Coffee and tea processing

Level-II

Based on May 2019, Version 2 Occupational standards

Module Title: Handling processed coffee and tea in a storage area

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LG #42	LO #1 Sampling coffee and tea for testing

Instruction sheet

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

- Taking representative sample of coffee and tea for testing
- Preparing sample for packaging, labeling and dispatch

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:

- Take representative samples of coffee and tea for testing
- Prepare samples for packaging, labeling and dispatch

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.
4. Ask your trainer for assistance if you have hard time understanding them.
5. Accomplish the “Self-checks” which are placed following all information sheets.
6. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
7. If your performance is satisfactory proceed to the next learning guide,

Information sheet 1: Taking representative sample of coffee and tea for testing.

1.1 Representative samples for coffee

Sampling is an act of taking the sample from the stock/storage coffee. Sampling is a process taking the sample of coffee from the stock for analyzing or testing the quality of coffee bean and processed coffee. During coffee and tea testing use random representative sample method in order to obtain sample from stock or storage that the best choice sampling.

Purpose of sampling is to collect a portion of material small enough in volume to be transported conveniently and handled in the laboratory while still accurately representing the material being sampled.

The purpose of taking the representative sample for testing is:

- Calculating the value or payment for each batch of material
- Adjusting downstream production
- Calculating the amount of by-products from each batches
- Calculating the blending of various material batches

The sampling process is begins with selection of green coffee bags randomly select the bags were separated from lots from different point in the bags at top, middle and at top after collection standardize the portion. The coffee beans should not have an uneven or dull color, they have been dried or wet processed may incorrectly so the purpose of Coffee processing is essential for specialty green coffee. If the green coffee beans look faded, the cup quality will be faded. So for analyzing the coffee bean and the processed coffee bean take the sample from the following storage.

Figure 1.coffee bean and Roasted coffee Storage

As show above figure coffee should be store, from this store take the sample by using random sampling methods that represents samples of coffee for testing purpose are:

- green coffee bean
- roasted coffee
- Grounded roasted coffee
- Cupping coffee/Sensory analysis (colour, flavour, taste, aroma, size)

1.1.1 Green coffee bean

Coffee bean should be taken from the coffee bags (sacks) or from EFSR loading which is prepared for sample testing.

Criteria required for Testing are:

- Check list format
- Recipe or instruction
- Batch number
- Code number
- Moisture meter
- Seiver/screener and Sample sacker

By using these criteria green coffee bean should be evaluated according to the following standard and specification:

- Grading Coffee bean respective to size and weight before and after roasted)
- Moisture Analysis of coffee bean from 10%-12%
- Pre-processing defects of coffee bean (insects, dead, other foreign matter/weed and other commodity seeds/
- weather affected Coffee and tea
- disease identification
- insects (live and dead) and foreign matter
- Weed and other commodity seeds.

1.1.1.1.Grading green coffee Bean with respect to size and weight:

Coffee is graded by size using rotating or shaking screens, replaceable metal sheets have round holes to retain beans over a certain size and allow smaller beans to pass. Screen sizes are expressed as numbers (robusta grade one screen 16), or by letters (Arabica grade AA - indicating a bold bean) or by descriptions (bold, medium or small bean). It all depends on the trade custom in any given country. Intermediate screen sizes (16.5), are important in some producing countries but disregarded in others. However, nearly all coffee for export is graded to exclude the largest and smallest beans, as well as broken beans and other particles.

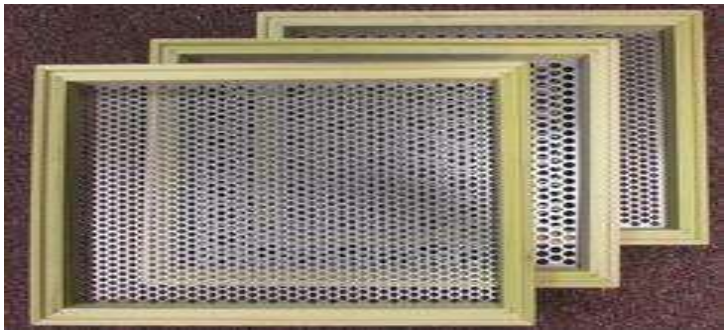

Figure 2.Screener/seiver

A single coffee bean weigh on average is 132.5 milligrams with Standard coffee round screen dimensions.

Table.1 coffee round screen and dimensions

Screen number	10	12	13	14	15	16	17	18	19	20
ISO dimensions (mm)	4.00	4.75	5.00	5.60	6.00	6.30	6.70	7.10	7.50	8.00

It is not always easy or possible to achieve a 100% accurate screen (nil passing through screen 16). Where a 100% accurate screen is required then marginally increasing the size of the holes to give a small tolerance in the screen may provide the required result. Slotted screens with oblong slits (usually 4.00 or 4.50 mm wide) are used in some countries to remove pea berries (single oblong beans in a cherry, the result of a genetic aberration because normally there are two beans in a cherry), which are sought after in some consuming countries.

Figure 3.bean dimension

Grading is ranking the bean based on the size and weight for the specialty coffee grade for exporting. Such as:

Grade 1: Specialty Grade Coffee Beans is no primary defects, 0-3 full defects, sorted with a maximum of 5% above and 5% below specified screen size or range of screen size, and exhibiting a distinct attribute in one or more of the following areas: taste, acidity, body, or aroma. Also must be free of cup faults and taints.Zero quakers allowed. Moisture content is between 9-13%.

Grade 2: Premium Grade Coffee Beans: Same as Grade 1 except maximum of 3 quakers.0-8 full defects.

Grade 3: Exchange Grade Coffee Beans: 50% above screen 15 and less than 5% below screen 15.Maximum of 5 Quakers. Must be free from faults. 9-23 full defects.

Grade 4: Standard Grade Coffee Beans: 24-86 full defects.

Grade 5: Off Grade Coffee Beans: More than 86 full defects.

Fig 4.Screener/seiver

1.1.1.2. Coffee bean Moisture Analysis

Moisture content or Water content is the quantity of water contained in a material (coffee bean or roasted coffee).The generally moisture contents of coffee bean that used for process is ranged from 9%-12% where as the roasted coffee is below 7%. if the moisture is below and above 9%- 12% verify the moisture by drying as it meet standards .So analyze the moisture content of coffee bean before and after process for sale as it fits ISO that can compete with standard of coffee bean of other country if not fit the ISO it is rejected.

Moisture Content:

- Fresh cherry coffee: 50%
- Green coffee bean: 9-13%
- Roasted coffee: < 7%

Benefits of coffee bean moisture detection:

- ✓ Improve products quality
- ✓ Lower energy cost
- ✓ Reduced time consuming
- ✓ Less waste and 100% product inspection

1.1.1.3 Origin of coffee and Variety

Coffee varieties are the diverse subspecies derived through selective breeding or natural selection of plants. International the most common species are robusta and Arabica. In Ethiopia the most popular coffee production is Arabica coffee.

