated data collection and can integrate with inventory management systems.

Depending on the region and industry, there may be specific regulations and requirements for measuring and recording animal products and by-products. It is crucial to understand and comply

with these regulations to maintain legal compliance and meet reporting obligations. Remember to adapt your measurement and recording methods to the specific requirements and characteristics of the animals and products on your farm. Accurate and consistent measurement and recording ensure better management, traceability, and decision-making processes.

1.4.Legislate OHS and human health

Taking into consideration its intended use, dairy product must be wholesome and must not contain biological, chemical, or physical hazards at a level that may be directly or indirectly harmful to humans or animals Legislation related to occupational health and safety (OHS) and human health varies by country, but the underlying objective is to protect workers and promote a safe and healthy working environment. Here are some key aspects of OHS legislation and its impact on human health:

Most countries have enacted laws and regulations that govern OHS. These laws set forth the rights and responsibilities of employers, workers, and regulatory bodies regarding workplace safety and health. They establish the legal basis for ensuring safe working conditions and protecting workers from hazards that may affect their health. OHS legislation often requires employers to conduct hazard identification and risk assessment processes. This involves identifying potential workplace hazards, evaluating their risks, and implementing appropriate control measures to mitigate those risks. The aim is to prevent accidents, injuries, illnesses, and long-term health effects caused by workplace exposures.

OHS legislation typically establishes permissible exposure limits (PELs) or occupational exposure limits (OELs) for various hazardous substances. These limits specify the maximum allowable concentrations or levels of exposure to harmful agents in the workplace. They are based on scientific research and aim to protect workers from adverse health effects associated with prolonged exposure to specific substances.

Some OHS regulations require employers to implement health surveillance programs. These programs involve monitoring workers' health to detect any adverse effects resulting from workplace exposures. Health surveillance may include regular medical examinations, biological monitoring, and assessment of occupational diseases. It helps identify health issues early and enables appropriate preventive measures to be implemented.

OHS legislation often mandates that employers provide training and education to workers regarding workplace hazards, safe work practices, and proper use of personal protective equipment (PPE). Training programs aim to increase workers' awareness of potential risks, equip them with the necessary knowledge and skills to work safely, and promote a culture of safety within the organization.

OHS legislation often emphasizes the importance of worker participation and consultation in health and safety matters. It may require employers to involve workers and their representatives in risk assessment, development of safety policies, and decision-making processes. Engaging workers in OHS matters helps identify hazards, implement effective control measures, and promote a sense of ownership and responsibility for their own health and safety.

OHS legislation establishes enforcement mechanisms to ensure compliance with safety and health regulations. Regulatory bodies are responsible for inspecting workplaces, investigating accidents and complaints, and taking appropriate enforcement actions when violations are identified. Penalties for non-compliance can include fines, sanctions, or even criminal prosecution in severe cases. Continual Improvement and Review: OHS legislation is typically subject to periodic review and revision to align with evolving scientific knowledge, technological advancements, and changing work environments. This ensures that regulations remain relevant, effective, and up to date in safeguarding worker health and safety.

It is important for employers, workers, and relevant stakeholders to familiarize themselves with the specific OHS legislation applicable in their jurisdiction and ensure compliance with its requirements. By adhering to OHS regulations, promoting a culture of safety, and implementing appropriate measures, organizations can protect human health, prevent work-related injuries and illnesses, and create safe and healthy workplaces.

1.5.Carrying out materials and equipment selection

When selecting materials for a farm, including Animal Farm, several criteria should be considered to ensure the safety, efficiency, and well-being of the animals. Here are some material selection criteria to consider:

- Durability: Choose materials that are strong, long-lasting, and resistant to wear and tear. Animals can be quite active, so it's essential to select materials that can withstand their movements and interactions.
- Safety: Prioritize the safety of the animals by selecting materials that are non-toxic, non-hazardous, and pose minimal risk of injury. Avoid materials with sharp edges, toxic coatings, or potential entrapment hazards.
- Cleanliness and hygiene: Opt for materials that are easy to clean and maintain hygiene. Smooth and non-porous surfaces make it easier to remove dirt, waste, and bacteria, reducing the risk of diseases and infections.
- Weather resistance: Consider the climate and weather conditions of the farm when selecting materials. Choose materials that can withstand exposure to sunlight, rain, wind, and temperature fluctuations without deteriorating or causing discomfort to the animals.
- Insulation: Select materials that provide adequate insulation to protect animals from extreme temperatures. Insulation can help maintain a comfortable and stable environment, reducing stress and promoting the animals' well-being.
- Sustainability: Give preference to environmentally friendly and sustainable materials. Consider the life cycle of the materials, including their production, use, and disposal. Choose materials that are recyclable, reusable, or made from renewable resources where possible.
- Cost-effectiveness: Consider the cost of materials and their long-term value. While it's important to prioritize quality and animal welfare, it's also essential to find a balance that fits within the farm's budget.
- Compatibility with animal needs: Consider the specific needs of the animals on the farm. For example, provide appropriate bedding materials for livestock, suitable nesting materials for poultry, and comfortable resting areas for all animals.
- Ease of installation and maintenance: Choose materials that are easy to install and maintain. This will help save time, effort, and resources when constructing and managing the farm.

- Regulatory compliance: Ensure that the selected materials comply with relevant regulations and standards for animal welfare, health, and safety. Familiarize yourself with any local or national guidelines or codes that apply to farm construction and operation.

By considering these criteria, you can select materials that promote the well-being of the animals on your farm while ensuring a safe and efficient environment.

1.6.Applying tests on animal products handling equipment and materials

When it comes to testing animal products handling equipment and materials, there are several key considerations to ensure safety, efficiency, and compliance with regulatory requirements. Here are some common tests and procedures that can be applied:

Perform tests to assess the performance of handling equipment, such as forklifts, conveyors, and lifting tools. This can include evaluating load capacity, stability, maneuverability, and control mechanisms. Ensure that the equipment operates smoothly and efficiently without compromising the integrity of the animal products. Test the cleanability and sanitation properties of equipment and materials used in the handling system. This includes evaluating surfaces for ease of cleaning, resistance to corrosion, and compatibility with sanitizing agents. Ensure that equipment and materials can be effectively cleaned and sanitized to maintain hygiene standards.

Conduct compatibility tests to ensure that equipment and materials used in the handling system do not adversely affect the quality or safety of animal products. This involves assessing the potential for contamination, off-gassing, or chemical reactions between the materials and the products being handled.

If temperature control is critical for the animal products, conduct tests to verify the effectiveness of equipment and materials in maintaining the required temperature range. This can include temperature mapping tests to assess the uniformity of temperature distribution within storage areas or refrigerated transport units.

Perform load tests to determine the maximum weight capacity of equipment and materials. This is particularly important when handling heavy or bulky animal products. Ensure that the

equipment and materials can safely handle the intended loads without compromising stability or posing a risk to workers.

Implement quality control procedures to verify the integrity and quality of animal products at different stages of the handling system. This can involve sampling and testing products for factors such as microbiological contamination, chemical residues, or physical defects. Establish testing protocols and standards based on regulatory requirements and industry best practices.

Assess the durability and wear resistance of equipment and materials over time. This can involve subjecting them to simulated operational conditions to evaluate their performance and identify potential weaknesses. Conduct regular inspections and maintenance to ensure that equipment remains in good working condition. Ensure that all equipment and materials used in the handling system comply with relevant regulatory requirements and industry standards. This may involve testing for specific certifications, such as food-grade materials or compliance with electrical safety standards.

Self check-1	Written test

Name …….. ID. …….. Date ……..

Test-1 choose the best answer

1. From the following which one is most perishability products?

A. Egg B. Milk C. Honey D. poultry

2. ____is the process of making a stable emulsion of milk fat and milk serum by mechanical treatment.

A .pasteurization B. Sterilization

C. Homogenization D. cream separation

3. Which one of the following is/are animal by product

A. milk B. meat C. Egg D. skin

4. From the advantage of product processing which one is incorrect?

A. increase palatability B. to add value

C. decrease shelf life D. minimize wastage

Test-2 writes short and brief answers

1. List animal product (2pts)

2. List animal by product (2pts)

3. Discribe the difference of animal product and by products (pts)

Satisfactory rating - 8 points Unsatisfactory - below 8 points

You can ask you teacher for the copy of the correct answers.

