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Ministry of Labor and Skills

Crop Production
LEVEL – III

Based on April 2022 version-1 occupational standard

Module Title: Performing Post-Harvest Management of Field Crops

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Table of Contents

Introduction to the Module

This module covers the knowledge, skills and attitude required to implement post-harvest opérations, plan harvest strategy, monitor moisture content, implement harvest schedule, co-ordinate and implement post-harvest treatments, implement hazardous waste disposal guidelines, implement packing and storage requirements of produce

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LG #1 LO #1- Preparing for implementation of post-harvest operations

Instruction Sheet 1

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

- Identifying Post-harvest operations and post-harvest work procedures
- Selecting materials, tools, equipment and machinery
- Carrying out Pre-operational and safety checks
- Identifying, risks assessing, controlling, implementing and reporting OHS hazards
- Selecting, using and maintaining suitable safety PPE

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 Post-harvest operations and post-harvest work procedures
- Select materials, tools, equipment and machinery
- Carry Pre-operational and safety checks
- Identify, assess risks, control, implement and report OHS hazards
- Select, use and maintain suitable safety PPE

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
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 1

1.1 Identifying Post-harvest operations and post-harvest work procedures

1.1.1. Identify post-harvest operations

Post-harvest refers to the period of time after crops have been harvested from the farm or field up to consumption. During this time, crops are typically subjected to a range of operations and procedures to ensure they are properly processed, stored, and prepared for sale or consumption. These operations and procedures are termed as Post-harvest operations and post-harvest work procedures. Post-harvest operations of field crop refers to the handling and storage of crops after they have been harvested. All activities that take place after harvesting crops or products, including cleaning, sorting, grading, packing, and storage are called post-harvest operations. Postharvest work procedures, on the other hand, are specific protocols or steps that workers follow during postharvest operations to ensure that the final product is of high quality. These work procedures can include things like wearing appropriate clothing and gloves, following sanitation protocols, using specific equipment correctly, and monitoring temperature and humidity levels. These operations and procedures have objectives to:-

- Prevent postharvest losses,
- Maintain quality
- Preserve their nutritional value, and
- Prolong their shelf life to make them available for consumption throughout the year.

Overall, post-harvest operation is a specific action or set of actions carried out to achieve a particular goal or objective. In the context of postharvest operations of field crops, an operation may refer to a specific activity or task that needs to be carried out in order to ensure the proper handling, storage and transportation of the crops after they have been harvested. Examples of postharvest operations include cleaning, sorting, grading, packaging, storage, transportation and marketing. Each of these operations involves a set of specific actions that must be carried out carefully and efficiently to minimize postharvest losses and ensure that the crops retain their quality and market value

Proper post-harvest management is essential in order to minimize losses of harvested crops due to spoilage or damage during storage and transportation. It can also increase the quality and value of crops, leading to higher profits for producers and improved food safety for consumers.

Post-harvest operations include activities such as:-

- **Harvesting**- is the process of gathering mature crops from a farm or field. It is the first step of post-harvest operation.
- **Threshing** - This process involves separating the grain from the rest of the plant material or husk. Examples include manual threshing, mechanical threshing, and drum thresher.
- **Cleaning** - This involves removing foreign matter, weed seeds and broken kernels from the crop before storage or processing. Examples include winnowing, sieving, and sorting.
- **Drying** - This process involves reducing the moisture content of crops to prevent spoilage and prolong shelf life. Examples include sun drying, mechanical drying, and aeration.
- **Grading** - Grading involves sorting crops based on quality and size. This is an important step in maintaining consistency in the final product. Examples include hand grading, mechanical sorting, and color sorting.
- **Packing** - This involves storing the crop in containers that protect them from physical damage, moisture, and pests. Examples include bags, crates, and containers. .
- **Transport** - Once packed, crops need to be transported to different locations for further processing or distribution. Proper transportation of crops from the field to storage locations helps minimize losses that occur from damage incurred during transportation. This involves the use of trucks, ships, and other types of transportation.
- **Storage** - Proper storage is important to prevent spoilage and maintain quality of the grains. Examples include silos, bins, warehouses and bags

1.1.2 **Postharvest work procedures**

Postharvest work procedures are specific protocols or steps that workers follow during postharvest operations to ensure that the final product is of high quality. These work procedures can include things like wearing appropriate clothing and gloves, following sanitation protocols, using specific equipment correctly, and monitoring temperature and humidity levels.

What is post-harvest loss?

Postharvest loss can be defined as the degradation in both quantity and quality of a food production from harvest to consumption. Quality losses include those that affect the nutrient/caloric composition, the acceptability, and the edibility of a given product. These losses are generally more common in developed countries. Quantity losses refer to those that result in the loss of the amount of a product. Losses of quantity (weight or volume) and quality (altered physical condition or characteristics) can occur at any stage in the postharvest chain.

1.2 Selecting materials, tools, equipment and machinery

Selecting materials, tools, equipment, and machinery for post-harvest operations of field crops can be a critical factor in maintaining crop quality and reducing losses. The selection is often based on:

- The crop type,
- Production quantity and quality,
- Processing needs, and
- The scale of operations.

When selecting materials, tools and equipment consider their durability, ease of maintenance and repair ability to ensure continued serviceability and economic viability. Common materials, tools, equipment, and machinery for post-harvest operations of field crops include:-

- Preservatives
- Chemicals
- Gases
- Cleaning agents,
- Labels
- Adhesives
- Tractors
- Machinery
- Washers
- Brushes
- sickle,
- knives,
- sieves,
- Trailers
- Light trucks
- Forklifts
- Knives
- Gloves
- Containers
- Grading
- winnowers,
- bags,
- Containers,
- Dryers
- Chemical applicators
- Labeling devices

- Packing tools
- Scales
- Hand trolleys and lifting aids
- Cool-rooms and
- dedicated storage facilities
- Fans
- bag sealers
- weighing scales
- staplers and
- Sewing machine
- trucks,
- trailers,
- carts and
- Conveyors and
- Power source; generator or solar pan

1.3 Carrying out Pre-operational and safety checks

Carrying out pre-operational and safety checks deals with ensuring that any equipment or machinery that is going to be used is safe to operate and in good working condition. This includes activities like:

- Inspecting the equipment for damage or wear,
- Checking that all safety guards are in place and functioning correctly,
- Verifying that all controls and settings are adjusted correctly, and
- Ensuring that there is no debris or obstructions that may hinder operation.

By performing these pre-operational and safety checks, workers help to prevent accidents, injuries, and equipment damage. It is an essential part of any job that requires the use of machinery or equipment. Here are some safety and pre-operational checks that you can carry out for field crop post-harvest operations:

- Check that all stored crops are dry and free from pests, mold, and other contaminants.
- Verify that storage bins are in good condition and that there are no leaks or structural issues.
- Ensure that all machinery is clean and lubricated.
- Check fuel levels, oil levels, tire air pressure, and hydraulic fluid levels in all machinery.
- Inspect all electrical systems, including fuses, wiring, and connections.
- Confirm that all guards and safety devices on equipment are in place and functioning properly.
- Remove any debris or tripping hazards from the working area.
- Confirm that all personnel are trained in the proper use of equipment and that they are wearing appropriate protective gear.

1.4 Identifying, risks assessing, controlling, implementing and reporting OHS hazards

Identifying, risk assessing, controlling, implementing and reporting OHS hazards is a continuous and ongoing process that requires active participation from all workers and management within an organization. The identification process involves evaluating the

potential hazards in the workplace, based on previous incidents, audits or inspections to determine what may cause harm to the workers. OHS hazards can be classified as:-

- **Physical hazards** exposure to physical factors such as noise, vibration, temperature extremes, radiation, or pressure changes.
- **Chemical hazards** exposure to hazardous chemicals.
- **Biological hazards** exposure to biological agents such as bacteria, viruses, fungi, and other microorganisms.
- **Psychological hazard** can cause harm to an employee's mental or emotional well-being
- **Ergonomic hazard** any physical condition or factor found in the workplace that can cause injury or health concerns. Examples include repetitive motions, awkward postures, and heavy lifting

Here is a draft outlining the steps for identifying, assessing, controlling, implementing, and reporting occupational health and safety hazards during field crop post-harvest operations:

1. **Identifying hazards** - The first step is to identify the potential hazards that may arise during field crop post-harvest operations. These hazards may include physical, chemical, and biological hazards that can affect the health and safety of workers.