Region	Variety	Country	Comply
Harar	Arabica	Ethiopia	From the region of Harar, Ethiopia. Known for its complex, fruity flavor that resembles a dry red wine. All three Ethiopian varieties are trademarked names with the rights owned by Ethiopia

Sidama	Arabica	Ethiopia	From the Sidamo (now Oromia) region of Ethiopia as well. All three Ethiopian varieties are trademarked names with the rights owned by Ethiopia
Yirgacheffee	Arabica	Ethiopia	From the Yirgachefe district in the Gedeo Zone of the Southern Nations, Nationalities, and People's Region of Ethiopia. All three Ethiopian varieties are trademarked names with the rights owned by Ethiopia

Sample from the different origin and different variety is sampling according to below figure.

Fig 5. Variety of coffee bean samples

1.1.1.4 Pre-processing defects of coffee (insects /live and dead and other foreign

- Insects damage
- Fully blacks
- Under ripe
- Quaker
- Shells
- Triangles
- Broken (chipped)
- Foreign matter(stone, nail, soil, other seed,)
- Cherry pods and Parchment

Insects damage and fully blacks is fully black is observed after the roasting the coffee bean because insect damaged coffee bean is absorb water during washing.

Figure .6 insect damage and fully black

Quaker/Immature/ beans generally impart grassy, straw-like or greenish flavors and are the main source of astringency in coffee. Quaker is Coffee seeds that don't properly react during the Maillard stage of roasting. Even at a relatively dark roast, Quakers will stand out with their pale orange or khaki appearance, and when ground it emits a rancid toasted peanut aroma. Quakers in coffees that are dried in the cherry (aka 'natural' or dry-process) as opposed to those which are depulped, fermented, and washed prior to drying in parchment.

Fig 7.Quaker

Shell is the husk on the out surface of coffee bean

Fig 8. Shell

Broken/Chipped/Cut beans can cause earthy, dirty, sour, or fermented beans. Chipped /broken is defects that occur during processing that is the most commonly encountered by large the result of some combination of human and mechanical errors. A Very frequently chipped and sometimes broken coffee will end up in export grade coffee. Chipping can happen both at the pulpier (where the affected area will often become slightly discolored during fermentation) at the dry mill parchment hulling.

While the discolored area of a pulpier-damaged coffee can infrequently lead to a bacterial infection, dry-mill nicked beans are rarely cause for serious concern Silver-skin discoloration can occur during fermentation and cherry-drying, resulting in a reddish hue (sometimes referred to as “foxy”) that is only skin-deep and generally has no little effect on the final flavor (though it may affect the coffee’s value due to its unsightly appearance).in other case the presence of dirty water during fermentation or washing, which will have a more pronounced

effect on roasting and taste. Coffee that is improperly hulled or pulped to leave full coffee pods (the defect term for the whole, dried cherry), significant portions of the cherry skin, and/or parchment stuck to the seed is a more serious concern.

underripe the washing channels used after depulping and fermentation are a first step in grading coffees, separating 'floaters' (which can include underripe seeds, drought affected coffee, and other developmental anomalies that negatively affect cup quality) from sinkers (high-density coffee of good quality). Fermenting coffee can also result in 'stinkers' – coffee that has over fermented and emits an acetic or briny aroma and flavor

Dried Cherry/Pods/Fungus bean imperfections can cause fermented, moldy, or Phenolic taste.

Foreign matter is a defect that occurs during processing which encountered by human and mechanical errors. Foreign matter (stone, nail, soil, other seed,)

Fig 11. Foreign matter

1.1.1.5 Weather affected Coffee and tea

Weather condition comprises the state of the atmosphere in terms of temperature and wind and clouds and precipitation.

There are five types of weather. Such as sunny, cloudy, windy, Snowy and rainy.
Coffee production has decreased due to changes in temperature, longer droughts, and increased invasion of pests. As climate change both Arabica and Robusta coffee bean production at risk, it affects the supply of coffee. Protection from direct sunlight and rainfall tend to provide good coffee growing conditions. Some country with distinct dry and rainy seasons is favorable, so that farmers can target the wet season to plant coffee seedlings

There are six main components, or parts, of weather. Such as:

1. Temperature
2. Atmospheric pressure
3. Wind
4. Humidity
5. Precipitation and
6. Cloudiness.(adding tea sample

Water activity affects the physiological activity of the Arabica plant causing a reduction in photosynthesis. The optimal temperature range of the **Coffee Arabica** tree 70% relative humidity and 64°–70°F

Temperature: Robusta coffee is better adapted to slightly higher temperatures, but is much less adaptable to lower temperatures than Arabica. The Food and Agriculture Organization of the United Nations (FAO) crop model determines the optimal and absolute temperatures for Robusta, ranging from 20°C to 30°C and 12°C to 36°C, respectively. Temperatures and rainfall distribution have impact on the Robusta plant. This may also have led to less concern about the impacts of climate change on Robusta, but could also be due to the lower trading volume on the world's coffee market (30%) compared to Arabica (70%).

A factor that is not well understood is the response of coffee to increased carbon dioxide concentrations that are also part of climate change. Many plants respond favorably to increased CO2 concentrations, especially contributing to increased water use efficiency. This may partially the negative consequences of increased water stress related to changing temperature and rainfall. In addition, coffee plantations are frequently affected by more severe and more frequently occurring extreme weather events

The FAO Crop model gives information on optimal and absolute temperatures for coffee Arabica, ranging from 14°C to 28°C and 10°C to 30°C, respectively. Besides the direct impacts of high temperatures on the coffee crop the increase of pests and diseases is supposed to be a consequence of increasing temperatures.

1.1.1.5.Disease identification

Identification is the process of identifying which the disease affects qualities or characteristics of a coffee and tea product and seeds. Coffee diseases are leaf rust and deterioration of coffee at storage because of climatic factors such as: Insect disease (Rodent) ,Fungus disease ,Pesticide disease, fungus (sporulates disease)

The fungus sporulates through the stomata rather than breaking through the epidermis as most rusts do, so it does not form the pustules typical of many rusts. The powdery lesions on the undersides of the leaves can be orange-yellow to red-orange in colour

Figure 12. Fungus disease

1.1.2 Roasted coffee represent sample:

- types of roasted coffee types
- Variety of coffee roasted
- Sensory analysis

1.1.2.1 Types of roasted coffee types

Coffee is roasted based on standard temperature and time in the controllable environment and roasting room temperature most of the time 25^0 C and at 205-250 ^{0} C roasting temperature. So take the roasted coffee from storage randomly check as moisture <7% the types of roasting by the observation and sensing with sense organ. These roasting types are:

Light roasts: Light brown in color, this roast is preferred for milder coffee varieties. There will be no oil on the surface of these beans because they are not roasted long enough for the oils to break through to the surface. Temperature 170- 230 ^{0}C.

All Arabica coffee samples were submitted to a light roast.

Medium roasts: This is medium brown in color with a stronger flavor and a non-oily surface. Temperature 230-240^{0}C

Medium dark roasts: dark color, this roast has some oil on the surface and a slight bitter sweet aftertaste.

Dark roasts: This roast produces shiny black beans with an oily surface and produce bitterness. The darker the roast, the less acidity will be found in the coffee beverage. Temperature 240-250^{0}C

When you roast coffee bean monitor time and temperature based on the standards of time, temperature 10 -20 minute at 205 to 250^{0}C**.**For example, when roasting a bean with lower density, you should consider adjusting your initial roasting temperature, or "charge temperature", slightly lower than you might for a denser bean (all other factors being basically equal) to achieve the same results for roasting level.