Operation Sheet-1	

1.1. Techniques of cheese making

A. Material, Tools and equipment's

- Milk
- Cultures and starter cultures
- Coagulation agents
- other ingredients (Herbs, Spices, Molds)
- Stainless steel or food grading container
- Cheese vat or pot
- Thermometer
- Cheese molds
- Cheese press
- Cheese cloth
- Curd cutter or Curd knife
- Cheese mat
- Cheese aging cover or Refrigerator
- Cheese wax or Vacuum sealer

B. Procedures

- select quality Milk
- pasteurize the selected milk
- Coagulation
- wait till curd formation
- after curd formation cut the curds
- Heat and Stir
- Drain and press
- add optimum amount of salt
- let to ripen and aged than pack

LAP TEST-1	Performance Test

Name……. ID…… Date ……

Time started: …… Time finished: …….

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **40 minutes**. The project is expected from each student to do it.

Task: 1. Perform Cheese preparing

Task: 2. perform cheese quality test

LG #19	LO #2 Determine animal product and by product handling and processing systems

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Requirement for quality and quantity product handling and processing
- Methods of animal products &by product handling and processing systems
- Determining basic principles of processing, packaging, and storage and preservation techniques
- Performing slaughtering procedure
- Applying post-harvest management systems
- Storing animal products and by products

Ensuring stock balance control This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Requirement for quality and quantity product handling and processing
- Methods of animal products &by product handling and processing systems
- Determine basic principles of processing, packaging, and storage and preservation techniques
- Perform slaughtering procedure
- Apply post-harvest management systems
- Store animal products and by products
- Ensure stock balance control

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets: Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the Self-checks which are placed following all information sheets.
5. Perform Operation Sheets
6. Do the “LAP test”
7. Ask from your trainer the key to correction key answers

Information sheet-2

2.1.Requirement for quality and quantity product handling and processing

To ensure effective handling and processing of products, both in terms of quality and quantity, several requirements should be considered. These requirements may vary depending on the specific industry and product type, but here are some general considerations:

A. Quality Assurance:

- Clearly define the quality specifications for the products, including parameters such as size, weight, color, composition, and sensory attributes.
- Implement robust quality control measures at various stages of handling and processing to ensure compliance with specifications. This may involve inspection, sampling, testing, and monitoring procedures.
- Develop and follow SOPs for handling and processing operations to maintain consistency and quality. These SOPs should include guidelines for equipment setup, product handling techniques, and quality control checks.
- Ensure that packaging materials are appropriate for maintaining product quality and preventing damage or contamination. Implement accurate labeling practices to provide essential information to consumers and regulatory authorities.

B. Quantity Management:

Establish an efficient inventory management system to monitor and control the quantity of products at various stages, from raw materials to finished goods. This includes tracking stock levels, implementing FIFO (first-in, first-out) or FEFO (first-expiry, first-out) principles, and minimizing waste or spoilage. Utilize forecasting techniques and market analysis to estimate product demand accurately. This helps optimize production and ensure sufficient inventory levels to meet customer requirements.

Assess and optimize production capacity to align with demand. Ensure that equipment, facilities, and workforce capacity are adequate to handle the expected quantity of products. Collaborate

with suppliers and logistics partners to ensure a smooth flow of materials, minimizing delays or disruptions that could impact product quantity.

C. Process Efficiency:

Analyze the product handling and processing workflow to identify bottlenecks, inefficiencies, and opportunities for improvement. Streamline processes, reduce idle time, and implement lean manufacturing principles to enhance efficiency. Utilize appropriate equipment, machinery, and automation technologies to improve productivity and reduce manual labor requirements. This can include conveyor systems, robotics, and advanced process control systems.

Provide adequate training to employees involved in handling and processing operations. Enhance their skills and knowledge to perform tasks efficiently and maintain product quality standards. Foster a culture of continuous improvement by encouraging feedback, conducting regular performance reviews, and implementing corrective actions to address identified issues.

It is important to consider applicable industry regulations and standards related to product handling and processing, such as food safety regulations or quality management systems. Regular monitoring, data analysis, and feedback from customers can help identify areas for improvement and drive ongoing optimization efforts.

2.2.Methods of animal products &by product handling and processing systems

Handling and processing systems for animal products and by-products can vary depending on the specific product, industry, and regulatory requirements. Here are some common methods used in the handling and processing of animal products:

I. Slaughtering and Dressing:

- ✓ Animals are rendered unconscious prior to slaughter using methods such as electrical stunning, mechanical stunning, or gas stunning.
- ✓ After stunning, animals are bled to remove blood from the carcass.
- ✓ Carcasses are eviscerated and prepared for further processing, including removal of internal organs, skinning, and cleaning.

II. Chilling and Cold Storage:

- ✓ Carcasses or meat cuts are subjected to controlled temperature environments to reduce their temperature quickly and inhibit microbial growth.

- ✓ Chilled or frozen animal products are stored in temperature-controlled environments to maintain their quality and extend their shelf life.

III. Cutting and Portioning:

- ✓ Carcasses are cut into primal cuts, such as loins, ribs, and legs, using various cutting techniques and specialized tools.
- ✓ Primal cuts are further divided into smaller retail cuts or portions based on market demand and customer specifications.

IV. Processing and Value-Added Products:

Some animal products, such as hams, bacon, or sausages, undergo curing and smoking processes to enhance flavor, texture, and preservation. Fermentation processes are used in the production of certain animal by-products, such as fermented sausages or cured meats. Animal products may be cooked or subjected to heat treatment methods, such as pasteurization or sterilization, to ensure safety and extend shelf life. Animal products can be transformed into value-added products like ready-to-eat meals, marinated items, or processed meats through processes like grinding, mixing, and forming.

V. Packaging and Labeling:

- ✓ Animal products are packaged using suitable materials that provide protection from contamination, extend shelf life, and comply with regulatory requirements.
- ✓ Proper labeling of animal products is essential to provide important information to consumers, such as product name, ingredients, nutritional information, storage instructions, and safety warnings.

VI. Quality Control and Assurance:

- ✓ Rigorous inspection processes are implemented to ensure product quality, safety, and compliance with regulatory standards.
- ✓ Animal products are tested for various parameters, including microbiological analysis, chemical residues, sensory attributes, and nutritional composition.

Systems are in place to trace animal products back to their source, ensuring accountability and enabling targeted recalls if needed. Hazard Analysis and Critical Control Points (HACCP)

systems are implemented to identify and control potential hazards throughout the handling and processing stages.

VII. Waste Management:

- ✓ By-Product Utilization: Animal by-products, such as bones, offal, or fats, may be processed and utilized for other purposes, including pet food, rendering, or industrial applications.
- ✓ Waste Treatment: Proper waste management practices are followed to handle and treat waste generated during the handling and processing of animal products, ensuring compliance with environmental regulations.

It is important to note that specific handling and processing methods may differ depending on the type of animal product, such as meat, dairy, eggs, or seafood, as well as regional or cultural preferences. Compliance with relevant food safety regulations and industry standards is crucial to ensure the quality, safety, and integrity of animal products throughout the handling and processing systems.

2.2.1. system of animal product handling

A. Cooling or Refrigeration

Refrigeration is a preservative and a storage method for meat and meat products. The most common method for prolonging the shelf life of meat is refrigeration, which involves storage of meat at temperatures between -2 and 5^{o}C. Refrigeration should begin immediately after slaughtering and continue through subsequent processing to consumption.

The internal temperature of the carcass, which is between 30 – 39^{o}C after slaughter must be reduced rapidly to about 5^{o}C at the thickest portion of meat in order to slow down the degeneration of the meat. Beef, pork, and lamb carcasses are usually cooled or chilled at temperature ranges of between -4 to 0^{o}C, while fish and poultry carcasses are cooled by immersion in ice water. The rate of cooling a carcass depends on the size of the carcass, amount of external or internal fat, and the temperature of the cooling environment. The rate of cooling will be slow if the carcass is large, fat is much, and the temperature of cooling environment is high. Meat or meat products should only be stored under refrigeration for a sort time because degenerative changes continue to occur and accelerates with time. The major factors that

influence the storage life of meat under refrigeration are the initial microbial load, temperature and humidity conditions during storage, the presence or absence of protective covering or packaging, the species of animal, and the type of product stored (raw or processed).

The storage life of meat will be shorter if the initial microbial load is high, humidity is low and temperature high, covering is absent, meat is from fish or poultry, and the meat is raw. Fresh meat purchased for consumption should not be stored under refrigeration for more than four days before consumption unless frozen.