2. **Risk assessment** - Once the hazards have been identified, it is important to carry out a risk assessment. This involves determining the likelihood and severity of the identified hazards and establishing ways to mitigate or control these risks.

3. **Control measures** - The next step is to implement control measures to minimize or eliminate the identified hazards. This may include developing new methods of work, improving training and awareness programs for employees, or installing new safety equipment in the workplace.

4**. Implementation** - After developing control measures, they should be implemented within the workplace by management and employees.

5. **Reporting** - Finally, it is important to report any occupational health and safety incidents that occur during field crop post-harvest operations. This will allow for an investigation into

the cause of the incident and any necessary changes to the control measures to prevent future occurrences.

1.5 Selecting, using and maintaining suitable safety PPE

Selecting, using, and maintaining suitable safety PPE is an important aspect of workplace safety. Safety PPE, or personal protective equipment, includes things like hard hats, safety goggles, respirators, gloves, and fall arrest systems. The selection of appropriate PPE should occur after a thorough hazard assessment of the workplace has been conducted. This will help to determine the types of hazards present in the work environment and what types of PPE are needed to protect employees. Once the appropriate PPE has been selected, it is important that it be used properly by employees. This includes things like wearing the PPE consistently and correctly, ensuring that it fits properly, and keeping it in good condition. Employees should also be trained on how to use the equipment correctly and when it should be used. Finally, maintaining the PPE is important to ensure that it continues to provide adequate protection. This includes things like inspecting it regularly for wear and tear or damage, replacing it as needed, and properly storing it when not in use. Proper maintenance of PPE can help to ensure that it remains effective at protecting workers from workplace hazards.

- **Identification of necessary PPE** – The first step is identifying the necessary PPE based on the specific tasks that will be performed during field crop post-harvest operations. This may include gloves, safety glasses, face shields, respirators, hard hats, and other safety equipment.
- **Selection of appropriate PPE** – After determining what PPE is needed, it is important to select the appropriate type of PPE. This typically involves considering factors such as the level of protection needed, the specific work environment, and individual worker needs.
- **Train workers in proper use** – Once the appropriate PPE has been selected, employees need to be trained in its proper use. This includes instruction on how to properly fit, adjust, and use the equipment and how to inspect it before each use.
- **Monitor use and maintenance** – Workers should be closely monitored to ensure that they are actually using the PPE and that it is being properly maintained. This may include regular inspections of PPE and ensuring that workers follow proper cleaning and maintenance schedules for the equipment.

- **Re-evaluation** – Over time, it may be necessary to re-evaluate the need for different types of PPE or to upgrade existing equipment as new safety standards emerge or as work environments change.

Self-Check 1	

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: choice

1. Which one of the following is not post-harvest operation**?**

A. Cleaning B. threshing C. grading D. weeding

2. Which one is field crop post-harvest equipment?

A. Combine harvester B. thresher C. winnowers D. all

Test II: Matching

A	**B**
1. Biological hazard	A. post-harvest activity
2. Glove	B. PPE
3. Drying	C. Noise
	D. Bacteria

Test III: Short Answer Questions

1. What is post-harvest?
2. Write the types of hazards with examples
3. Write and explain post-harvest operations.
4. List at least five tools and equipment used for field crop post-harvest operation.
5. What is risk assessment?
6. What does mean by postharvest operation?

LG #2 LO #2- Planning harvest strategy

Instruction Sheet 2

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

- Estimating commencement date and the time span
- Calculating the equipment and labour resources required
- Applying pre-harvest pest control treatments
- Determining, planning, and describing order of harvesting

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:

- Estimate commencement date and the time span
- Calculate the equipment and labor resources required
- Apply pre-harvest pest control treatments
- Determine, plan, and describe order of harvesting

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
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Information Sheet 2

2.1 Estimating commencement date and the time span

Estimating commencement date and the time span refer to the process of determining when a project is expected to start and how long it will take to complete. This involves analyzing the project requirements, resources, and constraints to determine a realistic start date and a timeline for completing all the necessary tasks. Accurately estimating these factors is critical for project planning and management, as it helps ensure that the project is completed on time and within budget constraints. Here is a draft outlining how to estimate the commencement date and time span for field crops:

1. Consider the planting date - The commencement date for a field crop will depend on when the initial planting takes place. This can vary depending on the crop being planted, the climate of the region, and other factors that may affect growth and development.

2. Determine the growth cycle - Each crop has its own growth cycle, which typically consists of several phases such as germination, vegetative growth, flowering, and ripening. It is important to estimate the length of each phase when determining the time span of the crop.

3. Account for any weather-related delays - Adverse weather conditions such as excessive rain or drought can impact both the commencement date and time span of a field crop. It is important to consider any potential weather-related delays when estimating these factors.

4. Monitor growth and adjust as necessary - As the crop grows and develops, it may be necessary to adjust the estimated commencement date and time span based on actual growth rates and observed weather patterns.

5. Harvesting - Harvesting typically occurs once the crop has reached maturity, which can vary depending on the type of crop being grown. This process should also be considered when estimating the time span for a field crop. Estimating commencement dates and time spans for field crops will depend on various factors unique to each situation. However, using these general guidelines should help provide a good estimate for when to expect a harvest.

Harvesting operation under taken when the crop is physiologically enough matured. This physiological maturity can be determined either by visual observation at field or by taking sample. In general timely harvesting of the crop has advantages of:

- Reduces crop loss due to birds, insects, rodents, and wild animals damage
- Decreases field insect pest infestation problem
- Frees the field for timely preparation for the next crop

The time of harvesting is determined by the degree of maturity. With a cereals and pulses ,a distinction should be made between maturity of stalks(straw),ears or seed pods and seeds for all that it affects successive operation , particularly storage and preservation.

Effects of pre mature harvest

Premature harvesting of field crops can have a number of negative effects. First and foremost, it can result in a lower yield, as the crops may not have had sufficient time to fully mature and develop. This can mean that farmers may not be able to sell as much of their crop, or may need to sell it at a lower price due to its lower quality.

In addition to reducing yields, premature harvesting can also have negative impacts on soil health and fertility. Harvesting too early can lead to nutrient depletion in the soil, as the crops may not have had enough time to fully absorb nutrients from the soil. This can also lead to decreased soil moisture and increased erosion, as the crops have not had time to establish strong root systems.

Finally, harvesting crops too early can have negative impacts on the environment more broadly. It may contribute to deforestation, as farmers may clear additional land in order to compensate for lower yields. Additionally, premature harvesting can lead to increased pesticide and herbicide use, as farmers may need to apply more chemicals in order to combat pests and weeds that might otherwise be controlled naturally by a healthy crop.

Overall, premature harvesting of field crops is generally not recommended, as it can have numerous negative impacts on farmers, the soil, and the wider environment.

Premature harvest reduces both yield and quality even when rust is damaging the grain. Under developed grain are low in test weight, starch content and market values.

Grain seed crops may be cut with as weather 7 days or more before they are ripe and allowed to dry under cool humid conditions. , or 3 to 4 days early under warm dry condition, without appreciable loss in yield or quality. For example wheat grain sometimes draws materials from the straw after it is cut when nearly ripe. Considerably more growth has occurred when immature barley grains were left to dry in the head than when they were threshed immediately. Most legumes ripen irregularly and the early ripened seeds often shatter.

Effects of delayed harvest

Delayed harvesting of field crops can also have negative impacts, which can vary depending on the type of crop and growing conditions. Some potential effects of delayed harvesting include:

1. **Reduced crop quality**: As crops are left in the field for longer, their quality can decline. This is particularly true for fruits and vegetables, which may become overripe or damaged if left to stay on the plant for too long.

2. **Increased susceptibility to pests and diseases**: Delayed harvesting can cause crops to become more vulnerable to insect pests and diseases. This is because as crops mature, they become more attractive to pests and pathogens.

3. **Decreased yield:** In some cases, delaying harvesting can lead to decreased yields. This is because plants may begin to senesce and stop producing new growth if left in the field for too long.

4. **Reduced nutrient content**: If crops are left in the field for an extended period of time, their nutrient content can decline. For example, crops such as corn and soybeans may lose protein and energy content if left in the field after maturity.