The basic process is simple: use heat to turn green unroasted coffee into brown roasted coffee. Roasting times vary, depending on the method and batch size, but you can expect the process at least **10 minutes** for smaller batches and **16 minutes** for larger batch. While these factors are very important, you should be consider some other characteristics that may help you to better understand your bean during the roasting process. These factors include the color, smell, and sound

Roasted coffee tests are specified base on:

- Net Weight (up to 4 results for the same product)
- Packaging Head Space Analysis + CO2 levels
- Moisture Analysis

Figure 12.types of roasting

1.1.3. Sample represents Grounded /milled coffee products

- Batch number
- code number coffee
- Sample of grounded coffee from different origin or variety(vary depend on roasting types and adjustable speed.
- Grounded form of coffee bean(fine and coarse)
- Sensorial Analysis(Sensory like earthy,moudy, coffee type by observing, taste ,aroma ,flavor, size

1.1.4 Sample represents coffee sensory analysis

Sensory is the important quality evaluation that evaluates the flavour, aroma, taste, colour and size of cupping coffee. To test these quality parameters the sample that required for testing:

- Batch number or code
- tea and coffee cupping
- List of Spoons
- Lists of Cups
- Panelists
- Water for mouth feel brush

- Laboratory room
- Design ware house

Coffee and tea inspection service

- Inspection of loading ,discharge and storage of tea and coffee
- Monitoring of stocks and warehouse
- Quality and quantity certification of the sample
- Representative sample of tea and coffee to be tested in laboratory
- Tea and coffee carrying cargos inspection from loading to discharging
- Truck or cargo inspection
- Verification of quantity and weight of the cargo

Coffee testing quality attributes are:

- Flavor
- Aroma
- Colour
- Taste

Figure14. Cupping coffee

If the above cupping quality of the coffee sensing is inappropriate for panelist which is raise from the following factors:

- ✓ Aflatoxins testing
- ✓ Physical and chemical assessment of tea and coffee
- ✓ Complaint analysis
- ✓ Pesticides, insecticides and fungicides residue testing

Sample represents tea testing:

Tea testing is the process in which a trained taster determines the quality of a particular tea. Tea is famous for its sweet smell and bitter test. The strength of tea is also famous as it helps to remove stress. We can easily taste these factors by following tea tasting method. Tea testing principle: ISO 3103 is a standard published by the International Organization for Standardization commonly referred to as ISO, specifying a standardized method for brewing tea.

Tea is coming from the same species of tree that is called Camellisensis. So tea has no variety. Therefore take the tea types of in order to compare the sensory attributes of them. These quality attributes are aroma, flavor, colour, bitterness and taste)

Represent sample of tea:

- Types of tea product (white tea ,black tea ,green tea ,oolong tea)

Figure 1.Tea testing

Tools and Materials for tea testing

1. A few selections of tea
2. Taster 150 ml capacity, cupped with tea bowls for holding the infused liquor.
3. Tasting Spoons.
4. Bowl for warming the spoons
5. Bowl for used spoons
6. Tea Holders
7. Water Boiler.
8. Thermometer
9. White bread

Tea testing procedure:

In order to test the quality attributes of tea follow the following instruction.

1. Make sure palate is clean.
2. Starting from the tea which will be the lightest taste not necessarily the lightest colour.
3. Scoop a spoonful to slurp in and let it roll in your tongue.
4. Let the liquid rest a second and roll it again before swallowing.
5. Feel your palate, tongue, throat and stomach for their reactions with the drink.
6. Halt for 5 to 10 seconds before you go for the next mug, after taking a small bite of bread to clean your palate and clear the lingers of the previous tea.

Remember to clear the palate every time when you go back to cross compare different selections

6. When the infused leaves are a bit cooler, sniff them. Compare the appearance and smells
7. Keep for each selection for later.

Example: 1

1. The liquor smell.

2. The inside of the mug lid smell

3. The aroma linger

4. Which part of it lingers longer or shorter

5. Part of the aroma remind you of another substance

6. The liquor taste

7. Any part of the taste come first and some other later

8. The different parts of the taste remind you of

9. The taste stay

10. The taste changing during the process of tasting

11. The texture of the tea liquor

12. Feeling taste at the throat or elsewhere

13. The infused leaves smell. Same as the liquor or different

14 .The characteristic differences between different selections

Quality control of Tea:

A system of maintaining standards in manufactured tea products by testing a sample (tea) of the output against the specification. This procedure involves:

Appearance: It involves observing the shape and color of the tea leaves.

Inner quality: It involves aroma, color and taste of the liquid

Quality parameters: The major quality parameters that are tested in made tea include Theaflavins (TF), Thearubigins (TR), High polymerized substances (HPS), Total liquor color (TLC) and Total soluble solids (Water extract).

Self check 1	Written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

I. Say true if the statement is correct and false if the statement is not correct (4 points)

1. To get the exact coffee screen hole is always easy or possible to achieve a 100% accurate screen

2. Specialty grade coffee is 100% no have primary defects

II. Choose (2 point)

1. Which of the following is not the purpose of taking sample for coffee testing?

A. Calculating the value or payment for each batch of material

B.Adjusting downstream production

Calculating the amount of by-products from each batches

D.Calculating the blending of various material batches E. none

III. Short answer (8 point)

1. What is grading and Write types of grading **(2 point)**

2. What is the range of coffee bean moisture content? What you do if above or below range professionally? (3 point)

3. Write the types of coffee bean roasting system and what happen at each roasting types? (2 point)

4. Write the defects of coffee bean and explain the briefly (2 point)

Note Satisfactory 15 unsatisfactory 8 points

Information sheet 2: Preparing samples for packaging, labeling and dispatching

2.1 Prepare packaging sample for coffee products.

Packaging is the science, art and technology of enclosing or protecting products for distribution, storage, sale, and use or it refers to the process of designing, evaluating, and producing packages.

Containment of packaging:

Keeping the contents clean fresh and safe for the intended shelf life is a primary function. Containment or agglomeration Small items are typically grouped together in one package to allow efficient handling. Powders and granular materials need containment.

Important packaging sample are listed in below table

No	Item required	Product for packaging	Standards	Specification	picture
1	Aluminum foil	-Green Coffee bean -Roasted coffee -Grounded coffee -tea	-Plastic packaging	-moisture proof	
2	Paper printer			Multi color	
3	Laminator		Stainless steel		
4	Paper and bags				
5	Poly ethene				
4	Valve sealed bags				

6	Vacuum sealed bags				
7	Vacuumized sealed jars				
8	Cans and plastic				
9	Green bean coffee, roasted and grounded				

2.2 prepare sample for labeling sample for coffee

Labeling is tool to promote and protect public health by providing accurate nutritional information.

An instrument of marketing and product promotion and can reduce the information problem between producer and consumers while reducing search costs for consumers.

Written a electronic or graphic communication on packaging. A panel found on a packaging of coffee which contains a variety of information about nutrional value of the food items.