B. Freezing

Freezing is an excellent method for preserving and storing meat. It results in less undesirable changes in qualitative and sensory (flavour, taste, juiciness and texture) properties of meat. Very low temperature retards microbial growth, enzymatic or chemical changes thereby retaining nutritive value. Freezing also prevents access by microbes to water available for microbial growth. However, freezing can cause damage by discolouration (freezer burn), formation of ice crystals in meat and the precipitation of cell constituents depending on whether freezing is done at a fast rate or at a slow rate. Freezing at a fast rate is more desirable than at a low rate.

There are different methods for freezing meat and meat products, which are:

- ✓ Still air: Air is the heat transfer medium and freezing depends on convection with meat freezes very slowly. The home freezer unit and the refrigerator freezer operate on this principle. Temperature ranges from about -10 to -30^{o}C.
- ✓ Plate freezer: Metal is the heat transfer medium and freezing depends on conduction, which is slightly faster than still air. Products are placed in direct contact with the freezer metallic plate or shelves. Temperature also ranges from about -10 to -30^{o}C.
- ✓ Blast freezer: Air is the medium of heat transfer but the heat is transferred at a higher velocity on account of the fans installed for rapid air movement. Temperature also ranges from about -10 to -40^{o}C and air velocity from 30 to 1070 meters/minute.
- ✓ Liquid immersion and liquid sprays: This is used mostly for packaged products especially poultry and fish. Freezing rate is rapid and comparable to blast freezing. The products are wrapped in plastic and immersed in the freezing liquid or the cold liquid is sprayed over

them. The liquid must be non-toxic, cheap, have low viscosity, low freezing point and high heat conductivity. Examples are sodium chloride brine (salt solution), glycerol, and glycol.

- ✓ Cryogenic freezing: This is the most rapid method of freezing. It involves extremely low temperatures where the freezing agent such as liquid or gaseous nitrogen or liquid, gaseous or solid carbon dioxide is applied. They can be applied as liquid immersion or spray.

Before meat under freezer storage can be used it has to be changed from the frozen state to the former state before freezing. This process is called thawing. The quality of meat after thawing will depend on conditions under frozen storage, thawing method, freezing rate (slow or fast), and condition of meat before freezing. There are five ways of thawing frozen meat products:

- Cold air: meat put into a refrigerator or cooler
- Warm air: meat left under ambient temperature
- Water: meat put in water or under running water
- Cooking: meat cooked directly as soon as taken from freezer
- Microwave: meat thawed according to the microwave thawing option

The cold air option is recommended as the best thawing method if the products are not going to be cooked or microwaved directly from the frozen state

2.3.Determining basic principles of processing, packaging, and storage and preservation techniques

Determining the basic principles of processing, packaging, and storage and preservation techniques for various products involves considering factors such as product characteristics, safety requirements, desired shelf life, and regulatory guidelines. Here are some fundamental principles for each aspect:

I. Processing Principles:

- Ensure that processing methods minimize the risk of microbial contamination, chemical hazards, and physical hazards to ensure product safety.

- Implement processing techniques that preserve the sensory attributes, nutritional value, and overall quality of the product.
- Design processing operations to maximize productivity, minimize waste, and optimize energy and resource utilization.
- Establish standardized procedures and protocols to ensure consistency and uniformity in processing operations.
- Monitor and control critical process parameters such as time, temperature, pH, and moisture content to achieve desired product outcomes.

II. Packaging Principles:

Packaging should provide a protective barrier against physical, chemical, and microbial contamination, ensuring product integrity and safety. Select packaging materials and techniques that extend the shelf life of the product by minimizing exposure to oxygen, light, moisture, and other deteriorative factors. Packaging should be user-friendly, easy to handle, and facilitate portioning, serving, and storage of the product. Packaging can serve as a vehicle for branding, product information, and regulatory compliance, including labeling requirements. Consider environmentally friendly packaging options, such as recyclable, biodegradable, or compostable materials, to minimize the environmental impact.

III. Storage and Preservation Principles:

Maintain appropriate temperature conditions during storage to prevent microbial growth, enzymatic activity, and chemical degradation. This may involve refrigeration, freezing, or controlled atmosphere storage and control humidity levels to prevent moisture-related issues such as mold growth, texture changes, or caking.

Shield products from direct light exposure, as it can lead to quality deterioration, vitamin degradation, and off-flavors. Prevent exposure to air and strong odors that can impact product quality and shelf life. Implement proper stock rotation techniques (e.g., FIFO) and inventory control systems to minimize waste, manage expiration dates, and ensure product freshness.

6. Preservation Techniques: Consider additional preservation techniques like canning, drying, fermenting, or pasteurization, depending on the product and desired shelf life.

It's important to note that specific processing, packaging, and storage techniques vary depending on the nature of the product, industry regulations, and cultural or regional preferences. Therefore, it's crucial to conduct thorough research, follow industry best practices, and comply with applicable food safety and quality standards to ensure the safety, quality, and longevity of the products.

General methods of preservation, cleaning, handling and storage are:

Collect eggs in an easy to clean container like coated wire baskets or plastic egg flats. This will prevent stains from rusted metal and contamination from other materials which are difficult to clean and disinfect.

Never cool eggs rapidly before they are cleaned. The egg shell will contract and pull any dirt or bacteria on the surface deep into the pores when cooled. Try to keep the temperature relatively constant until they are washed.

Wash eggs as soon as you collect them. This helps limit the opportunity of contamination and loss of interior quality. Washing eggs with water 10^{o} (degrees) warmer than the egg will make the egg contents swell and push the dirt away from the pores of the egg. If you have extremely dirty eggs, a mild detergent approved for washing eggs can be used. Never let eggs sit in water. Once the temperature equalizes the egg can absorb contaminants out of the water.

Cool and dry eggs quickly after washing. Store eggs small end down in an egg carton to keep the air cell stable and at 10-12°C and 70-75% relative humidity. Never hold eggs at or above room temperature or at low humidity more than necessary. If eggs sit at room temperature (25°C) they can drop quickly in quality daily. Leaving eggs in a warm, dry environment will cause interior quality to drop quickly.

Do not stack (place them one above the other) eggs too high. If collecting in baskets do not stack eggs more than five layers deep. If using plastic flats do not stack more than six flats. If you stack eggs too deep you will increase breakage.

Never store eggs with materials that have an odour. Eggs will pick up the odours of apples, fish, onions, potatoes and other food or chemicals with distinct odours. Sell the oldest eggs first and try to use or sell all eggs before they are three weeks old.

2.4.Performing slaughtering procedure

Slaughtering animals is a specialized skill that requires specific training, knowledge of animal welfare practices, and compliance with legal and ethical guidelines. It is typically conducted by trained professionals in approved facilities that adhere to strict regulations and standards.

If you are looking for information on slaughtering procedures, I would recommend consulting official guidelines and resources provided by relevant regulatory bodies or seeking assistance from experts in the field, such as veterinarians, agricultural extension services, or professional butchers. They can provide accurate and detailed guidance on the proper and humane procedures involved in animal slaughter.

I. Slaughtering procedure

- ✓ Purchase or prepare beef cattle
- ✓ Quarantine in lairage for 2 to 3 day before slaughter
- ✓ prepare and clean slaughtering area
- ✓ Done pre-mortem test
- ✓ slaughter and bleeding
- ✓ flying/remove skin
- ✓ apply post mortem test
- ✓ portioning and clean material, tools and equipments

Figure: Splitting, washing and dressing of carcasses



II. Materials, tools and equipment used to slaughter beef cattle

Slaughtering beef cattle involves a range of materials, tools, and equipment to ensure the process is safe, efficient, and humane. Here are some commonly used items:

A. Materials:

- ✓ Beef Cattle: The animals to be slaughtered, typically raised for meat production.
- ✓ Water: Used for cleaning and sanitizing various surfaces and equipment.
- ✓ Cleaning and Sanitizing Agents: Chemicals or detergents used to clean and sanitize the slaughtering area and equipment.
- ✓ Packaging Materials: Used for storing and transporting the beef carcasses and meat products.
- ✓ Rendering Materials: Materials used for rendering processes, such as separating fat and protein, to produce by-products like tallow and meat and bone meal.

B. Tools and Equipment:

- ✓ Stunning Equipment: Various stunning methods can be used, including captive bolt stunners, electric stunners, or firearms, all designed to render the animal unconscious before slaughter.
- ✓ Restraining Equipment: Chutes, gates, or squeeze systems are used to safely restrain and immobilize the cattle during the slaughtering process.
- ✓ Knives and Cutting Instruments: Sharp knives and cutting instruments are used by skilled butchers to perform the necessary incisions and cuts during the slaughtering and butchering process.
- ✓ Hoists and Chains: Used to lift and suspend the carcass for further processing and evisceration.
- ✓ Bleeding Equipment: Tools such as sticking knives or bleeding cones are used to sever major blood vessels, allowing the animal to bleed out.