5. **Greater susceptibility to weather-related damage**: Delayed harvesting can also make crops more vulnerable to weather-related damage such as wind, hail, and rain. Overall, while delayed harvesting can be beneficial in some cases – such as when trying to increase seed production or waiting for crops to fully mature – it is generally not recommended as it can cause quality and yield losses. Therefore, farmers should strive to harvest their crops at the optimal time based on weather conditions and crop maturity for maximum yield and quality

When harvested with combine the small grain must stand in the field until the moisture content of the grain has dropped to 14% or less, a necessity for safe storage without artificial drying. For

example, when wheat grain has a moisture content of 13% or less the rachis of the wheat spike breaks readily , and the straw will burn freely. Losses from the delayed harvest are caused by shattering, crinkling, lodging and leaching. The indicators or harvesting indexes of cereal and pulse crops vary depending on the specific crop, but some common ones include:

Crop maturity: The first indicator for harvesting is the maturity of the crop. For cereals, it is recommended to start harvesting when the moisture level of grains is around 18-20%. For pulses, harvesting can begin when 80-90% of the pods have turned brown or yellow.

Starch content: Starch content is an important indicator for cereals such as maize and wheat, where high starch content indicates optimal harvest time.

Seed size and color: For pulse crops, seed size and color can be an important indicator of harvest time. Seeds that have developed their final color and are well-filled usually indicate that the crop is ripe and ready for harvesting.

Plant height: The plant height can also be an indicator of maturity for some crops like wheat, barley, and oats. As these crops mature, the plants will begin to droop and turn yellow.

2.2 Determining, planning, and describing order of harvesting

Determining, planning, and describing the order of harvesting deals with the sequence of harvesting your crops. This includes deciding which fields or sections to harvest first, which equipment to use, and the timing and scheduling of the harvest. The order of harvesting is essential as it can affect the overall success of your operation, including crop quality and quantity. Here are some key factors to consider in determining, planning, and describing your order of harvesting

Maturity level - You should harvest crops with the highest maturity levels as they are likely to be the most valuable.

Climate conditions - Ensure that you are harvesting crops during favorable weather conditions and avoid harvesting crops during unfavorable weather conditions.

Accessibility of fields - Fields that are easily accessible should be harvested first to expedite the harvest period.

Equipment availability – Use equipment suitable to each field’s crop variety and the access of each harvest field.

Labor resources – Determine which fields require more labor-intensive work than others, especially in instances where produce requires manual picking.

Crop rotation methodology- Ensure that your crop rotation methodology is aligned with harvest planning techniques so that fields get rotated after picking due amounts of crop.

Determining the order of harvesting field crops depends on a few factors:

1. Maturity: You want to harvest crops at their peak maturity for maximum yield and quality. So, you need to determine which crops are ready for harvest first and plan accordingly.

2. Marketability: You also need to consider which crops are in highest demand and plan to harvest those first, so they can be marketed and sold immediately.

3. Equipment: Some equipment is tailored to specific crops, so you want to order the harvest to utilize each equipment effectively. Once you have considered these factors, you can plan the order of harvesting your crops. Here is a basic plan for field crop harvesting:

- Determine when the crops are ready for harvest - This will depend on the type of crops you have and their growth cycle. You should check your crops regularly to ensure they are not overripe or under ripe.
- Determine the equipment required for harvest – this could include combines, harvesters, or threshers.
- Schedule the harvesting team - You should ensure that you have enough staff on hand to complete the harvest efficiently and safely.
- Map out the fields - You should create a map of your fields, including the location of all crops and any obstacles that may hinder the harvesting process.
- Finalize transportation plans – make sure you have trucks or trailers available for transporting the crops to storage areas.
- Begin Harvesting - Make sure all equipment has been checked and is functioning properly before beginning the actual harvest.
- Transport Crops to Storage Area - Once harvested, transport your crops to a suitable storage facility such as a silo or warehouse.
- Post-Harvest Management – Take care of any necessary action after the harvest is complete

Field crop harvesting strategy deals with the planning, execution, and management of the harvesting process for various field crops. This includes:

- Selecting the appropriate equipment,
- Determining the optimal timing for harvest,
- Efficient use of labor, maximizing yield and quality,
- Minimizing losses due to weather and other factors, and
- Ensuring compliance with regulations and safety standards.

The specific strategies and considerations for harvesting will vary depending on the type of crop being harvested, as well as the geography, climate, and other factors specific to the region where the crop is grown. For example, crops grown in regions with frequent rains may require different harvesting strategies than those grown in dryer regions. Ultimately, a successful field crop harvesting strategy seeks to achieve the maximum yield of high-quality crops while minimizing losses and ensuring efficiency and safety throughout the process. Here is a strategy for planning your field crop harvesting:

1. Evaluate your crop - Assess your crops to determine the size of your field, yield, and other relevant information.

2. Determine a suitable harvesting method - Decide on the appropriate harvesting method based on the type of crop you have, the quantity of the crop, and the availability of machinery and labor.

3. Plan your workforce - Determine the number of laborers required for the harvest and their responsibilities.

4. Schedule your harvest - Plan when to start harvesting to ensure that it is done at the optimum time when the crop is at its peak maturity level to get the highest quality yield.

5. Arrange transport for harvested crops - Ensure that adequate transportation is available for harvested crops to be taken to storage areas like silos or warehouses.

6. Develop safety policies - Establish safety protocols and train all personnel on safe handling practices.

7. Monitor progress and adjust plan as needed - Keeping an eye on the progress of harvesting operations and making adjustments as needed in response to changing conditions like weather or unexpected crop disease or damage.

8. Implement post-harvest management – Take actions in alignment with post-harvest management like cleaning farm area, seed-saving for next crop, or selling harvested crops in markets.

2.3. Calculating the equipment and labor resources required

For field crop post-harvest activities, you'll need a range of equipment and labor resources depending on the specific activities involved. Here are some things to consider:

- Harvesting equipment: You'll need equipment that can effectively harvest the crop. Depending on what you're harvesting, this could include machinery like threshers, combines, or pickers.

- Transportation equipment: You'll need means to transport the crop from the fields to the storage or processing sites. This could include trucks, tractors, or trailers.
- Processing equipment: If you're planning on processing the crop after harvesting, you'll also need specific equipment such as milling machines, sorting machines or drying equipment.
- Labor force: You should also consider the number of workers required based on the size of your harvest and the complexity of the post-harvest activities. Some activities will require more workers than others like sorting and grading of produce. Once we gather these details, we can make an estimate of how much equipment and labor resources are required for your project.

2.4 Applying pre-harvest pest control treatments

Pest control in intensive agriculture involves pre- and postharvest treatment of crops with a variety of synthetic chemicals generically known as pesticides. Pesticides include herbicides and insecticides that are mainly used in the pre harvest stages, rodenticides that are employed while storage of the crops and fungicides which can be applied at any stage of the process. Apply pre-harvest pest control treatments for field crops before harvest. This includes:

- Cultivating the field regularly to remove weeds and pest habitat.
- Using resistant crop varieties that are less susceptible to pest damage.
- Biological controls such as natural enemies of pests, crop rotations or intercropping with companion crops can be used to manage pests, without using synthetic chemicals.
- Using synthetic pesticides for pest control can be done in accordance with regulations that stipulate the type of chemical, formulation and safe handling, or recommended intervals prior to harvest.

Here are some steps you can follow for applying pre-harvest pest control treatments for field crops:

- Identify the specific pests or diseases that are affecting your crops: This will help determine the type of pesticide or treatment that's needed.
- Determine the right timing for applying the treatment: Most pesticides need to be applied when the pest is at its most vulnerable stage, and this can vary depending on the crop and pest type.

- Choose the right pesticide for the pest, crop, and situation: Make sure to read the label carefully and follow all instructions for application, safety, and storage.
- Prepare the equipment for application such as sprayers, nozzles, and water sources if needed.
- Mix the pesticide according to the recommended rate and in accordance with local regulations. Wear appropriate protective clothing or equipment during mixing and application.
- Apply the pesticide at the right time and using the proper application equipment to minimize spray drift.
- Monitor your crop after applying treatment to ensure it is working. Make sure to note any signs of resistance or additional pest outbreaks and take action accordingly. Remember to always follow safety precautions, with particular attention to when spraying of pesticides is due especially with regards to environmental impact, injury or illness to person and wildlife. If in doubt on certain aspect in the processes consult with a certified expert or professional in the field.