Objective: brand identification, description and promotion

Samples required for coffee labeling:

1. Product Name: coffee
2. Coffee suppler :it tells country growing country
3. Roast grade :levels
4. Coffee brand: the name of the brand or company that is selling the coffee
5. Farm /origin
6. Attitude
7. Coffee bean type
8. How coffee has been processed?
9. Date of roasted :best before
10. Expire date: use by date
11. Bag weight

12. instruction **:**place in dry place

Fig 1.Packaging sample

2.3 prepare sample dispatching sample

Dispatch is a procedure for assigning employees (workers) or vehicles to customers.

Samples for dispatching for are:

- Brands of product
- Code of product
- Batch number of product
- Expire date of product (best before and use by date)
- Weigh of product and Volume of product
- Name of Producer of at that day
- Packaging material to pack that product

Self check 2: Written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

1. Define labeling, packaging and dispatching (5 point)

2. What is the use of labeling, packaging and dispatching? (5 point)

3. State the sample preparation of labeling, packaging and dispatching (5 point)

Note Satisfactory 15 unsatisfactory 8 points

LG #43	LO #2 Move Coffee and tea into and out of storage

Instruction sheet

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

- Identifying coffee and tea for handling and storage facility
- Selecting appropriate silo types and handling equipment
- Segregating coffee and tea according to type, variety and quality characteristics
- Taking measurement to minimize pest infestation
- Moving coffee and tea into and out of storage
- Checking coffee and tea during movement
- Cleaning storage and handling equipment
- Implementing suitable measures to minimize desiccant dusts

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:

- Identify coffee and tea for handling and storage facility
- Select appropriate silo types and handling equipment
- Segregate coffee and tea according to type, variety and quality characteristics
- Take measurement to minimize pest infestation
- Move coffee and tea into and out of storage
- Check coffee and tea during movement
- Clean storage and handling equipment

- Implement suitable measures to minimize desiccant dusts

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Information sheet 1: coffee and tea for handling and storage facility

1.1 Coffee Handling facility:

Handling is transporting or moving the green coffee bean or processed coffee from the place to place or from production area to customer by using different material handling equipment.
These facility or equipment use for both green coffee bean and processed coffee for the selling. Such as:
Lorry, cart, forklift, trolley, sack, bag, loader, silos, jute, silo conveyors, silo elevators, chute augers/ screw.

1.2 Tea Handling facility

To handle tea in the industry and deliver to customer or market the important handing facility is equipment and transportation facility.
Material handling for tea facility includes, forklift, trolley, conveyor, packaging material allowed for the tea like tea bags, plastic, carton and loader

1.3 coffee storage facilities:

Storage facility is the facility of the stock in the storage for shelf life a product in order to safe and properly manage product in the store by controlling the environmental factors like packaging material, temperature, moisture content, relative humidity, design of ware house, insects like rodent, at store room and itself appropriately close and controlled to avoid the environmental factors out of room ventilation by using the appropriate equipment thermometer, hygrometer, moisture meters and ventilator
To handle coffee there are different facility in the storage

- Ware house design
- Ventilation /aeration attachment
- Temperature and humidity controller
- Moisture meter and hygrometer device

- Use Desiccant dust removal

Temporary storage:

Temporary is a short time storing product .example roasted coffee stored temporally that is not more than five days because it is more sensitive for oxidation.The fresher the ground coffee, the better the end products. Coffee should be ground as it required (it begins to loss freshness within 15-30 minutes and, some establishments grind enough coffee for each service before it begins, many place grind coffee to order for the maximum freshness of the coffee.

Permanent storage:

Raw bean can store at least up to 7-8 years .roasted coffee beans should be store at super market and production within 6-8 days of begin opened. Ground coffee loses its aroma and dries out within a matter of hours if not stored correctly. Roasted coffee beans release CO_2.Packaging therefore often includes a one-ways valve enabling gases to be extracted without allowing oxygen to enter the bags

Coffee should be:

- ✓ Stored in an air tight container (decrease the oxidation)
- ✓ Kept away from light
- ✓ Store at room temperature in a stable environment approximate 15^0 C
- ✓ Kept away from excess moisture
- ✓ Kept away from the odorous products (citrus fruit, onions garlic, herbs and spices)

Note: coffee should not be stored in the refrigerators or freezer

1.5 Tea storage facility

Packaging material is the mandatory bags, cartons, container, and loading, ware house design, temperature of room 25^0 C, moisture and light controlling must required in the storage room for keeping the tea freshness.

Self check 1: Written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

I. Answer the following question according to asked (2 point each)

1. Write coffee handling facility

2. Write tea handling facility

3. Write coffee storage facility

4. Write tea storage facility

5. What is the effect of the environment and temperature on coffee and tea handling?

6. Write the major factors that affect coffee and tea at storage

Note Satisfactory >10 unsatisfactory below 8 points

Information sheet 2: Selecting appropriate silo types and handling equipment

2.1 Coffee and tea silo types

Silos are deep bins in which the plane of rupture of material store meets the opposite sides of the structure before meeting the top horizontal surface of the material. It is a tall cylindrical structure.

Types of silos for coffees

- ✓ Reinforced concrete silos
- ✓ Pre stressed concrete silos
- ✓ Steel silo
- ✓ Concrete block silo
- ✓ Fibre reinforced polymer silos

2.2 Coffee handling equipment

A silo conveyor is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transport of heavy or bulky materials

Silo elevators are a lift, of coffee that moves in a vertical shaft to carry coffee bean to the vertical building.

Silo chute: the sliding of roasted coffee and coffee bean at inlet and exit

Tea silos

Fig 1. chute silo

Screw/augers Conveyors (FSC) provides dust free, low energy, low maintenance and low cost conveying

A screw conveyor or auger conveyor is a mechanism that uses a rotating helical screw blade, called a "fighting", usually within a tube, to move coffee or grain materials

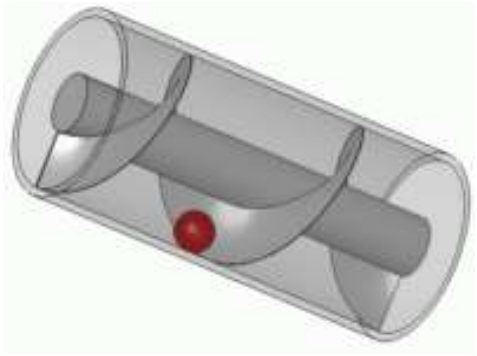

Figure 2. Screw

In the coffee storage and processing coffee industry the following handling equipment are required. such as:

- ✓ Trolley
- ✓ Front end loaders/ Forklift
- ✓ wall charts and other visual recording methods
- ✓ warning devices
- ✓ ventilation/aeration equipment

Trolley is the handling facility equipment that transport or move coffee and tea material and product in the specific area.

Figure 3.trolley

Ventilator is a low-cost solution to common air pressure

To Use Fans to Ventilate a Room

- ✓ Open the windows to create ventilation.
- ✓ Determine which window allows the wind to blow into your room.
- ✓ Place an electric fan in front of the window breeze pointing into the room.
- ✓ Place a second fan pointing out of the window or door on the other

Fig 4. Ventilator

Equipment checks in the coffee and tea plant process the integral parts of the equipment should be check because the parts of equipment may make a fault and contaminate product on the critical point during handling. Such parts are:**:**

- gearbox
- bearings, oil levels,
- thermometer, and

- pressure gauge

Gearbox is an enclosed system that transmits mechanical energy to an output device an industrial. Gearbox can modify their speed, torque, and other attributes to convert the energy into a useable format.