- ✓ Hide Removal Tools: Tools like hide pullers and skinning knives are used to remove the hide from the carcass.
- ✓ Evisceration Tools: Instruments such as gutting hooks, evisceration knives, and saws are used to remove the internal organs and separate the carcass into primal cuts.
- ✓ Carcass Splitting Equipment: Saws or splitting saws are used to split the carcass into halves or quarters.
- ✓ Inspection Tools: Inspection instruments like meat probes, thermometers, and pH meters are used to assess the quality and safety of the meat.
- ✓ Sanitizing Equipment: Equipment such as pressure washers, sprayers, and brushes are used to clean and sanitize the slaughtering area and equipment.

It is important to note that slaughtering beef cattle should be conducted following local regulations, industry guidelines, and with consideration for animal welfare. Additionally, proper training and expertise are crucial to ensure the process is performed efficiently, safely, and in accordance with ethical practices.

III. Treatment of livestock before slaughter

Stress in its many forms, e.g. deprivation of water or food, rough handling, exhatustion due to transporting over long distances, mixing of animals reared separately resulting in fighting, is unacceptable from an animal welfare viewpoint and should also be avoided because of its deleterious effects on meat quality. The most serious consequence of stress is death which is not uncommon among pigs transported in poorly ventilated, overcrowded trucks in hot weather. From loading on the farm to the stunning pen animals must be treated kindly, and the Lorries, lairages and equipment for livestock handling must be designed to facilitate humane treatment. Stress immediately prior to slaughter, such as fighting or rough handling in the lairage, causes stored glycogen (sugar) to be released into the bloodstream. After slaughter this is broken down in the muscles producing lactic acid. This high level of acidity causes a partial breakdown of the muscle structure causing the meat to be pale, soft and exudative (PSE). This condition is mostly found in pigs.

Long-term stress before slaughter such as a prolonged period of fighting during transport and/or lairage leads to exhaustion. The sugars are used up so that less is available to be broken down and less lactic acid is produced. The reduced acidity leads to an abnormal muscle condition known as dark, firm and dry (DFD) in pigs or dark cutting in beef. The condition is rarer in lamb. Such meat has a high pH (above 6.0) and spoils very quickly as the low acidity favours' rapid bacterial growth.

IV. Stunning and bleeding of slaughter animals

Most countries have legislation requiring that animals are rendered unconscious (stunned) by a humane method prior to bleeding. Exceptions are made for religions which require that ritual slaughter without prior stunning is practised, provided the slaughter method is humane. Stunning also makes sticking (throat-slitting) less hazardous for the operator. The animal must be unconscious long enough for sticking to be carried out, and for brain death to result from the lack of blood supply.

A. Methods of stunning

Direct blow to skull using a club or poleaxe The blow must be dealt with precision and force, so that the skull is immediately smashed, causing instantaneous unconsciousness. In cattle the aiming point is in the middle of the forehead in line with the ears, where the skull is thinnest. Horses have thinner skulls and are therefore easier to stun by this method. In sheep and goats the brain is more easily reached from the back of the neck. Pigs have a well-developed frontal cavity so the blow should be aimed slightly above the eyes. Slaughtering mask a bolt held in the correct position by the mask is driven into the animal's brain by a hammer blow. The device is usually fitted with a spring which returns the bolt to its original position.

Free bullet fired from a pistol into the skull is effective but unsafe. This method has been used on horses and cattle. Captive-bolt pistols fitted with a blank cartridge are effective on cattle and sheep but not pigs whose skulls are thicker. After firing, the bolt returns to its original position in the pistol. The bolt may or may not be designed to penetrate the skull. With penetrating types the

brain becomes contaminated with hair, dirt and bone fragments. If brains are to be saved as edible tissue then the non-penetrating type with a mushroom-shaped head should be used.

Electrical stunning an electric current of high frequency but, in the case of manually operated equipment, of relatively low voltage (60–80 V) is passed through the brain of an animal for a few seconds to produce unconsciousness. If applied correctly a deep state of unconsciousness is invariably achieved. Strict safety rules must be observed. Head tongs are suitable for pigs and sheep but not for cattle. The electrodes carried on the ends of the tongs must be accurately placed. Places where the skull is thick must be avoided. Electrical contact is impeded by hair and caked mud. Water or brine will improve contact but the head must not be completely wet otherwise the current will have a short-circuit path avoiding the brain. The electrodes must be applied with strong pressure.

Carbon dioxide stunning is used only in large pig abattoirs. Pigs are induced into a chamber and exposed to a concentration of 85 percent CO_2 for about 45 seconds. Although effective for anaesthetizing sheep, it is impractical because of large amounts of CO_2 collecting in the wool and affecting operators on the killing line.

V. Bleeding after stunning

The objectives of bleeding are to kill the animal with minimal damage to the carcass and to remove quickly as much blood as possible as blood is an ideal medium for the growth of bacteria. Sticking, severing the major arteries of the neck, should immediately follow stunning. Care must be taken not to puncture the chest cavity or it will fill with blood.

NB in Cattle Insert the sticking knife carefully just above the breastbone at 45° pointed toward the head. Ensure that the carotid arteries and jugular veins are severed in one movement.

A. Bleeding on a rail

The most hygienic system of bleeding and dressing is to shackle the animal immediately after stunning, then hoist it on to a moving rail. The animal is stuck while being hoisted to minimize the delay after stunning. Bleeding continues until the blood flow is negligible when carcass dressing should begin without further delay.

Blood for human use must be collected with special equipment to avoid contamination from the wound, the gullet of the knife. A hollow knife directs blood away from the wound into a covered stainless-steel container without touching the skin or hide. The knife may be connected to a hose to reduce the risk of contamination. The hose may even be connected to a pump to speed the blood flow. Between 40 and 60 percent of the total blood volume will be removed though this will be reduced if sticking is delayed. To prevent coagulation, citric acid solution made up with one part citric acid to two parts water is added at a rate up to 0.2 percent of the blood volume. The main sources of contamination during sticking and bleeding include the knife, the wound and the food-pipe. The knife should be changed after each operation and returned to a sterilizer. Cutting the hide of sheep and cattle and opening out to make a clean entry for the sticking knife reduces contamination from the wound. If the food-pipe is pierced semi-digested food may be regurgitated contaminating the blood and neck wound.

B. Horizontal bleeding

Horizontal bleeding is claimed to give faster bleeding rates and a greater recovery of blood. This may be due to certain organs and blood vessels being put under pressure when animals are hoisted, thus trapping blood and restricting the flow. Bleeding on the floor is very unhygienic. The operation should take place on a specially designed, easily cleaned stainless-steel table which should be cleaned frequently. If blood is to be saved it must not come in contact with the table before reaching the collecting vessel.

C. Bleeding without stunning

The Jewish and Muslim religions forbid the consumption of meat which was killed by any method other than bleeding. Since it is difficult to guarantee that all animals will recover

consciousness after being stunned by any particular method, stunning is not generally allowed. There are exceptions, however. Some communities do accept low-voltage electrical stunning.

Because animals are fully conscious at the time of sticking, ritual slaughter may be less humane than sticking after stunning. To reduce the suffering operators must be highly skilled so that a successful gash cut severing all the veins and arteries is made quickly at the first attempt. Different communities have different regulations as to the orientation of the animal at sticking, some favouring a position lying on its side, others insisting it lie on its back. The animal should not be hoisted until unconsciousness due to lack of blood supply to the brain is complete.

I. basic equipment needed for the slaughtering operation**:**

- stunning gun, electrical head tongs or simple stunning equipment for direct blow
- knives: sticking - 15 cm sharpened on both sides skinning - 15 cm curved
- a sharpening steel
- oil or water sharpening stone
- scabbard and belt for holding knives
- meat saw - hand or electric and cleaver
- block and tackle or chain hoist strong enough to hold the weight of the animal to be slaughtered
- pitch, chocks or skinning rack (dressing cradle)
- a strong beam, tripod or track 2.4 to 3.4 m from floor
- spreader - gambrel or metal pipe
- several buckets
- working platforms
- scalding barrel or tank
- pot, barrel or system for boiling water
- bell scrapers
- solid scraping table or platform
- thermometer registering up to 70°c

- hog or hay hook
- torch or flame for singeing

2.5.Applying post-harvest management systems

Post-harvest management of livestock products refers to the practices and techniques applied after the slaughter or harvesting of animals to ensure the quality, safety, and preservation of the products. Here are some key aspects and techniques involved in post-harvest management of livestock products:

A. Chilling and Cold Storage:

Immediately after slaughter, the animal carcasses or meat cuts should be cooled down to appropriate temperatures to inhibit microbial growth and maintain product quality. Utilize refrigeration or cold storage facilities to maintain the desired temperature and humidity levels for the specific type of livestock product. Implement proper chilling techniques, such as air or water chilling, to achieve rapid and uniform cooling.