2.5 **Applying IPM principles and organization policy**

Integrated Pest Management (IPM) is an approach to pest control that relies on a combination of strategies to suppress pests below damaging levels while minimizing the impact on beneficial organisms and the environment.

In post-harvest operations of field crops, IPM can be applied to prevent pest infestations and maintain crop quality throughout storage and transportation. Here are some potential organizational policies that would support IPM principles in post-harvest operations:

1. Regular monitoring: Set up a routine monitoring system to identify pests and their populations within the storage facility. Use sticky traps, pheromone traps, and visual inspections to stay on top of any possible infestations.

2. Record-keeping: Keep detailed records of pest populations, storage temperature, moisture levels, and other environmental factors that can affect pest activity. This data can be used to identify trends and develop effective pest management strategies.

3. Sanitation: Establish a sanitation program that includes regular cleaning of storage areas, equipment, and vehicles used for transportation. Proper sanitation can help reduce the likelihood of pest infestations and can also help prevent the spread of diseases that can damage crops.

4. Biological control: Implement biological control measures such as releasing natural enemies or predators in the storage area to limit pest populations.

5. Chemical control: When needed, use chemical control methods such as fumigation or insecticides approved for use in storage facilities while adhering to local health and safety regulations.

Self-Check 2	

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choice questions

1. To determine, plan and describe order of harvesting, we have to consider:

A, Crop maturity B. equipment availability C. climatic condition D. all

2. Which one of the following is effects of delayed crop harvesting?

A. Increase susceptibility to insect pests and disease
B. Yield reduction
C. Quality reduction
D. all

Test II. True /false questions

1. The first indicator of crop for harvesting is the maturity of the crop
2. Crop yield quality and quantity reduction cannot resulted from pre mature crop harvesting.
3. Field crop harvesting strategy deals with the planning, execution, and management of the harvesting process for various field crops.
4. Integrated Pest Management (IPM) is an approach to pest control that relies on a combination of strategies to suppress pests below damaging levels while minimizing the impact on beneficial organisms and the environment.

Test III: Short answer questions

1. Write the effects of pre mature harvesting and delay harvesting
2. What are the considerations to calculate the equipment and labor resources required for specific crop harvesting?

3. What are the factors to consider in determining, planning, and describing your order of harvesting?
4. What is IPM principles and organization policy?

LG #3	LO #3- Monitoring moisture content

Instruction Sheet 3

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

- Monitoring crop moisture content
- Monitoring and determining weather patterns and forecasts
- Adjusting harvesting operations
- Planning for drying and storage.

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:

- Monitoring crop moisture content
- Monitoring and determining weather patterns and forecasts
- Adjusting harvesting operations
- Planning for drying and storage

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
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Information Sheet 3

3.1 Monitoring crop moisture content

To monitor the moisture content of your field crops, you can use a variety of tools such as :

- Moisture meters,
- Hygrometers , or
- Weighing the produce.

These methods can help you determine the optimal time for harvesting your crops and ensure that they are of high quality. It's important to monitor the moisture content regularly so that you can ensure your crops are not too dry or wet, both of which can cause damage during harvesting and storage.

Harvesting field crops that are over-dried or least dried can have a significant impact on their quality and yield. When crops are harvested when they are too dry, they may shatter or break, causing some of the yield to be lost. Additionally, over-drying can lead to decline in the nutritional value of the crops, resulting in lower-quality produce. On the other hand, harvesting crops when they are too wet can cause problems during storage and processing as well. Wet crops are more susceptible to spoilage and can also lead to mold growth, which can contaminate the entire harvest. In summary, it's important to harvest field crops at the right moisture content, which will vary depending on the specific crop and environmental conditions. Regular moisture content monitoring can help you determine the optimal time for harvesting your crops.

The optimal moisture content for harvesting field crops will vary depending on the specific crop and other environmental factors. However, there are a few indicators that can help you determine if your crops are at the right moisture level for harvesting. One indicator of the optimum moisture content is the firmness of the crop. If the crop is too dry, it may break or shatter easily, while if it's too wet, it may be too soft and may not have enough structural integrity during harvesting and storage. Another indicator is the color of the crop. Some crops, such as corn, will take on a more yellowish color when they are ready to be harvested, while others, like wheat, may have a brownish or golden color. In addition to these visual indicators, you can also use specialized tools such as moisture meters or hygrometers to accurately measure the moisture content of your crops. For

some crops, such as hay, a common practice is to monitor the drying rate of the crop and harvest it when it reaches a certain moisture content. Overall, it's important to monitor your crops regularly to ensure that they are harvested at the optimum moisture content for maximum yield and high-quality produce. Here are some general references on optimum moisture content for various crops during harvest that might be helpful to you: - For wheat, the usual acceptable range of moisture content is between 12% to 14%. This range may vary on factors such as geographic location, weather, storage conditions, and the intended use of the crop. - For corn, the optimum moisture content can differ depending on the intended use of the crop after harvest. For example, dent corn used for grain may have an optimum range of moisture content between 25% to 28%, whereas corn used for silage requires a much higher moisture content range of 62% to 68%. For soybeans, the optimum moisture content range for harvesting is between 10% to 14%. Moisture content lower than this range can cause shatter losses, while higher moisture content can cause storage problems due to mold formation. It's important to note that these optimum moisture content ranges may vary based on several factors such as geographical location, climate, storage facilities and condition, harvesting practices and equipment used, and intended use of the crop. You may need to determine the optimal range of moisture content for your specific crops based on these and other factors.

3.2 Monitoring and determining weather patterns and forecasts

There are several ways to monitor and determine weather patterns and forecasts in order to harvest field crops. Here are some suggestions:

- Check local weather forecasts: One of the easiest ways to keep track of weather patterns is to check local weather forecasts frequently. Most weather services provide detailed forecasts online, in addition to updates on their social media pages and apps.
- Use weather apps: Weather apps can send alerts about changing weather conditions in your area, and can also provide detailed forecasts that include temperature, precipitation, and wind speed.
- Monitor soil moisture: The moisture level of soil can have an impact on the growth and development of crops. You can use soil moisture sensors or probes to monitor the moisture level of your soil, which can help you determine when to harvest your crops.

- Look for signs of ripeness or maturity: The color and texture of your crops can be indicators of golden color and plump kernels. If you're harvesting corn, you can check for dry brown silks and kernels that are filled all the way to the tip.
- Harvest in dry conditions: It's important to harvest crops when the weather is dry in order to avoid damage caused by wet conditions. Make sure to check the forecast before harvesting your crops.
- Be prepared for unexpected changes: Weather patterns can change quickly, so it's important to be flexible and prepared for unexpected changes. Keep an eye on the forecast throughout the day and adjust your harvesting schedule as needed.

3.3 Adjusting harvesting operations

When it comes to adjusting the timing of field crop harvesting, it's important to consider factors such as weather patterns and soil conditions. If the crop is ready to harvest earlier or later than anticipated due to changes in these factors, it may be necessary to adjust the harvest schedule accordingly. Regarding adjustments to harvesting methods, there are a number of variables that can be considered to optimize operations. For example, changing the type of harvesting equipment used could improve efficiency, or reevaluating the size of the harvesting crew could help ensure that the job is completed within a shorter window of time.

3.4 Planning for drying and storage

One of the most critical physiological factors in successful grain storage is the moisture content of the crop. High moisture content leads to storage problems because it encourages fungal and insect problems, respiration and germination. However, moisture content in the growing crop is naturally high and only starts to decrease as the crop reaches maturity and the grains are drying. In their natural state, the seeds would have a period of dormancy and then germinate either when re-wetted by rain or as a result of a naturally adequate moisture content.

The requirements for safe storage, including the principles involved in both natural and artificial drying, followed by drying methods suitable for the small grower, as well as for the larger scale operations of cooperatives and commercial farms.

Finally, various types of storage structures and systems, from family size up to commercial units, are discussed, together with management suggestions for preventing damage during the storage period.

Planning for the drying and storage of crops is just as important as the harvesting process itself. Here are some steps that may be helpful in optimizing and streamlining your drying and storage operations:

1. Test the moisture content of your crops: to ensure safe storage, crops should have a moisture content of less than 15%. Handheld moisture meter, oven dry method and distillation method are methods used to test the moisture levels of your crops before they are placed into storage.

2. Choose the right type of drying equipment: there are various options available, such as natural-air drying systems, low-temperature dryers, and high-temperature dryers. Selecting the right equipment for your specific crop type and volume can help increase efficiency while also minimizing costs.