Thermometer steaming and milk to prepare that perfect coffee an important factor to consider is the temperature of your milk. Regularly calibrating your thermometer will ensure consistent milk temperature and tasting coffee every time. The simplest way to calibrate a milk thermometer is with the use of ice water. If the thermometer reads between1-4°C adjust to 0°C.

Pressure gauge:

Pressure Gauge is your coffee machines way of showing you exactly how much pressure it is applying to your coffee during an extraction. It is important to understand that the pressure itself is not a variable when brewing your coffee; this is not a setting that you can change in your machine. What the Brew Pressure Gauge does allow you to do, is give you a way to understand what you may need to weak in order to improve your coffee.

Pressure is created when there is resistance in the flow of water from the coffee Machines pump to your cup, when there is no resistance in the port filter (an empty basket) water will run through very quickly. When there is resistance in the basket (ground coffee) it slows down the waters path creating pressure, in other words your machine has to work harder to pass the same amount of water through the coffee.

If there is too much or too little resistance in the waters path. Before we go on, it is important to establish the benchmarks. When your coffee extraction begins, the coffee machines pump will push water through the grounds. The gauge will shoot up and sit briefly at around 10 bars of pressure, and then it will slowly reduce back down and should settle between 8.5 - 9.5 bars of pressure. Grind is set correctly to extract 60ml of for 30 seconds (for a double).

Too much pressure

If the pressure above 9.5.This means that your coffee machine has to work too hard to pass the water through your coffee, creating more pressure. As a result your coffee extraction will take too long; this is called over extraction and will yield a very acidic and bitter tasting coffee. To fix this you should be do one or more of the following:

Too much pressure

- Change the grinder to a coarser setting
- Reduce the Dosage (amount of coffee)
- Apply less pressure when tamping

If your pressure gauge is showing less than 8.5 while your extraction is running. If this is the case then it means the water is finding it too easy to pass through the ground coffee in your port filter. When this occurs your coffee extraction will happen too quickly (under extracted), resulting in a weak and sour tasting coffee .To fix this you may need to one or more of the following:

To little pressure

- Change the grinder to a finer setting
- Increase the Dosage (amount of coffee)
- Apply more pressure when tamping

Fig 5. Pressure gauge

This coffee handling equipment is used to handle the coffee bean in a bins industry plant that is handling in the setting line or process line in the industry. Example Silo conveyors, Elevators, augers/ screw

The following silos is used to segregate coffee in a line process

Fig 6. Silos

Self check 2: written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

I. Choose the best answer

1. What is silo and write the types of silos and briefly explain them (2 point)

2. Write handling equipment in the coffee process plant and material handling equipment for both coffee and tea. (2 point)

3. Write work principle of coffee thermometers and gauge pressure (4 point)

4. What happen and what you do if the gauge bar is above or below 8.5-9.5 bars?(2 point)

Note: satisfactory > 7 unsatisfactory <7

Information sheet 3: Segregate coffee and tea according to type, variety and quality characteristics

Introduction

Segregation is a process of setting apart or separation of roasted coffee bean or green coffee bean from others variety of coffee through setting line or process line. During coffee segregation coffee is separately segregated according to the variety, type an quality in the coffee processing industry and an also segregate from the farm up to the final products with a coffee value chain that is from upstream(farm or farmer) (producer), midstream (processor) downstream (export ,margin cross value chain)

3.1 Segregate coffee according to type

First of all, there are 3 main types of coffee beans. The names of these coffee beans are Robusta, Liberica and Arabica. There are also sub-types of these beans. But these are the main bean types. These types of beans take on different flavors while they are being processed and harvested.

Liberica: Liberica is a low yield type of coffee compared to Arabica and Robusta.

Robusta: This type of coffee, which contains 2.5% more caffeine than other types, has a pretty strong taste.

Arabica: This coffee bean with low caffeine and a smoother taste is aromatic and delicious. 80% of the coffee in the world is produced from these types of beans. Ethiopia produces Arabica coffee for the international market. The characteristics of these coffee beans according to countries and factors, such as temperature and origin affect the flavor of the coffee beans.

3.2 Segregate coffee according to variety

Coffee varieties are the diverse subspecies derived through selective breeding or natural selection of plants. Varieties and cultivars are commercially important due to various unique and inherent traits such as disease resistance and fruit yield. These unique traits are what producers use to select breeds when developing crops. Therefore, at a micro level, breed selection is critical to the success of a producer and one of the key components of cup quality. For this reason, breed selection is an important aspect of sustainability within coffee production.

3.3 Segregate coffee according to quality characteristics

Physical (length and width of coffee beans,100 bean weight, screen sizes, and raw quality) and cup quality (aromatic intensity, aromatic quality, acidity, astringency, bitterness, body, flavor, overall standard, and total cup quality) parameters, as well as total coffee quality, were evaluated by a team of certified panelists.

The lack of incentives, climate change, and increased resistance of coffee pathogens are considered the main causes of deterioration in the physical and organoleptic quality attributes of coffee which are the main problem for global coffee trade and consumption. To increase the overall production and consumption of coffee goes to increase organoleptic or final cup quality attributes. The large factors that affect the physical, chemical, and sensory characteristics of coffee.

Coffee cherries harvesting, go through a complex series of postharvest processing steps to be in a more stable, transportable, and roast able form. The initial postharvest processing steps ensure the safe transformation of the highly perishable green cherries into stable green coffee beans with a moisture content of 10% to 12% wet basis (w.b.), to avoid unwanted fermentation.

The initial postharvest processing step is:

- Natural drying
- semi-wet drying based on the mechanism adopted
- Natural drying.

Natural drying: involves drying the mature of coffee fruit under the sun that followed by manual or mechanical removal of outer unwanted layers. “Naturals” offer a coffee with heavy body and smooth, sweet, and complex cupping quality attributes. The wet method uses the coffee cherries after the removal of pulp and mucilage. During these it influences the taste, flavor, and aroma potential of coffee. Fermentation occurs in the pulp and mucilage of fruit during the natural drying process.

Roasting is next to fermentation in transforming the green coffee beans into roast coffee beans. The primary objective of roasting is to convert the green coffee beans into a brittle and extractable form. Green coffee beans behave as “mini bioreactors” upon exposure to roasting temperature **(205°C),** during which various biochemical reactions (Maillard reactions, pyrolysis, Strecker degradation) result in the production of more different types of aroma compound.

Primary processing of coffee begins just after the harvesting of coffee cherries. Coffee cherry processing consists of drying (natural, wet, or semi-wet), fermentation, roasting, storage, grinding, and brewing.

Coffee cherries (Primary processing of coffee) involving green bean production is grouped into secondary processing.

Figure. Cherry and parchment coffee

Secondary coffee processing aims to transform coffee cherries into green coffee beans and to lower the water content of fresh cherries to allows the moisture content of beans 11% to 12% it involves the removal of husk/hull of beans and preparation of the beans according to market requirements. Inadequate systems of harvesting, processing, storage, and transportation are responsible for the widespread failure to maintain the inherent quality of coffee produced in Ethiopia.