B. Packaging and Labeling:

Use suitable packaging materials that provide protection from contamination, moisture loss, and physical damage. Properly label the packages with necessary information, including product name, date of packaging, batch/lot numbers, nutritional information, and storage instructions. Ensure compliance with labeling regulations and guidelines specific to your region.

C. Quality Control:

- ✓ Establish quality control measures to monitor and maintain the quality and safety of livestock products throughout the post-harvest handling process.
- ✓ Conduct regular inspections, sensory evaluations, and microbial testing to ensure adherence to quality standards and food safety regulations.
- ✓ Implement traceability systems to track the origin and processing history of the products

D. Inventory Management:

- ✓ Implement efficient inventory management practices to manage stock levels, minimize waste, and prevent product spoilage.
- ✓ Utilize inventory tracking systems, such as first-in, first-out (FIFO) or batch management, to ensure proper rotation and utilization of products.
- ✓ Monitor expiration dates and shelf life to avoid selling or using expired products.

E. Transportation and Distribution:

- ✓ Ensure proper handling, storage, and transportation conditions during product distribution to maintain product quality and safety.
- ✓ Use suitable transportation vehicles equipped with temperature control systems to prevent temperature fluctuations.
- ✓ Follow hygienic practices and adhere to food safety regulations during product transportation.

F. Value-Added Processing:

- ✓ Consider value-added processing techniques to diversify product offerings and extend the shelf life of livestock products.
- ✓ This may include techniques such as smoking, curing, marinating, or processing into ready-to-eat meals or convenience products.

G. Waste Management:

- ✓ Implement proper waste management practices, including the safe disposal or utilization of by-products and waste generated during post-harvest handling.
- ✓ Comply with environmental regulations and guidelines for waste treatment and disposal.

It is important to note that post-harvest management practices may vary depending on the specific livestock product, such as meat, dairy, eggs, or other animal-derived products. Additionally, it is crucial to follow local regulations, guidelines, and best practices for post-harvest management to ensure the safety, quality, and compliance of livestock products.

In general the structure needs to be kept cool (refrigerated, processed or at least ventilated and shaded) and the produce put into storage must be of high initial quality.

Storage is essential for the following reasons:

- Perishable nature of agric. & bio-materials

- Provision of food materials all year round
- Pilling/ provision for large scale processing
- Preservation of nutritional quality
- Price control and regulation
- Optimization of farmers‟ gain / financial empowerment of farmers
- Opportunity for export market

2.6.Storing animal products and by products

Storing animal products and by-products properly is crucial to maintain their quality, safety, and shelf life. Here are some general guidelines for storing different types of animal products:

I. Meat and Poultry:

Store fresh meat and poultry in the refrigerator at temperatures below 40°F (4°C). Keep them in sealed containers or wrapped tightly in moisture-proof and leak-proof packaging. If you do not plan to use the meat or poultry within a few days, freeze it at 0°F (-18°C) or below. Use freezer-safe packaging to prevent freezer burn and maintain quality. Clearly label packages with the date of storage to ensure proper rotation and avoid using products past their recommended storage times.

II. Dairy Products:

Most dairy products, such as milk, cheese, and yogurt, should be stored in the refrigerator at temperatures between 32°F (0°C) and 40°F (4°C). Follow storage instructions specific to each product. Keep dairy products in their original packaging or transfer them to airtight containers to prevent absorption of odors and to maintain freshness. Avoid temperature fluctuations by placing dairy products away from the refrigerator door and in a consistently cool area of the fridge.

III. Eggs:

- Refrigeration: Store eggs in their original carton or in an egg container in the refrigerator at temperatures between 32°F (0°C) and 40°F (4°C).
- Positioning: Place eggs on a shelf rather than on the refrigerator door to minimize temperature fluctuations.
- Separation: Keep eggs separate from strong-smelling foods as eggs can absorb odors.

IV. Seafood:

- Refrigeration: Store fresh seafood in the refrigerator at temperatures between 32°F (0°C) and 40°F (4°C). Place seafood on ice or in a sealed container to maintain freshness.
- Freezing: If you don't plan to use seafood within a few days, freeze it at 0°F (-18°C) or below. Use freezer-safe packaging to prevent freezer burn.
- Labeling: Label packages with the date of freezing and use within the recommended storage time for optimal quality.

V. By-Products and Other Animal-Derived Products:

- Follow specific storage instructions: Different by-products and animal-derived products may have varying storage requirements. Follow the manufacturer's instructions or industry guidelines for proper handling and storage.
- Keep in appropriate containers: Store by-products in suitable containers that prevent contamination and maintain product quality.
- Maintain proper temperature: Ensure that the storage temperature is appropriate for the specific product to prevent spoilage and maintain safety.

Additional Tips:

- Regularly clean and sanitize storage areas to prevent the growth of bacteria and cross-contamination.
- Follow proper storage order and rotation techniques (e.g., first-in, first-out) to minimize waste and ensure product freshness.
- Monitor storage conditions regularly, including temperature and humidity levels, to ensure they remain within the recommended range.

It is important to note that specific storage requirements may vary depending on the product, regional regulations, and industry guidelines. Always refer to product-specific instructions and consult relevant regulatory authorities for precise storage recommendations for animal products and by-products.

Self check-2	Written test

Name…… ID. …… Date ……

Test-1 choose the best answer

1. Which of the following is an appropriate storage temperature for fresh meat?

A) 50°F (10°C) B) 32°F (0°C) C) 80°F (27°C) D) 20°F (-6°C)

2. What is the recommended storage method for eggs?

A) Freezing C) Refrigeration

B) Room temperature D) Sun-drying

3. Which packaging material is suitable for preventing freezer burn in frozen seafood?

A) Paper bags C) Aluminum foil

B) Plastic wrap D) Wax paper

4. What is the purpose of using airtight containers for storing dairy products?

A) Prevent odor absorption C) Increase shelf life

B) Enhance flavor D) Improve texture

5. Which of the following is an example of a by-product derived from animal processing?

A) Milk B) Steak C) Leather D) Apples

Satisfactory rating - 4 points Unsatisfactory - below 4 points

You can ask you teacher for the copy of the correct answers

Operation Sheet-2	

2.1. Technique of slaughtering animals

A. Materials, Tools and equipment's

- Beef cattle
- water
- cleaning and sanitizing agents
- Stunning equipment
- Restraining equipment
- Knife and cutting instruments
- Bleeding equipment
- Hide removal tools (hide puller and skinning knife)
- Carcass splitting equipment
- inspection tools (meat probes, thermometer, pH meter)

B. Procedures

- Purchase or prepare beef cattle
- Quarantine in lairage for 2 to 3 day before slaughter
- prepare and clean slaughtering area
- Done pre-mortem test
- slaughter and bleeding
- flying/remove skin
- apply post mortem test
- portioning
- clean material tools and equipment

LAP TEST-2	Performance Test

Name……. ID…… Date ……

Time started: …… Time finished: …….

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **60minutes**. The project is expected from each student to do it.

Task: 1. Perform slaughtering beef cattle

LG #20	LO #3 Install and operate animal products and by products handling and processing equipment

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Installing plate cooler and pre-cooling system
- Installing refrigeration system
- Applying tests on animal products handling equipment and materials
- Completing commissioning tests
- Completing routine maintenance program
- Storing and restocking animal by-product
- Performing cleaning work area
- Communicate and coordinate the working groups Ensuring stock balance control

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Install plate cooler and pre-cooling system
- Install refrigeration system
- Apply tests on animal products handling equipment and materials
- Complete commissioning tests
- Complete routine maintenance program
- Store and restocking animal by-product
- Perform cleaning work area

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets: Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the Self-checks which are placed following all information sheets.
5. Perform Operation Sheets
6. Do the “LAP test”
7. Ask from your trainer the key to correction key answers

Information sheet-3

3.1. Installing plate cooler and pre-cooling system

Installing a plate cooler and pre-cooling system can help improve the efficiency and effectiveness of cooling processes in various industries, such as dairy farming or food processing. Assess the cooling requirements, including the desired cooling capacity, temperature reduction needed, and flow rate of the fluid to be cooled. This will help determine the appropriate size and specifications for the plate cooler and pre-cooling system. Choose a plate cooler and pre-cooling system that meets the identified requirements. Consider factors such as the materials of construction, compatibility with the fluid being cooled, and energy efficiency.