3. Implement proper airflow and ventilation: correct airflow is critical to ensuring uniform and efficient drying. Ensure that the drying area is well-ventilated to prevent mold and other forms of contamination.

4. Monitor temperature and humidity: regular monitoring of temperature and humidity levels can help identify potential problems before they become serious. Keep records of these levels throughout the drying and storage process.

5. Invest in storage facilities: choose storage facilities that are appropriate for your crop type and volume. Proper storage facilities should provide protection against pests, moisture, and other forms of damage. Drying and storage are critical stages in ensuring the quality of agricultural produce from the farm to the consumer's table. Proper planning for drying and storage is essential to avoid postharvest losses and maintain the product's quality and market **value.** This document aims to provide guidelines for planning effective drying and storage systems.

Drying

Drying systems fall into two main groups:

Natural drying using ambient air temperature and either direct sunlight or natural air movement through the crop.

Artificial drying using mechanical means (e.g. a fan) to move air through the crop, with the air being either at ambient temperature or artificially heated.

Natural drying

The traditional methods used by farmers for drying grain rely on natural air movement to reduce moisture content to a safe level for storage. Natural drying may be divided in three main methods

Drying in the field before harvesting:-The method of leaving the crop standing in the field for drying is popular in areas where maturity of the crop coincides with the beginning of a dry season. However, a crop left unharvest is exposed to attack by insects, birds, rodents, wild animals, strong winds and occasional rain showers, which can damage and reduce the crop considerably. These factors are particularly important with the new, improved high-yielding crop varieties, which are often more susceptible to damage from the environment than the traditional varieties. For instance, a hybrid maize cob has less leaf cover than the cob of traditional maize varieties and is therefore more open to attack by insects and birds. Field drying of the crop will also delay clearing of the field. This should be taken into account in areas where the field needs to be prepared for a second rainy season, or where the humidity is high enough at the end of the growing season to allow for an additional crop, such as beans.

Drying in Shallow-layer natural drying: - The harvested crop is spread on hard ground, on roofs, on purpose-built platforms or on trays. As the crop is exposed to the sun, it will dry fairly quickly depending on the humidity of the ambient air. The product should be stirred frequently to ensure even drying. The disadvantage of this method is that the crop has to be brought in or covered every evening or before rain. The labour requirements may be reduced considerably by placing the harvest on a plastic or tarpaulin sheet for easy handling or on a platform/tray covered by transparent plastic.

Ventilated structures for natural drying: - Very small producers may suspend bundles of the crop from trees or poles so they are freely exposed to the air. With larger quantities, the harvested crop method may be heaped on platforms or racks and topped by a layer of straw for rain protection. This is commonly used for sheaves of paddy and cereals, as well as for cob-maize and groundnut plants. Drying is dependent on the free flow of air through the crop, so the heap should be made as open as possible.

- Harvest produce at its optimal moisture content to minimize postharvest losses. Choose the right drying method depending on the type of crop and volume of production (e.g., sun-drying, mechanical drying, or combination).
- Ensure proper airflow during drying to guarantee uniform moisture removal.
- Monitor product temperature and moisture content regularly to prevent mold growth and spoilage.
- Clean and disinfect drying equipment regularly to avoid contamination of the produce.

Storage

Storage is the art of keeping the quality of agricultural materials and preventing them from deterioration for specific period of time, beyond their normal shelf life. Different crops are harvested and stored by various means depending on the end utilization. Whether the seed will be used for new plantings the following year, for forage being processed into livestock feed, or even for crops to be developed for a special use, the grower must be aware of harvesting and storage requirements toward a quality product. After determining the prescribed use for the crop, timing for harvest and storage is of important consideration. Along with an assessment of when to harvest, the farmer needs to determine the method of harvesting.

There are several types of grain storage available for farmers and agricultural businesses, including:

1. Silos - These are tall, cylindrical structures designed to store large amounts of grain. They are commonly made of metal or concrete and can hold grain for extended periods of time.

2. Grain bags - These are long plastic tubes filled with grains and sealed on both ends. They are typically used for temporary storage and can be transported easily.

3. Grain bins - These are smaller versions of silos and are typically used for on-farm storage. They are made of metal and can be easily moved between locations.

4. Pile storage - This involves storing grain in large piles on the ground. It is a less expensive option than silos or grain bins but requires a large amount of land.

5. Underground storage - This method involves storing grain in trenches or caves dug into the ground. It is not commonly used due to the risk of spoilage or contamination.

Store produce in appropriate containers based on the crop's characteristics (e.g., grain bin, gunny bags, or sealed plastic containers).

Use appropriate storage facilities (e.g., warehouses, silos, or cold storage) based on the crop's requirements.

Monitor product temperature, humidity, and air circulation regularly to minimize losses due to pests, mold growth, and spoilage.

Practice First-In-First-Out (FIFO) inventory management to ensure older produce is utilized before newer ones.

Clean and disinfect storage facilities regularly to avoid contamination of the produce

Self-Check 3	

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

I. True/false questions

1. Regular moisture content monitoring can help you determine the optimal time for harvesting your crops.
2. The optimal moisture content for harvesting field crops will vary depending on the specific crop and other environmental factors.
3. Drying and storage are critical stages in ensuring the quality of crops from the farm to the consumer's table.
4. Proper planning for drying and storage is essential to avoid postharvest losses and maintain the product's quality and market value
5. High moisture content leads to storage problems because it encourages fungal and insect problems, respiration and germination.

II. Choose the best answer

1. Which one of the following is grain storage

A. Silo B. grain bag C. grain bins D. all

2. Which one of the following method is not used to test crop moisture content?

A. Moisture meter B. hygrometric method C. weighing method D. None

3. One of the most critical physiological factors in successful grain storage is the moisture content of the crop. A. true B. false
4. _____is the art of keeping the quality of agricultural materials and preventing them from deterioration for specific period of time, beyond their normal shelf life

A. Drying B. Storage C. Harvesting D. Threshing

III. Short Answer Questions

1. What are the types of field crop drying methods?
2. Write the different types of grain storage.
3. What are the ways to monitor and determine weather patterns and forecast?

Operation Sheet 3

3.1. Determining Crop/grain moisture content by oven drying method

A. Materials, Tools and equipment required to measure crop moisture

- Personal Protective Equipment (PPE) such as overall, Boats, Gown, hat and Hand glove, goggle and face mask.
- Weight measuring balance
- Oven drier
- Calculator
- Sample of crop/grain
- Paper
- Container

B. Procedures of determining crop moisture content

I. Take 10g of grain (w_w) sample with in 4g of container

II. Dry the grain by oven drier

III. Measure the weight of the dried grain by measuring balance that may give us 6g including container weight

IV. Subtract the weight of container from weight of dried grain with container which is 6g-4g=2g (dry weight of grain)

V. Finally, Calculate the moisture content of the grain by using the formula:

$$MC_g = (w_w - d_w)/w_w * 100$$

LAP Test 3

Name……3……..ID……Date……..

Time started: _____ Time finished: _____

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

Task 3.1 Perform grain moisture content determination by oven drying method.

LG #4	LO #4- Implementing harvest schedule

Instruction Sheet 4

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

- Reviewing harvest schedules
- Managing operating hours and collecting operator diaries
- Co-ordinating equipment operation for maximum efficiency
- Noting and reporting initial plan change to harvest

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:

- Review harvesting schedules
- Manage operating hours and collect operator diaries
- Co-ordinate equipment operation for maximum efficiency
- Note and report initial plan change to harvest

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
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information sheet- 4

4.1.Reviewing harvesting schedules

Reviewing harvesting schedules deals with the process of examining and assessing the timeliness and effectiveness of a farmer's crop harvest schedule. The goal of reviewing harvesting schedules is to optimize the timing and method of harvesting to improve productivity and quality while minimizing costs. The process of reviewing harvesting schedules involves several steps.

First, the current schedules need to be examined in order to identify areas where improvements could be made. This may include analyzing factors that impact harvest dates such as weather, soil moisture levels, and crop development stages.

Next, the available harvesting methods must be evaluated in order to determine which methods are most effective for specific crops and types of fields. For example, manual handpicking may be more effective for certain crops, while machine harvesting may be optimal for others.

Additionally, the timing and labor requirements of harvesting must be taken into account. Harvesting schedules should consider factors such as the availability of adequate labor during peak harvest times and the efficient use of equipment.