Dry processing: converting coffee cherries into green beans appear to be of major importance. Of these processing variables, natural or sun-drying is the most commonly used to transform the cherries into green beans Dry processing involves sun-drying/fermenting of the whole fruit, and produces coffee that is heavy in body, sweet, smooth, and complex. Sun-drying is a long process, and 95% of Arabicas from Brazil and Ethiopia.

Upstream chain coffee is segregated according to the production, harvest off-farm practices by the coffee farmers.

In **upstream**, coffee segregation is remarked on aspects that are having a major impact on coffee production, mostly the effect of climate change and disease becoming a major impact on the green coffee bean quality. Coffee quality is being encouraged by various practices through extension services, by better marketing opportunities and options.

Midstream chain, the challenges have centered around washing coffee and the setup of wet milling process, since washed coffee fetches a much higher price on international markets. The Ethiopia Coffee Exchange (ECX) has contributed to the functioning of the value chain, with farmers are more satisfied at the services provided by the Ethiopia exchange commodity such as in moisture and quantity testing, transactions .ECX use Traceability

Downstream coffee chain

There are many factors that influence the quality and ultimately the price of coffee. Ethiopia exchange commodity measures quality by washing the observable such as geographic origin and producers are not being rewarded for such in local retail markets. VSS, washed coffee are important determinants of quality premiums in export market

Within the International context of coffee trade, quality comes high in the requirements. When client and the exporting company are closely work with the producers farmers) by applying the value chain informed the value of the coffee can improve.

Quality and Traceability

Quality, traceability and the supply chain play are a great role to ensure the quality of coffee.

Quality is the sum of the requirement of the market or at least of what we believe are the requirements of the market in which all actors are integrated supply chain should know what is it quality request. Compete internationally, along with creating powerful producer organization backed by the government – all of which could make Ethiopia's coffee market flourish.

Traceability is the ability to trace all processes from procurement of raw materials to production, consumption and disposal to clarify

Traceability

Provide information of manufacturers, suppliers, and distributors are recorded. This information is tracked in all processes from procurement of raw materials and parts to machining, assembly, distribution, and sales to ensure traceability is important.

Traceability has been defined in **the ISO 9001** standard from the International Organization for Standardization

Self check 3	Written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

I. Say true if the statement correct and false if the statement incorrect (2 point each)

1. Traceability is the all process from raw material up to consumer and disposal
2. Upstream chain is segregated and practiced by exporter and importer coffee trader.
3. Fermentation occurs in the pulp and mucilage of green coffee bean at the natural drying process.

II.Short answer (2 point each)

1. Write the different between primary processing and secondary processing of coffee
2. What is the difference between quality and traceability?
3. Write three main coffee value chains
4. Write the initial steps of postharvest processing
5. What is dry processing?

Note: satisfactory 16 **unsatisfactory<10**

Information sheet 4: Take measurement to minimize pest infestation

4.1 Take measurement to minimize pest infestation

To minimize pest infestation apply

- Integrated pest management
- Good Manufacturing Practices
- Good inspection
- Use pesticide and insecticide.

Most pest management professionals should be the follow the Integrated Pest Management (IPM) steps in protecting warehouses from pests.

Integrated Pest Management (IPM) steps in protecting warehouses from pests

- Facility Inspection
- Pest Prevention
- Pesticide Treatment Practices
- Evaluating the Program
- Elimination of pests

Facility Inspection: The pest management professional should work the on-site facility manager for a comprehensive sanitation for pest control and identify acceptable and deficient areas that inspect a regularly.

- **Pest** Droppings off a **pest infestation**
- nesting
- Grease marks and grease tracks.
- damage structure of pest
- Damaged plants

Pest Prevention: to prevent pest infestation finding of the inspection, the professional worker should be recommend to facility managers to minimize pest entry points and reduce harborage areas. Use non-chemical and pesticide for looking to address pest problems.

Preventing Pests

- Remove source of shelter.
- Store items in safe and enclosed containers.
- Dispose of garbage regularly with a tightly closed lid.
- Reduce clutter or areas where pests can hide.
- Seal and close off any cracks or holes to eliminate outside entry.

Pesticide and Herbicides Treatment Practices: by apply fumigation to treat for pests especially with raw ingredients in the coffee ware house or storage is required.

Evaluating the Program: Pest control is not an item that can be checked off a “to do” list once. Proper pest management includes an ongoing relationship between a facility manager and a pest management professional. Both parties must work together to protect coffee bean, property and people against the diseases and dangers that pests present.

Stored Product Pests

A variety of insects are grouped together and classified as stored product pests. Infest mostly packages and inventories of packaged coffee bean and other grain mostly.

Stored product pests:

- peanut/rice and coffee moths
- Coffee berry borer and coffee bean weevils.
- red flour and warehouse beetles

In the coffee warehouse, important pests to recognize are the coffee cherry, coffee bean weevil and coffee moth caterpillars feed almost exclusively on the skin of the fruit.

Coffee that is not dried to recommended levels (9–13 %moisture) allows for fungus to grow, which makes the beans more attractive to insects. Insect pests feed on the stored coffee and, left unchecked, can reduce its weight significantly. An insect attack can also compromise the physical qualities of the coffee, resulting in a greater number of defects, and can even change the finished beverage,

The greatest damage occurs in warehouses located in areas of high temperature and humidity, such as those located in sea ports."

Though fungus and insect pests cause the most damage to coffee, other pests, including rodents, nuisance wildlife, birds and flies, may also be encountered in coffee warehouses.

Removal of Pest Entry Points

- Sweeps all doors between the inside and outside gaps are present.
- Direct employees to make sure doors
- Closed door at all times, never propped open on hot days
- Install air doors and plastic to reduce interior access of pests.
- To ensure Insect light traps are effective or that do not attract outside pests.
- Check all incoming stock for pests or dense of pest damage.

Pest infestation can control in biological pest control, cultural control (trap cropping, fumigation) and sterilization methods.

Self check 4	Written test

Name…… ID…… Date…….
Directions: Answer the following questions below. If necessary to aid some explain

I. Say true if the sentences is correct and false if the sentences in correct (2 point each)

1. The major factor of the pest infestation in ware house is temperature and humidity.
2. Pesticides and insecticide is the major pest treatment practice
3. To prevent the pest the professional manager in ware house is not mandatory

II.Choose the best alternative from the following option (2 point each)

1. Which of the following is used to remove the pest from pest entry point?
   A. Sweeps all doors
   B. B. to ensure Insect light traps effective or do not attract outside pests.
   C. Check all incoming stock for pests or dense of pest damage.
   D. All

2. Which of the following is used to minimize pest as the chemical purpose?

A. pesticides B insecticide C. Herbicide D. all

II.Short answer (5 points)

1. Write the steps of integrated pest management in pest infestation
2. Define Infestation

Note: Satisfactory rating >10 points **Unsatisfactory below 10 points**

Information sheet 5: Move coffee and tea into and out of storage

5.1 Move coffee and tea into and out of storage

Moving is process or capable of transporting of coffee into storage for maturation process and saving the coffee and at the same time move out from storage for process and customer consuming. Most of the time coffee moves in morning and night for the because of environmental factor during the days.