Design the layout of the cooling system, considering the available space, accessibility for maintenance, and the flow path of the fluid. Ensure that the system is properly integrated into the existing process or equipment. Clear the installation area and ensure it is clean, level, and stable. If necessary, install a concrete pad or base to provide a solid foundation for the equipment.

Mount the plate cooler in the designated location according to the manufacturer's instructions. Connect the inlet and outlet pipes to the appropriate ports on the plate cooler, ensuring proper alignment and tight connections. Install any necessary valves, flow meters, or pressure gauges. If a separate pre-cooling system is being installed, follow the manufacturer's instructions to mount and connect the system components. This may include a refrigeration unit, condenser, compressor, evaporator, and associated piping.

Connect Power Supply: If the plate cooler or pre-cooling system requires electrical power, connect it to a reliable power source following electrical codes and safety guidelines. Ensure that the system is properly grounded. Test and Commission: Before operation, thoroughly inspect the installed system for any leaks, loose connections, or abnormalities. Fill the system with the appropriate cooling medium, such as chilled water or refrigerant, and test its functionality. Verify that the desired cooling capacity and temperature reduction are achieved.

Monitor and Maintain: Establish a regular maintenance schedule for the plate cooler and pre-cooling system. This may include periodic cleaning, filter replacement, lubrication, and

inspection of components. Monitor system performance and address any issues promptly. It is important to consult with a qualified professional or follow manufacturer guidelines specific to the plate cooler and pre-cooling system being installed to ensure proper installation and operation.

3.2. Installing refrigeration system

Installing a refrigeration system can be a complex process that requires careful planning and expertise. Here is a general overview of the steps involved in installing a refrigeration system:

I. System Design and Sizing: Determine the cooling requirements for the intended application, including the desired temperature range, cooling capacity, and airflow requirements. This information will help determine the appropriate type and size of the refrigeration system.

II. Select Equipment: Choose the necessary components for the refrigeration system, such as the compressor, condenser, evaporator, expansion valve, and any necessary controls or accessories. Consider factors such as the application, refrigerant type, energy efficiency, and manufacturer recommendations.

III. Plan System Layout: Design the layout of the refrigeration system, considering factors such as available space, accessibility for maintenance, and proper airflow. Determine the location for each component, ensuring that there is sufficient clearance for ventilation and service access.

IV. Prepare Installation Area: Clear the installation area and ensure it is clean, level, and suitable for supporting the weight of the equipment. Install any necessary mounting brackets or supports.

V. Install Compressor and Condenser: Mount the compressor and condenser in their designated locations, following the manufacturer's instructions. Connect the refrigerant lines between the compressor and condenser, ensuring proper insulation and tight connections. Install any necessary vibration isolators or dampers to reduce noise and vibration.

VI. Install Evaporator: Mount the evaporator in the desired location, considering factors such as airflow and accessibility. Connect the refrigerant lines between the condenser and evaporator,

ensuring proper insulation and tight connections. Install any necessary fans, blowers, or ductwork to facilitate airflow.

VII. Install Expansion Valve and Controls: Install the expansion valve at the appropriate location in the refrigerant line. Connect the necessary control wiring, sensors, and thermostats according to the system design and manufacturer instructions.

VIII. Refrigerant Charging: Follow proper procedures to charge the refrigerant into the system. This may involve connecting a manifold gauge set, purging air from the lines, and adding the appropriate amount of refrigerant as specified by the manufacturer.

VIIII. Electrical Connections: Connect the electrical supply to the system, following electrical codes and safety guidelines. Ensure that all wiring is properly sized, protected, and connected to the appropriate terminals.

X. Test and Commission: Before operation, thoroughly inspect the installed system for any leaks, loose connections, or abnormalities. Perform a system startup and commissioning process, which may involve running the system through a series of tests to verify proper operation, temperature control, and refrigerant pressures.

XI. Training and Documentation: Provide training to the operators and maintenance personnel on the proper use, maintenance, and troubleshooting of the refrigeration system. Keep detailed documentation of the installation, including system specifications, component manuals, and any necessary permits or certifications.

It is important to consult with a qualified refrigeration technician or contractor for the installation of a refrigeration system, as they will have the expertise and knowledge to ensure proper installation, refrigerant handling, and system performance.

3.3. Applying tests on animal products handling equipment and materials

Applying tests on animal products handling equipment and materials is crucial to ensure food safety, quality, and compliance with regulatory standards. This involves sampling and analyzing equipment and materials for the presence of microorganisms, such as bacteria, molds, and yeasts. It helps identify potential sources of contamination and assess the effectiveness of cleaning and sanitation procedures. Animal product handling equipment and materials should be tested for allergenic substances, such as proteins from common allergens like milk, eggs, or shellfish. This testing helps prevent cross-contamination and ensures the safety of individuals with food allergies.

Equipment and materials used in animal product handling should be tested for chemical residues, such as veterinary drugs, pesticides, or cleaning agents. This testing helps ensure compliance with legal limits and prevents the presence of harmful substances in the final products. Physical contamination tests involve inspecting equipment and materials for any foreign objects, such as metal fragments, plastic pieces, or glass shards. This testing helps prevent potential hazards and ensures product integrity.

Equipment surfaces that come into direct contact with animal products should be tested for abrasion resistance and wear. This ensures that equipment does not degrade over time, preventing particles or flakes from contaminating the products. Temperature monitoring and testing of refrigeration units, cold storage areas, and transport containers are essential to ensure that animal products are stored and transported within the required temperature range to maintain freshness and prevent microbial growth.

Functional testing involves checking the proper operation of equipment, such as valves, seals, pumps, or sensors. This ensures that the equipment is functioning correctly and will not compromise product safety or quality. Equipment and materials should be tested against applicable regulatory standards and industry guidelines to ensure compliance. This may include testing for specific parameters, such as material composition, dimensions, or performance criteria. It is important to work with accredited laboratories or qualified professionals to perform these tests accurately and interpret the results correctly. Regular testing and monitoring should be

incorporated into the quality assurance and food safety programs of the facility to maintain high standards of animal product handling.

3.4. Completing commissioning tests

Completing commissioning tests is an essential step in the installation and start-up of equipment or systems to ensure their proper functioning and performance. Verify the mechanical integrity of the equipment or system by checking for proper installation, alignment, and functioning of components. This may involve visual inspections, checking for leaks, verifying connections, and ensuring proper lubrication.

Verify the electrical integrity and performance of the equipment or system. This may include checking voltage levels, verifying proper grounding, testing electrical connections, and ensuring the correct operation of controls and safety features. Perform tests to verify that the equipment or system operates as intended and meets the specified requirements. This may involve running the equipment through different operating modes, checking for proper sequencing, and verifying the performance of individual components.

Ensure that all safety features and protocols are in place and operating correctly. This may include testing emergency stops, interlocks, safety sensors, and alarms to ensure they function as intended. Conduct tests to evaluate the performance of the equipment or system. This may involve measuring and verifying factors such as temperature, pressure, flow rates, efficiency, or other relevant parameters against specified design criteria.

Assess the equipment or system's performance under different environmental conditions. This may involve subjecting the equipment to temperature variations, humidity levels, or other environmental factors to ensure it can operate reliably in different scenarios. Simulate normal operating conditions and evaluate the equipment or system's performance over an extended period. This may involve running the equipment continuously for a specified duration to identify any issues that may arise during regular operation.

Document the results of commissioning tests, including any deviations, observations, or issues encountered. Prepare a comprehensive commissioning report that summarizes the test procedures, results, and any necessary corrective actions or recommendations. It is important to follow manufacturer guidelines, industry standards, and any applicable regulations when

conducting commissioning tests. Engaging experienced professionals or technicians with expertise in the specific equipment or system being commissioned can ensure accurate testing and proper interpretation of results.

3.5. Completing routine maintenance program

Implementing a routine maintenance program for livestock product processing machines is crucial to ensure their optimal performance, minimize breakdowns, and extend their operational life. Create a schedule that outlines the frequency of maintenance tasks for each machine. Consider the manufacturer's recommendations, equipment usage patterns, and environmental factors when determining the intervals between maintenance activities.