Finally, once a new or revised harvest schedule has been developed, it is important to test and refine it over time. Farmers should monitor the progress made under the new schedule to see if it meets the desired results, make adjustments as they identify areas for improvement, and continuously work to maximize productivity and quality.

Overall, reviewing harvesting schedules is an essential part of modern farming techniques that can lead to improved productivity and profitability while minimizing waste and production costs.

4.2 Managing operating hours and collecting operator diaries

Managing field crop harvest operating hours and collecting operator diaries is important for ensuring that your farm is running as efficiently as possible and for providing valuable record keeping. Here are some steps you can take:

- Determine the optimal operating hours for your team based on the specific requirements of your crops and equipment. Consult with your team members to determine the best schedule that will yield the most productivity and efficiency.
- Communicate the operating hours and expectations clearly to all team members, including any break schedules and overtime policies.
- Coordinate with your team members to ensure adequate coverage during peak harvesting times. This may require hiring additional labor or shifting scheduling to accommodate for a heavy workload.
- Utilize technology such as automated time clock systems or mobile apps to track time worked by each operator.
- Collect daily diaries from each operator. These diaries should include information such as which fields were worked on, what tasks were performed, any equipment problems encountered, and notes on crop yields or quality.
- Use the data collected in the operator diaries to conduct regular performance reviews and to make informed decisions about future scheduling and resource allocation.

4.3 Coordinating equipment operation for maximum efficiency

Coordinating equipment operation for maximum efficiency involves the optimization of equipment use through coordination among team members and communication. This means that equipment needs to be used in a way that;

- Reduces unnecessary downtime and
- Maximizes productivity.

This requires proper scheduling, efficient transportation of equipment, and strategic placement on job sites. Additionally, proper maintenance of equipment is important to ensure that it runs efficiently and can withstand the demands of the job.

Field Crop Harvesting Equipment Operation Coordination Plan

1. Develop a plan for the field crop harvest: Before beginning the harvest, make sure to have a clear plan in place for the operation. This should include the location(s) of the fields to be harvested, the type of crops to be harvested, and the expected time frame for completion.

2. Assign tasks to the equipment operators: Make sure to assign specific tasks to each equipment operator, such as operating a specific piece of harvesting equipment or transporting harvested crops.

3. Schedule equipment maintenance: To prevent delays during the harvest, schedule regular maintenance for all equipment involved in the operation. This includes checking oil and fluid levels, replacing worn parts, and cleaning the equipment after each use.

4. Coordinate communication between equipment operators: Establish a clear communication protocol between equipment operators to ensure efficient work flow. This can include using radios or other communication devices to keep everyone informed of progress and any changes in plans.
5. Monitor progress and adjust plans as necessary: Continuously monitor the progress of the harvesting operation and make adjustments to the plan as necessary. This can include reallocating equipment and personnel to areas where progress is slow, or adjusting work schedules to accommodate changes in weather or crop ripening. The most common types of field crop harvesting equipment and their operations:

1. Combine Harvesters - Combines are the most well-known crop harvesting equipment, consisting of a cutter bar, reel, threshing cylinder, and separator unit. The cutter bar cuts the crop and feeds it into the reel, which then feeds it into the threshing cylinder where the crop is separated from the stalks. The crop is then processed through sieves to remove chaff and other debris before being collected in a hopper.

2. Grain Carts - Grain carts are towed behind combines and used to transport harvested grain from the combine to a waiting tractor and trailer or a storage unit. Grain carts are typically equipped with a hydraulic auger for unloading grain quickly.

3. Baler Machines - Balers are used to bale hay and straw crops, compressing the material into a compact package that can be easily transported and stored. Baler machines come in various sizes, with round balers being the most well-known type.

4. Forage Harvesters - Forage harvesters are used to chop up corn or other plants for livestock feed. They consist of a rotating drum with cutting blades that cuts up the crop, while centrifugal force throws it out through a spout into a waiting transport vehicle.

5. Cotton Pickers - As the name suggests, cotton pickers are used to harvest cotton. These machines use spindles to pull the cotton fibers from the plant and collect them in bins for transport.

4.4 Noting and reporting initial plan change to harvest

Noting and reporting initial plan change to harvest field crops refers to the process of documenting and communicating any changes to the original plan for harvesting field crops. This could be due to different reasons such as unexpected changes in weather, equipment breakdowns, or other unforeseen issues that could affect the efficiency of the harvest operation. When a change occurs, it is important to first document the details of the change, including what has changed, why it has changed, and how it will impact the operation. Once the change has been documented, it should be communicated to all relevant personnel involved in the harvesting operation. Adjustments may then need to be made to the plan to accommodate the new circumstances. Close monitoring of progress is also necessary after implementing the plan change to identify any additional adjustments that may need to be made and ensure that the harvesting operation remains on track. By noting and reporting initial plan changes, the harvesting team can work together to ensure a safe, efficient and successful crop harvest. The procedure for noting and reporting an initial plan change to harvest field crops:

1. Identify the Need for Plan Change: The first step in noting and reporting an initial plan change is to identify the need for the change. This could be due to weather-related issues, unexpected equipment breakdown, or other unforeseen circumstances.

2. Document the Change: Once the need for a plan change has been identified, it is important to document the change. This should include details on what the change is, why it is necessary, and how it will impact the harvesting operation.

3. Notify Relevant Personnel: After documenting the plan change, it is important to notify all relevant personnel of the change. This can include equipment operators, supervisors, and other team members involved in the harvesting operation.

4. Make Adjustments to the Plan: Once all relevant personnel have been notified of the plan change, adjustments should be made to the plan as necessary. This may include reallocating equipment, changing work schedules, or other adjustments to accommodate the new circumstances.

5. Monitor Progress: Finally, it is important to closely monitor progress after implementing the plan change. This will help identify any additional adjustments that may need to be made and ensure that the harvesting operation remains on track.

Self-Check 4	

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

I. Choice questions

1. Which of the following activity is conducted when there is change in initial harvesting plan?

A. Document the details of the change,
B. Including what has changed
C. Why it has changed
D. All of the above

2. To maximize the equipment efficiency, equipment operation requires;

A. proper scheduling,
B. efficient transportation of equipment,
C. Strategic placement on job sites.
D. All

3. Which of the following external factors have impact the harvesting process?

A. Weather conditions,
B. Labor availability,
C. Equipment availability
D. All

4. Field Crop Harvesting Equipment Operation Coordination Plan includes;

A. Develop a plan for the field crop harvest:
B. Assign tasks to the equipment operators:
C. Schedule equipment maintenance:
D. All

5. Which one is field crop harvesting equipment?

A. Combine Harvesters
B. Grain Carts
C. Baler Machines D.. All

II: True or False questions

1. Managing field crop harvest operating hours and collecting operator diaries is important for ensuring that your farm is running as efficiently as possible.
2. Coordinating equipment operation for maximum efficiency involves the optimization of equipment use through coordination among team members and communication..
3. By noting and reporting initial plan changes, the harvesting team can work together to ensure a safe, efficient and successful crop harvest

III: Short Answer Questions

1. What are the general template for creating a field crop harvesting schedule?
2. Write the procedure for noting and reporting an initial plan change to harvest field crops
3. Write the most common types of field crop harvesting equipment and their operations.

LG #5	LO #5- Coordinating post-harvest work

Instruction sheet 5

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

- Coordinating post-harvest works
- Undertaking post-harvest operations and environmental implications.
- Maintaining a clean, safe and hygienic work area

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:

- Coordinate post-harvest works
- Undertake post-harvest operations and environmental implications.
- Maintain a clean, safe and hygienic 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
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information sheet 5

5.1 Coordinating post-harvest works

Coordinating field crop post-harvest work means managing and overseeing the various tasks that need to be carried out after the crop has been harvested. This includes tasks such as transportation, cleaning, drying, and storage, as well as ensuring that each task is done correctly and efficiently. Coordinating these tasks requires proper planning and communication. It's important to ensure that there are enough resources available for each step and that everyone involved knows their roles and responsibilities. Also, identifying a reliable storage facility is key to ensuring the quality of the crop is maintained over time. Coordination involves making sure that all necessary resources, such as equipment and manpower, are available and organized in a way that maximizes efficiency. Additionally, coordination involves communicating with relevant stakeholders to ensure that everyone involved is aware of their roles and responsibilities. The ultimate goal of coordinating field crop post-harvest work is to ensure that the crop is stored safely and properly so that it can be sold or used for consumption without any issues.