Green beans store the best in cooled airtight containers, and can easily stay for a year without losing flavor. Roasted beans are best stored in airtight containers out of the light. The best material choices for the container are ceramic or opaque glass. Plastic and metal may alter the flavor of the coffee bean. In addition, for the first week of storage, containers should be opened or vented by a relief valve to release the carbon dioxide gas that will be produced by the roasted beans to prevent the gas from changing the quality of the coffee.

Coffee beans are sensitive to moisture, they must be packed in bags that allow air to circulate sealed bags would promote condensation and deterioration of the bean

When coffee is move to the storage there are many risk factors that affect the coffee in the environment during the transportation.

When coffee move to storage the main factors that must be control for the coffee in the storage area is:

- ✓ Packaging
- ✓ Temperature
- ✓ Humidity/moisture
- ✓ Pest control
- ✓ Ventilation.

By considering these factors the green coffee bean, roasted coffee and grounded coffee stored in place and control when if you should be out from the storage place by low environmental factors.

Generally coffee bean move to storage at a night, morning, when there is no light and the same when out of storage in addition packaging material is mandatory for the moving coffee in and out of storage. At room temperature stored 25 ^{0} C

Risk factors loss prevention

Packagin**g**

Coffee beans are usually packaged in new bags of woven natural materials (e.g. jute or sisal), which allow free air circulation. The protective and ventilation measures conventionally taken in a general cargo ship do not generally apply to containers.

The constant increase in container ship tonnage has increasingly reduced the supply of space in conventional ships. Two types of container are used to transport coffee

Standard containers differ in the materials used for wall and ceiling construction. Corrugated steel sheet, fiber glass-reinforced plastics and, occasionally, plywood, are used. The floor always consists of wood or perforated pressure plate.

To simplify opening and closing of the containers, standard containers have a few small „ventilation holes“, which have no ventilation effect but merely equalize pressure differentials on opening and closing of the containers. A standard container stuffed with coffee should be stowed below deck. The extreme temperature differences on deck (up to 60°C between day and night) could result in container sweat during maritime transport

Reception: is the process of receiving coffee bean from the producers by taking the sample from the station for the sake of processing or exporting for the sale.

Green coffee reception is based on the result of quality assurance taken into the processing stage.

- ✓ Weighing
- ✓ Cleaning –light impurities by aspiration
- ✓ Destining –removal of stone by destoner
- ✓ Magnetic impurities-metal pieces
- ✓ Storage

Treatment and/or blending of Coffee and tea grades:

The most important phases of the treatment with respect to tea production (which can be used for the production of any type of tea desired as opposed to the later explained CTC production) are: withering, rolling, fermenting, drying and sorting into leaf and broken grades, i.e. sizes.

The most important grades for tea:

Important grades for:

Leaf Sizes

1. Flowery Orange Pekoe = FOP

- contain less tannin
- the golden or silver-coloured

They indicate that young tealeaves were used; however this is not necessarily a determinant of exceptional quality.

2. Orange Pekoe = OP

3. Pekoe = P and Flowery Pekoe = FP

This leaf is shorter and larger than the Orange Pekoe, often also more open and not as finely rolled. Pekoes have a ball-shaped leaf. Pekoes are stronger in the infusion or liquid than the Orange Pekoe, because the latter contains more leaf ribs and less "flesh".

b) Broken Tea

1a. Flowery Broken Orange Pekoe = FBOP

This grade refers to the larger and very aromatic qualities of the small-leafed teas.

1b. Golden Broken Orange Pekoe = GBOP

A very fine and strong tea.

Aeration:

Aeration is the process of blowing the air into the storage silo.aeration is he process by air is circulating through a coffee and tea equipment during the handling and storing the green coffee bean. Therefore to desiccate this dusts from the machine aeration is applied by use of fan or blower machine attached on the plant in the coffee process industry

Dispatch:

Dispatch is delivering the coffee after process in finished or after the packaging is finished at the end of the coffee and tea processing.

Company policies and procedures is all work is carried out according to regulatory and licensing requirements, legislative requirements industrial awards and agreements

Police and procedure of coffee and tea handling to storage

- Don't store coffee in refrigerator or freezer
- Don't exposure roasted coffee to direct sun light
- Store coffee and tea in a dark and dry place
- Don't store roasted coffee more than 6-8 day after roasted and grounded

Occupational Health and Safety (OHS)

Occupational health and safety is one of the most important aspects of human concern.

It aims an adaptation of working environment to workers for the promotion and maintenance of the highest degree of physical, mental and social well being of workers in all occupations.

The question of occupational health and safety, as a global issue, is now taking a new turn.

The main contributory factors towards to agricultural development that are taking place in the developing countries, and the emergence of new products and product process movement from place to place

Self check 5: written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

I. Say true if the sentence is correct and false if the sentence is in correct (2point each)

1. Moving coffee in a day light is better than in a night

2. Coffee is stored at room temperature at controlled environmental humidity

3. Packaging material of coffee bean during movement storage mandatory

II.Choose the following (2 point each)

1. Which one of the following is allowed during coffee movement into storage

A. duration of movement B. packaging C. temperature D design of ware house E. all

2…… is the process of receiving coffee bean from the storage

A. Reception B. aeration C dispatching D. grading

Note: Satisfactory rating 10 points **Unsatisfactory below 10 points**

Information sheet 6: Checking coffee and tea during movement

6.1 Checking coffee and tea during movement

When you move coffee bean from farm (producer) to the storage (stock) or from storage out consider the factors that you should check is as the following:

- Room temperature
- Temperature of the coffee bean itself
- Relative humidity of the environment
- Moisture content of the bean
- Packaging material of the bean
- Maturation of coffee bean after and before the storage
- Design of ware house and window ventilation
- Disease that affect the coffee bean at the stock or storage
- Pest infestation
- Direct sun light

Required instruments for checking

- Thermometers
- Moisture meters
- Relative humidity instrument

By using this instrument check the moisture of coffee bean as it is ranged 10-12%

Keep coffee bean in airtight container.

Coffee bean greatest enemies are air, moisture, heat and light

To preserve your beans fresh roasted aroma and flavour for long, store them in an air tight container. Avoid at all costs using clear containers. Everyone likes the look of a transparent jar of coffee beans on the counter to look at, but it's not the best storage Light should be affect beans. Keep your beans during storage in a cool ,dark location. Near a window that allows light in has the potential to be far too warm of a location. Retail packaging is designed for short shelf storage, not storage coffee beans.invest in good quality coffee storage canisters with an airtight seal.

For checking processed coffee:

The first you have to go through the roasting process, which subjects to very high temperatures, bringing out the caffeol that produces that distinct coffee aroma and flavor. Right after roasting is when your coffee beans are considered to be at their 'freshness. The roasted beans face their greatest enemies in the environment oxygen/air, moisture, heat, and light.

The longer the newly-roasted beans are exposed to the air, the faster they oxidize, sacrificing their taste (adding that unwanted bitterness) and aroma. This is what roasters avoid by packing and delivering their beans after roasting. Newly-roasted beans can lose their freshness relatively quickly.Taking more conscious efforts in properly storing coffee beans.

Factors of storing coffee.