Identify the specific maintenance tasks required for each machine. These tasks may include cleaning, lubrication, inspection, adjustment, calibration, and replacement of components. Refer to the equipment's user manual or consult with the manufacturer for detailed instructions. Assign responsibilities for performing maintenance tasks to designated individuals or teams. Clearly communicate the roles and expectations to ensure accountability and timely completion of the maintenance activities.

Gather the required tools, lubricants, cleaning agents, replacement parts, and other supplies needed to perform the maintenance tasks effectively. Ensure that all necessary items are readily available when the maintenance activities are scheduled. Regularly clean the machine to remove dirt, debris, and product residues that can accumulate over time. Pay attention to critical areas such as conveyor belts, cutting blades, sensors, and filters. Use appropriate cleaning agents and methods recommended by the manufacturer.

Apply lubricants to the designated moving parts of the machine as specified by the manufacturer. Lubrication helps reduce friction, prevent wear and tear, and ensure smooth operation. Use the recommended lubricants and follow the recommended intervals for lubrication. Regularly inspect the machine for signs of wear, damage, or loose components. Check for leaks, abnormal sounds, vibrations, or unusual odour. Inspect electrical connections, belts, chains, and other critical parts. Address any issues promptly to prevent further damage or operational disruptions.

If the machine has adjustable settings or parameters, periodically calibrate and adjust them as required to maintain accuracy and optimize performance. Follow the manufacturer's guidelines

or consult with qualified technicians for proper calibration procedures. Monitor the condition of machine components, such as belts, blades, filters, seals, and bearings. Replace any worn, damaged, or faulty parts promptly to prevent operational issues and ensure consistent product quality.

Maintain thorough documentation of all maintenance activities, including dates, tasks performed, parts replaced, and any observations or issues encountered. This recordkeeping helps track maintenance history, identify recurring problems, and inform future maintenance decisions. Regularly review the maintenance program effectiveness, identify areas for improvement, and incorporate feedback from machine operators or maintenance personnel. Continuously refine the maintenance procedures and adjust the schedule based on actual machine performance and evolving requirements. By implementing a comprehensive routine maintenance program, you can optimize the performance and reliability of livestock product processing machines, reduce downtime, and ensure the production of high-quality products.

3.6. Storing and restocking animal by-product

Storing and restocking animal by-products require careful handling and adherence to relevant regulations to ensure food safety and prevent contamination. Designate a dedicated storage area specifically for animal by-products. This area should be separate from other food products to prevent cross-contamination. It should be well-ventilated, clean, and equipped with appropriate temperature controls to ensure product integrity.

Maintain proper temperature control in the storage area to prevent spoilage and bacterial growth. Refrigeration or freezing may be necessary depending on the specific type of animal by-products. Follow recommended temperature ranges for different products and regularly monitor and record the storage temperatures.

Ensure that animal by-products are properly packaged to maintain product quality and prevent contamination. Use appropriate packaging materials that are resistant to leakage, breakage, and moisture. Consider using sealed containers, vacuum-sealed bags, or other suitable packaging methods based on the specific requirements of the by-products.

Implement an effective inventory management system to track the quantities, dates, and types of animal by-products stored. Use a first-in, first-out (FIFO) approach to ensure proper rotation and

minimize waste. Regularly conduct stock checks to maintain accurate inventory records. Maintain strict hygiene and sanitation practices in the storage area. Clean and sanitize the storage area regularly, paying attention to surfaces, shelves, and equipment. Follow proper cleaning procedures and use appropriate sanitizing agents to eliminate potential contaminants.

Implement effective pest control measures to prevent infestations. Seal any gaps or openings that could serve as entry points for pests. Regularly monitor for signs of pest activity and take appropriate measures, such as traps or professional pest control services, to mitigate the risk. Familiarize yourself with local regulations and requirements regarding the storage and restocking of animal by-products. Ensure that you comply with all applicable laws, permits, and licensing requirements. Keep records of any necessary documentation, such as permits or certificates of compliance.

Train employees involved in the storage and restocking process on proper handling procedures, hygiene practices, and regulatory requirements. Foster a culture of awareness and responsibility for food safety among all personnel involved in the storage and restocking activities. Establish a traceability system to track the origin and movement of animal by-products within your facility. Maintain accurate records of supplier information, batch numbers, and any relevant quality assurance documentation.

Regularly assess the performance and adherence to quality standards of your animal by-product suppliers. Ensure that they meet your requirements for product quality, safety, and regulatory compliance. By following these guidelines, you can ensure the proper storage and restocking of animal by-products, mitigate the risk of contamination, and maintain compliance with food safety regulations. It is important to consult with local regulatory authorities or food safety experts for specific guidance based on your location and the nature of the animal by-products you handle.

3.7. Performing cleaning work area

Milk, when it emerges from a healthy udder (the mammary gland of the female animal, which has teats where milk comes out from) contains only a very few bacteria. However, milk is a perishable product. It is an ideal medium for micro-organisms and as it is a liquid, it is very easily contaminated and invaded by bacteria. Almost all bacteria in milk originate from the air,

dirt, dung, hairs, dust, dirty equipment, operators, and other extraneous substances. In other words, milk is mainly contaminated with bacteria during milking.

The major group of bacteria in milk is the lactic acid bacteria, which grow and produce lactic acid rapidly when milk is kept at ambient temperature and it becomes sour. How soon the milk turns sour depends on the degree of contamination and on the temperature of the milk. Therefore, proper cleaning and sanitizing procedures are essential to control the quality of milk. Cooling milk to a temperature of 4ºC as soon as the animal is milked (the first 2 – 3 hours) makes the bacteria inactive and prevents them to grow and produce the lactic acid.

It is the process of protecting the working environment from different hazardous thing which can cause risk on the society or workers and environment. To keep our work site in safe manner you should follow:

- Providing training to the worker and society
- Regular house keeping
- Periodic inspection of different hazards
- Maintenance of equipments

Generally Cleaning and safeguarding work site increase the product quality and quantity and increase occupational health and safety.

A. The cleaning check list

The machine and equipment rented from supplier should be

- ✓ Unplug from soon finished service from socket if it is machine.
- ✓ Cleaned from any dust, feather and any particle before returned.
- ✓ Disinfect every equipment and machine before return it back

The clean check list should be

USE	×	✓

NO.	TYPE OF TOOLS	CLEANED	MAINTAINED	DISPOSSED	DISCRIBTION
1					
2					
3					
4					
5					
6					

“×” NOT cleaned “”use for cleaned maintained

The cleaning procedure for the wastage of animal product and by-products from a processing house involves several steps to ensure proper disposal and hygiene. Here's a general outline of the cleaning process:

I. Personal Protective Equipment (PPE):

- Before starting the cleaning procedure, ensure that all personnel involved are wearing appropriate PPE, including gloves, goggles, aprons, and boots, to protect against potential hazards.

II. Segregation and Collection:

- Segregate the animal product and by-product waste according to their type and any specific regulations or guidelines in place.
- Use designated containers or bins for each waste category to prevent cross-contamination.

III. Removal of Solid Waste:

- Collect solid waste such as bones, trimmings, or other non-liquid by-products using suitable tools like shovels or scoops.
- Place the waste into durable, leak-proof containers or bags designed for waste disposal.

IV. Spill Cleanup:

- In case of any spills or leaks, promptly clean them up using absorbent materials like sawdust, sand, or absorbent pads.

- Dispose of the absorbent materials along with the solid waste in the appropriate waste containers.

V. Liquid Waste Management:

- Drain liquid waste, such as blood or other fluids, into designated collection systems or drains.
- Install appropriate filters or traps to prevent solid waste particles from entering the drainage system and causing blockages.
- Ensure that the liquid waste disposal complies with local regulations and environmental requirements.

VI. Cleaning and Sanitization:

- Thoroughly clean all surfaces, equipment, and tools that came into contact with the animal product and by-product waste.
- Use suitable cleaning agents and disinfectants to remove any residues and eliminate potential pathogens.
- Follow the cleaning and sanitization procedures recommended by the cleaning agents' manufacturers and any applicable regulations.
- Pay particular attention to areas where waste may have accumulated, such as drains, processing equipment, or waste storage areas.

VII. Waste Disposal:

- Adhere to local waste disposal regulations and guidelines for the proper disposal of animal product and by-product waste.
- Arrange for the collection and disposal of the waste by authorized waste management services or facilities.
- Keep records of waste disposal activities, including dates, quantities, and disposal methods, as required.

VIII. Cleaning Validation:

- Validate the effectiveness of the cleaning process by conducting visual inspections and, if necessary, microbial testing to ensure that all waste residues and potential contaminants have been effectively removed.