5.2 Undertaking post-harvest operations and environmental implications

The term undertaking post-harvest operations refers to the various activities that are carried out after crops have been harvested from farms. These activities include transport**,** cleaning, threshing, grading, drying, and storage of the harvested crops. These post-harvest operations have significant environmental implications, which can either be negative or positive. One major negative environmental implication of post-harvest operations is the release of greenhouse gases (GHGs), mainly carbon dioxide and methane, which contribute to global warming. GHG emissions during post-harvest operations can result from the burning of crop wastes during threshing, drying, and cleaning activities. These emissions are especially high in developing countries, where traditional and inefficient harvesting methods are still used. On the positive side, proper post-harvest management techniques have the potential to reduce food losses and waste, which can in turn reduce the need to expand agricultural land into natural ecosystems. This can help to sustainably manage land use and reduce deforestation, conserving biodiversity and wildlife habitats.

5.3 Maintaining a clean, safe and hygienic work area

Maintaining a clean, safe, and hygienic work deals with ensuring that your workspace is free from germs, clutter, and safety hazards. This includes:

- Regularly cleaning and disinfecting surfaces,
- Organizing your space to promote productivity and focus,
- Encouraging good hygiene practices among your colleagues,
- Providing necessary supplies like hand sanitizer and tissues, and
- Implementing safety procedures to prevent accidents or injuries.

A clean and hygienic work environment can help to prevent the spread of illness, improve overall productivity, and boost employee morale.

To maintain a clean, safe, and hygienic work area related to field crop harvesting and handling, there are several steps that need to be taken.

Firstly, it is important to ensure that all equipment and machinery is cleaned and sanitized regularly. This includes both processing equipment and tools used for manual labor such as harvest knives. It is also important to take precautions such as wearing gloves when handling raw crops and washing your hands frequently.

Secondly, the work area should be kept free of debris and clutter. This includes removing any fallen or broken branches or other debris from the ground, and ensuring that walkways are clear and unobstructed.

Thirdly, it is important to maintain proper hygiene practices in the work area. This includes having hand sanitizer or hand-washing stations readily available, and encouraging workers to take frequent breaks to wash their hands.

Finally, it is important to train all staff members on proper safety protocols and provide adequate personal protective equipment (PPE) such as gloves and safety glasses

Self-Check 5	

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Test I: Write True or False

1. Coordinating these tasks requires proper planning and communication
2. Maintaining a clean, safe, and hygienic work deals with ensuring that your workspace is free from germs, clutter, and safety hazards.
3. The ultimate goal of coordinating field crop post-harvest work is to ensure that the crop is stored safely and properly
4. A clean and hygienic work environment can help to prevent the spread of illness, improve overall productivity, and boost employee morale over limb disorders.

Test II: Short answer questions

1. Write the environmental implication of post-harvest operations.

2. What are the activities conducted to maintain a clean, safe, and hygienic work area?

3. Explain what does mean by coordinating post-harvest works.

4. What happen if not maintaining a clean, safe and hygienic work area?

5. What is the ultimate goal of coordinating field crop post-harvest work?

6. How can maintain clean, safe and hygienic work area?

LG #6	LO #6- Implementing post-harvest treatments

Instruction sheet 6

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

- Threshing, drying, transporting and storing harvested crop produce
- Grading ad labelling
- Identifying and disposing produce that not meet specification
- Selecting post-harvest treatments
- Conforming time, rate, application method and environmental requirements
- Implementing post-harvest practices
- Cleaning and maintaining tools, equipment and machinery

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:

- Thresh, dry, transport and store harvested crop produce
- Grade and label
- Identify and dispose produce that not meet specification
- Select post-harvest treatments
- Conform time, rate, application method and environmental requirements
- Implement post-harvest practices
- Clean and maintain tools, equipment and machinery

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
4) Accomplish the Self-checks
5) Perform Operation Sheets
6) Do the “LAP test”

Information sheet 6

6.1 Threshing, drying, transporting and storing harvested crop produce

The first step to ensure proper threshing is to harvest the crop at the right time, when it is fully mature and dry by proper harvesting method (manual and mechanical) and equipment.

I. **Harvesting**- is the process of gathering mature crops from a farm or field. It is the first step of post-harvest operation. Different crops can be harvested by different harvesting equipment. Some of harvesting equipment include:

i. **Self-propelled reapers**: Also known as walk-behind reapers or, more popularly, self-propelled reapers, reaper sets are permanently attached to two-wheeled mini-tiller engines and transmissions with the operator walking behind the machine. They are only used for cutting rice and wheat stalks and laying the harvested cropsin windrows for drying and collecting.

Figure 6.1 a self-propelled reaper (Source G. Basnet).

ii. **Two-wheeled tractor mounted reapers:** Two-wheeled tractor mounted reapers have reaper attachments mounted on the front of two-wheeled tractors (also known as power-tillers), with the operator sitting at the rear of the tractor. .

iii. **Four-wheeled tractor mounted reapers (4WT**): 4WT mounted reaper implements are large machines mounted on the front of four-wheeled tractors with the operator sitting on the tractor. The tractors have 30 to 60 hp engines and with the reaping attachment can cover approximately 1-1.3bigha/hr or 0.3-0.4 ha/hour. The attachment can be removed and remounted as needed, and comes in cutting widths of 2, 2.2 and 2.4 meters.

Figure 6.2 A 4WT mounted reaper.

iv. **Combine harvesters :** Combines are multi-function machines that can simultaneously reap standing crops, thresh, and separate the chaff from the grain. Combines can cover a large are in a short period—up to 0.25 ha/hr—producing large heaps of clean ready-to-sell grain. With minor adjustments, standard combines can harvest both rice and wheat. The application of an additional maize header' attachment enables combines to harvest row-planted maize.

Figure 6.3 A combine harvester.

II. **Threshing**:-is the process of separating the grain from the rest of the plant after it has been harvested. There are several methods of threshing which can classified as:

- **Traditional /manual method:** includes beating, flailing and treading
- **Modern/ mechanical method:** includes combining and threshing machines

Figure 6.4 traditional threshing (flailing) (source: https://en.wikipedia.org/wiki/Threshing)

What causes postharvest loss at this stage?

Cereal losses emerge at threshing due to grain spillage, incomplete separation of the grain from the chaff, and grain breakage due to excessive striking. Delays in threshing after harvest can also cause losses in quality and quantity of grain since moisture accumulation can encourage mold growth and other losses. Manual threshing is physically taxing and costly in terms of labor, which makes a transition to mechanical threshing appealing,

Types of threshers

A. **4WT PTO-driven thresher**: Rice, wheat, and multi-crop 4WT PTO-driven threshers are high capacity machines whose outputis usually measured in tonnes per hour. They canalso be powered by electric motors, stationary engines through belts.

Figure 6.5 A 4WT PTO-driven paddy thresher

Figure 6.6 rice threshing machine (source: https://en.wikipedia.org/wiki/Threshing)

Figure 6.7 A 4WT PTO-driven wheat thresher.

B. Maize de-huskers and shellers: De-huskers are used to separate the husks that cover Maize cobs, while shellers separate the grain from the cob. Indian de-huskers and shellers are one machine which first de-husks the maize cob and then shells the grain from the cobs. Manny of the Chinese sourced machines separate the functions of de-husking or shelling and usually come in smaller sizes, with electric power ranging from 0.5-3 hp.

Figure 6.8 A maize de-husking and shelling machine

III. Cleaning: The cleaning process is performed after the threshing to separate whole grains from broken grains and other foreign materials, such as straw, stones, sand, chaff, and weed seed. Winnowing is the most common method used for cleaning in the developing countries.

Screening/sifting is another common method of cleaning, which can be performed either manually or mechanically.

Inadequate cleaned grains can:-

- Increase the insect infestation
- Mold growth during storage,
- Add unwanted taste and color,
- Damage the processing equipment.

A large amount of grains are lost as spillage during this operation, and grain losses during winnowing can be as high as 4% of the total production. Cleaning equipment used to clean threshed crops includes the following:

1. **Air Screen Cleaners**: These cleaners use air to separate light materials like leaves and chaff from heavy ones like grain or seeds. They are effective in cleaning large quantities of crops.