There are 3 important factors to consider in storing your coffee.

- ✓ Air or oxygen
- ✓ Air tight
- ✓ packaging

First keep roasted coffee away from exposure to **air or oxygen**. Packaging is the key. The most convenient of packaging is to use valved packs. Valved packets of coffee beans are equipped with a specially designed hole that allows the release of carbon dioxide, without letting any air in that can make the beans go stale. These are not for long-term storage, so always check on the roasting date stamped on the pack.

Instead of clear containers, especially design coffee vaults which is made of stainless steel with lids to keep the vaults airtight. You have a good-sized, airtight container, it is important to avoid exposing it to high-temperature or hot environments. This includes areas like your windows, the cupboard near stove, or the counter space beside your roaster. Heat can accelerate none enzymatic browning and degradation of the aromatic properties of your beans, which makes them go stale faster.

The loss of carbon dioxide from coffee occurs due to diffusion forces, which move molecules because of differences in pressure and molecule concentrations. When coffee is ground, the porosity and surface-to-volume ratio increase, which accelerates degassing and staling


Beans are the seeds of the coffee cherry
They are cleaned, triaged and processed
They go through a roasting process
Beans are ground
Freshly roasted beans make the best cup of coffee

Self check 6	Written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

Loading of each question (2 point)

1. What is the moisture content of unroasted coffee by what apparatus you check?
2. What is the moisture content of roasted coffee?
3. What you should be check during coffee bean move to storage
4. At what place green coffee bean and roasted coffee stored
5. Write the important factors that you consider in the storage of your coffee.

Note: Satisfactory rating 10 points **Unsatisfactory below 10 points**

Information sheet 7: Clean storage and handling equipment

7.1 Clean storage and handling equipment

Cleaning is the process of removing unwanted substances, such as dirt, infectious agents, and other impurities, from surface of handling equipment in the coffee processing plant or environment. Cleaning supplies should be stored in a separate area.

Cleaning principle of worker hygiene

- ✓ Wear clean cloths
- ✓ Maintain personal cleanliness
- ✓ Hand soap and cleaning detergent
- ✓ Disposable towels and Clean water
- ✓ Using the bathroom.
- ✓ Remove all unsecured jewelry and other objects.
- ✓ No eating, chewing or smoking in packing areas.
- ✓ Gloves must be intact, clean and sanitary.
- ✓ Wear hairnets and ear covers.
- ✓ A worker with a health problem that could contaminate food or food equipment should be excluded from working with food.

Storage is a place or stock of the coffee and tea temporary store up to the consuming and processing is carrying out.

After check stored coffee bean and around coffee storage when the area of coffee bean are infested by insects and dusts accumulated in the room storage properly clean handling equipment by using different agents like soap or detergent

Storage of green bean

Stored, green bean is very susceptible to being contaminated by nearby chemicals or fuels. Storage and shipment of green bean in jute sacks that have been made on machinery lubricated with petroleum oils, can lead to a 'baggy' or 'oily' taste in the coffee. Use clean, jute sacks, fork list, trolley specially made for coffee.

Green bean that is stored for long periods in hot and humid conditions is liable to absorb moisture from the atmosphere with resultant mould producing musty flavours. To ensure minimum spoilage, beans in jute sacks or woven poly bags should be evenly stacked in a well-ventilated area that remains at less than 65% relative humidity. After some time in storage, the bean surface begins to oxidize leading to 'woody' taints. Coffee should not be stored for longer than 12 months as the beans fade and mottle.

Transport (move)

Storage and transport pose similar risks to coffee quality. Re-wetting of beans due to leaky tarpaulins, or high humidity inside hot containers standing for long periods in tropical ports, can result in the coffee developing mouldy or musty flavours. Special techniques for handling bulk or bagged green beans for container shipping are now well known.

Coffee Storage Locations:

- ✓ Choose a cool, dark, dry place
- ✓ Do not store coffee in the refrigerator or freezer; the humidity can cause moisture to infiltrate the packaging.

Self check: 7	Written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

I. Say true if the statement is correct and false if the statement is incorrect (6)

1. Cleaned equipment stored separately in storage place
2. Most of the time green coffee bean and roasted coffee can be stored freeze or refrigerator**.**
3. When green coffee bean stored for long periods in hot and humid conditions it cannot absorb moisture from atmosphere

II.Choose the following accordingly (4 point)

1. Which of the following is used for handling n the coffee storage area?

   A. Jute sacks B.forlift C. trolley D. All

2. Which of the following is the cleaning principle of worker?

   A. Wear clean cloths
   B. Maintain personal cleanliness
   C. Hand soap and cleaning detergent
   D. Disposable towels and Clean water
   E. all

Note: Satisfactory rating>10 points **Unsatisfactory below 10 points**

Information sheet 8: Implementing suitable measures to minimize desiccant dust

8.1 Implementing to minimize desiccant dusts

A **desiccant** is a hygroscopic substance that is used to induce or sustain a state of dryness (desiccation) in its vicinity; it is the opposite of a humectants. Commonly encountered pre-packaged desiccants are solids that absorb water. Desiccants for specialized purposes may be in forms other than solid, and may work through other principles, such as chemical bonding of water molecules. They are commonly encountered in foods to retain crispness. Industrially, desiccants are widely used to control the level of water in gas streams.

Desiccation is the act or process of drying or desiccating something or the state of being or becoming dried up: removal or loss of moisture: thorough drying.

Desiccant dusts are insecticides that have the ability to dry out the bugs' waxy coating of the bugs dehydrating and eventually kill them.

The insecticide part of the desiccant dusts are physical not chemical. Meaning that desiccant dusts provide a safe, reliable tool for reducing infestation.

Silica gel acts as a desiccant against pests, inducing a state of dryness on the target insect. In order to adhere least toxic pest control, make sure that if the purchaser either of these products is not formulated with a pesticide. A chemical is not necessary for these materials to be effective at pest control. Because they act as a physical insecticide, there is no risk of resistance.

Desiccating dusts can be blown into voids through small holes drilled into the walls and on the surface of the machine that dusts are accumulated. Dusts placed in wall voids or cracks and

sealed can be effective for kept dry. They can be used in areas where is not practical, such as in small cracks around doors, cabinets, and molding.

They can be used around the edge of or brushed directly into ware house storage room. For pest specific uses of desiccating dusts. The purpose of the desiccant is to remove moisture from the process air stream. If the desiccant is doing its job and the heaters and blowers are working as designed, the dew point of the process air is reduced.

It is important to avoid contamination of the desiccant:

- Follow instructions for filter maintenance to minimize the chance of desiccant contamination from dust
- Follow instructions for regeneration blower maintenance to make sure that desiccant is being properly drier after removing moisture from the air stream.
- Utilize a plasticizer filter to avoid plasticizer contamination

Fig.1 Silica gel desiccant

Self check 8	Written test

Name…… ID…… Date…….

Directions: Answer the following questions below. If necessary to aid some explain

1. What is desiccant? (2 point)
2. What is the use of desiccant? 2(point)
3. How to avoid or implement contamination of desiccants(3 point)
4. What is the purpose of desiccant dust? (4 point)

Note: Satisfactory rating>5 points Unsatisfactory below 5 points

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