VIIII. Regular Monitoring and Maintenance:

- Implement a regular monitoring and maintenance program to ensure ongoing cleanliness and waste management within the processing house.
- Conduct periodic inspections to identify and address any potential issues or improvements needed in the waste management and cleaning procedures.

It's important to tailor the cleaning procedure to the specific requirements and regulations of the processing house and comply with any local environmental and waste management guidelines. Consult with waste management experts or regulatory authorities to ensure proper disposal practices for animal product and by-product waste.

When cleaning materials, tools, and equipment in an animal product processing house, it's important to use appropriate cleaning agents and follow proper procedures to maintain hygiene and prevent cross-contamination. Here are some common materials, tools, and equipment found in an animal product processing house and guidelines for cleaning them:

A. Stainless Steel Surfaces and Equipment:

- ✓ Use non-abrasive cleaners suitable for stainless steel surfaces.
- ✓ Avoid using harsh chemicals or abrasive materials that can damage the stainless steel.
- ✓ Clean stainless steel surfaces with a cloth or sponge, following the grain of the steel.
- ✓ Rinse thoroughly and dry with a clean cloth to prevent water spots.

B. Cutting Tools (Knives, Blades, etc.):

- ✓ Disassemble cutting tools if possible and clean each component separately.
- ✓ Use hot water and mild detergent to remove residues and debris.
- ✓ Scrub the cutting edges gently with a brush or sponge.
- ✓ Rinse thoroughly to remove soap and debris.
- ✓ Sanitize the blades using a food-grade sanitizing agent and let them air dry before reassembling.

C. Processing Machinery and Equipment:

- ✓ Follow the manufacturer's guidelines for cleaning and maintenance.
- ✓ Disconnect the equipment from power sources before cleaning.
- ✓ Remove any visible debris or product residues.
- ✓ Use appropriate cleaning agents suitable for the type of equipment.
- ✓ Scrub surfaces, gears, and other accessible parts with brushes or sponges.

- ✓ Rinse thoroughly with clean water to remove cleaning agents.
- ✓ Sanitize the equipment using approved sanitizing agents.
- ✓ Allow the equipment to air dry completely before reconnecting and using.

D.Conveyor Belts and Food Contact Surfaces:

- ✓ Remove any loose debris or food particles from conveyor belts.
- ✓ Use approved cleaning agents suitable for food contact surfaces.
- ✓ Scrub the belts or surfaces with brushes or scrubbers.
- ✓ Pay attention to crevices and hard-to-reach areas.
- ✓ Rinse thoroughly with clean water to remove cleaning agents.
- ✓ Sanitize the belts and surfaces using a food-grade sanitizing agent.
- ✓ Allow sufficient drying time before resuming operations.

E.Containers, Trays, and Utensils:

- ✓ Empty and discard any remaining product or waste.
- ✓ Pre-rinse the containers, trays, and utensils to remove loose debris.
- ✓ Wash with hot water and a suitable detergent.
- ✓ Scrub with brushes or scrubbers to remove stubborn residues.
- ✓ Rinse thoroughly with clean water.
- ✓ Sanitize using a food-grade sanitizing agent or by immersing in hot water.
- ✓ Allow to air dry or dry with clean towels.

F.Protective Clothing and PPE:

- ✓ Launder or clean protective clothing, such as aprons or gloves, according to manufacturer instructions.
- ✓ Use appropriate cleaning agents and follow recommended washing procedures.
- ✓ Ensure they are completely dry before reuse or storage.

Remember to consult manufacturer guidelines, equipment manuals, and applicable regulations when cleaning materials, tools, and equipment in an animal product processing house. Regular cleaning and maintenance practices are essential to maintain a clean and safe processing environment.

3.8. Communicate and coordinate the working groups Ensuring stock balance control

To effectively communicate and coordinate working groups for ensuring stock balance control, follow these steps:

A. Assign Responsibilities: Clearly define the roles and responsibilities of each working group involved in stock balance control. Assign specific tasks to individuals or teams based on their expertise and capabilities.

B. Establish Communication Channels: Set up regular communication channels to facilitate information sharing and collaboration among the working groups. This can include in-person meetings, emails, project management tools, or dedicated communication platforms. Ensure that all relevant team members have access to these channels.

C. Develop a Stock Control Strategy: Create a comprehensive stock control strategy that outlines the objectives, targets, and key performance indicators (KPIs) for maintaining stock balance. Clearly communicate this strategy to all working groups to align their efforts and objectives.

D. Regular Meetings: Schedule regular meetings with the working groups to discuss stock control activities, progress, challenges, and opportunities. These meetings provide an opportunity for sharing updates, addressing concerns, and coordinating actions.

E. Information Sharing: Encourage open and transparent information sharing among the working groups. Make sure that everyone has access to accurate and up-to-date stock data, including inventory levels, incoming shipments, outgoing orders, and any other relevant information.

F. Collaborative Planning: Engage the working groups in collaborative planning to determine stock replenishment needs, order quantities, and timing. Coordinate efforts to optimize stock levels while minimizing the risk of stockouts or excess inventory.

G. Data Analysis and Reporting: Analyze stock data regularly to identify trends, patterns, and potential issues. Generate reports that highlight stock imbalances, slow-moving items, or any other stock-related concerns. Share these reports with the working groups to facilitate informed decision-making.

H. Problem Resolution: When stock imbalances or discrepancies arise, involve the relevant working groups in problem-solving efforts. Collaboratively assess the root causes, identify corrective actions, and implement solutions to restore stock balance.

I. Continuous Improvement: Foster a culture of continuous improvement among the working groups. Encourage them to share ideas, suggestions, and best practices for enhancing stock control processes. Regularly review and refine the stock control strategy and associated procedures based on feedback and lessons learned.

J. Training and Development: Provide training and development opportunities to enhance the skills and knowledge of the working groups in stock control and inventory management. This can include workshops, seminars, or online courses to improve their understanding of stock control principles and techniques.

K. Performance Monitoring: Monitor the performance of the working groups in achieving stock balance control objectives. Track relevant KPIs, such as stock turnover ratio, fill rate, or stock accuracy, and provide feedback and recognition based on performance results.

By effectively communicating and coordinating the working groups, you can ensure a collaborative approach to stock balance control. Regular communication, shared goals, and a focus on continuous improvement will contribute to maintaining optimal stock levels and optimizing the overall operational efficiency.

Self check-4	Written test

Name _____ ID. _____ Date _____

Test-1 choose the best answer

1. Which of the following methods is commonly used for monitoring the health and behavior of farm animals?

A. Visual observation B. remote sensing

C. Genetic testing D. Thermal imaging

2. Which of the following is an appropriate cleaning method for maintaining cleanliness and hygiene at a work site and animal farm?

A. Sweeping and manual removal of debris B. Using high-pressure water jets

C. Applying chemical disinfectants without rinsing D. Leaving the area untreated

3. Why is documenting important in an animal farm?

A. To track animal health and medical treatments

B. To comply with legal and regulatory requirements

C. To monitor production and performance metrics

D. All of the above

4. Which of the following is an example of an external parasite that commonly affects animals?

A. Tapeworm B. Heartworm

C. Flea D. Hookworm

5. Which of the following factors is important for ensuring biosecurity on an animal farm?

A. Allowing free access for visitors B. Mixing different species of animals together

C. Implementing quarantine procedures D. Ignoring proper waste management practices

Satisfactory rating - 8 points Unsatisfactory - below 8 points

Operation Sheet-4	

4.1. Technique of cleaning animal House

A. Tools and equipment's

- Manure Forks
- Wheelbarrows Carts
- Power washers
- Barn Scrubbers
- Vacuum systems
- Disinfectant Sprayers/Foggers
- Water Hoses and Nozzle
- Scrub Brushes and Brooms
- Muck Spreaders
- Personal Protective Equipment (PPE)

B. Procedures

- Remove animal
- Remove loose debris
- Pre-rinse
- Cleaning solution preparation
- Scrub and clean
- Disinfection
- Rinse
- Dry
- Inspect and maintain
- Bedding and replenishment
- Record keeping

LAP TEST-4	Performance Test

Name……. ID…… Date ……

Time started: …… Time finished: …….

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **30 minutes**. The project is expected from each student to do it.

Task: 1. Perform cleaning of Barns (milking house)

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https://youtu.be/k4lN80r22mc

https://youtu.be/vr1Y5bjrBlY

The bold address indicate that the Trainer who develop the Module

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