2. **Drum Cleaners**: These cleaners use rotating drums with perforations that screen out smaller debris while allowing good quality seeds to pass through.

3. **Gravity Tables**: These tables use the principle of gravity to separate materials of different densities. They are especially useful in separating lighter materials like chaff from heavier ones like grain.

4. **Spiral Separators**: These machines use a spiral conveyor to separate seed from debris by density. They work well for small seed crops like clover, alfalfa, and grasses.

5. **Vibratory Separators**: These machines use vibrations to separate materials by size and density. They are especially useful for cleaning large quantities of crops. When cleaning equipment, it is important to follow the manufacturer's instructions. Some general cleaning steps include

- Disconnecting the power supply,
- Removing any remaining materials,
- Wiping the equipment down with a clean cloth, and
- Lubricating any moving parts as necessary.

IV. **Drying**: Once the grain has been separated from the rest of the plant, it needs to be properly dried to prevent rotting or molding. This can be done using

- Natural or sun light
- Artificial drying methods.

Natural drying involves spreading the crop out in a thin layer in a dry area with good air circulation. Artificial drying methods include using heated air or specialized driers. It is important to monitor the moisture content during the drying process and adjust as necessary. Drying of threshed and cleaned field crops is a crucial step in the postharvest process, as it helps to reduce moisture content to a safe level for storage and transportation. Methods typically used for drying field crops:

- **Sun Drying**: This method is simple and low cost. The crop is spread out on a clean surface under the sun to reduce its moisture content. Sun drying is ideal for areas with a lot of sunshine and low humidity.
- **Mechanical Drying**: This method uses heaters or dryers to remove moisture from the crop. Mechanical drying is ideal for large-scale crop production. However, it is expensive and requires careful temperature control to prevent burning or spoilage of the crop.
- **Natural Air Drying**: This method involves airflow through the crop in a well-ventilated area, such as an open-sided barn or warehouse. Natural air drying is slower than mechanical drying but produces better quality dried crops compared to sun drying.
- **Heated Air Drying**: In this method, heated air is blown through the crop at high velocity, reducing its moisture content. This method requires a carefully designed and maintained system to prevent spoilage of the crop.
- **Microwave Drying**: This method uses microwave radiation to remove moisture from the crop. It is fast and energy-efficient but requires specialized equipment and careful monitoring to prevent burning. When drying crops, it is important to ensure that the temperature and humidity levels are carefully monitored and controlled to prevent spoilage of the crop

V. **Transporting**: Transporting harvested produce can be challenging, as it requires proper storage and handling to prevent damage or spoilage. The produce should be:

- Carefully loaded onto transport vehicles
- Secured to prevent shifting during transit
- Kept at appropriate temperatures during transport.

For longer distances, refrigerated trucks or containers may be necessary.

VI. **Storing**: Finally, harvested produce must be stored properly to maintain its quality and freshness for as long as possible. Each type of crop may require different conditions for storage, but some general guidelines include: -

The storage area should be clean, dry, and well-ventilated

- Produce should be stored in appropriate containers such as bins or bags
- Temperature and humidity levels should be monitored regularly
- Stored produce should be checked frequently for signs of damage, decay or infestation

Factors Affecting Seed Longevity in Storage

A. Kind (or) variety of seed
B. Initial seed quality
C. Moisture content
D. Relative humidity and temperature during storage
E. Provenance
F. The activity of organisms associated with seeds in storage

Two methods of grain storage

- Bag storage
- Loose in bulk storage

The choice based on the local factors

- Type of grain
- Duration of storage
- Value of grain
- Climate
- Transport system
- Cost and availability of labour
- Cost and availability of bags
- Incidents of rodents and certain types of insects

The two types of storage structure

A. Traditional (bulk type)
B. Modern storage structure includes**:**

- Bagged storage system
- Silo storage system
- Air tight storage system
- Aerated storage system
- Low temperature storage system
- Controlled atmosphere storage system
- Damp grain storage system with chemicals

6.2 **Grading and labelling**

Grading: is the process of sorting produce by quality and size. The purpose of grading is to ensure that consumers receive produce with consistent quality and characteristics, which can help to improve consumer satisfaction and demand. The grading process typically involves sorting produce based on factors such as appearance, texture, ripeness, and color. This can be done either manually or using specialized equipment such as electronic sorting machines. Each grade of produce should have specific criteria established that are based on industry standards. These criteria should be clearly communicated to all involved parties, including growers, packers, and distributors.

Labeling: Labelling is the process of providing important information about the produce to the end consumers. Labelling should be :

- Clear,
- Informative, and
- Visible on each item of produce.

Some important label information includes: -

- The name and contact information of the producer or distributor –
- The country of origin
- The type of produce
- The grade
- Any relevant food safety or handling information
- Any certifications related to organic or
- Sustainable production methods

In some cases, additional information may be required by law, depending on the country or region where the produce is being sold. Having clear and accurate labels can help to build trust with consumers and ensure that they have a positive experience with your brand

6, 3. **Identifying and disposing produce that not meet specification**

6.3.1 Identifying Produce That Doesn't Meet Specifications

It is important to have clear and well-established specifications for produce quality when harvesting and packing produce. This can help identify any product that does not meet acceptable quality standards. Produce that does not meet these quality standards may have physical defects or

may not meet weight or size requirements. It is important for workers to constantly monitor the produce during the harvesting, packing, and storage process to ensure that everything is up to par. If any produce is suspected to fall below accepted quality standards, it should be removed from and sorted separately from produce that meets specifications. This can be done by manual sorting or by using specialized equipment depending on the crop and harvest method. Disposing of Produce Not Meeting Specifications: Once produce has been identified as not meeting specifications, it can be disposed of in a number of ways. One option is to use it for animal feed or compost. If the produce is contaminated or unfit for consumption, it may need to be destroyed or discarded in an appropriate manner. It is important to note that there may be laws or regulations regarding the disposal of unsalable produce. It is advisable to consult with local authorities regarding the proper procedures and regulations.

6.4 Selecting post-harvest treatments

There are several post-harvest treatments that can be conducted for field crops after they have been harvested. Here are a few examples:

- Cleaning and sorting: Once the crop has been harvested, it needs to be cleaned and sorted to remove any weed seeds, diseased seeds, or damaged seeds. This will help ensure that the crop is of high quality and will store well.
- Drying: Many field crops, such as grains and pulses, need to be dried after they have been harvested. Drying helps to reduce the moisture content of the crop, which is important for preventing spoilage and ensuring that the crop stores well.
- Storage: After the crop has been harvested and cleaned, it needs to be stored in a suitable environment. The storage area should be cool, dry, and well-ventilated to prevent spoilage and mold.
- Grading: Field crops can be graded according to their size, color, and other factors. This is important for marketing purposes, as different customers may have different requirements for the crop.
- Treatment with pesticides: In certain cases, field crops may need to be treated with pesticides after harvesting to prevent infestation by pests and insects.

6.5 Conforming time, rate, application method and environmental requirements

Deals with the recommended practices for post-harvest treatments for field crops, including cleaning and sorting, drying, storage, grading, and treatment with pesticides. For each of these treatments, there are specific time, rate, application method, and environmental requirements that

should be followed in order to ensure that the crop is of high quality and free from pests and disease. These requirements can vary depending on the type of crop being treated.

6.6 Implementing post-harvest practices

Proper handling of crops during and after harvest is crucial to prevent damage and maintain quality. This includes avoiding rough handling, using appropriate harvesting equipment, and ensuring proper storage conditions To implement post-harvest practices for field crops, you can follow these general steps: 1. Plan ahead: Develop a post-harvest management plan that includes details about the crop, harvesting method, handling, cleaning, drying, storage, grading, and transportation. This plan should be designed to maintain crop quality and minimize losses. 2. Train your staff: Provide training to all staff involved in post-harvest activities on proper handling, cleaning, drying, storage, grading, and transportation techniques. This will help ensure consistency and quality throughout the process. 3. Choose appropriate equipment: Use appropriate equipment for harvesting and post-harvest activities to minimize damage and preserve crop quality. This may include harvesting tools, washing machines, dryers, and storage containers. 4. Maintain cleanliness: Keep post-harvest equipment and facilities clean and free of debris to avoid contamination and spoilage. 5. Monitor temperature and humidity: Regularly monitor storage conditions such as temperature and humidity levels to prevent mold growth and spoilage. 6. Check for pests and diseases: Regularly check stored crops for pests and diseases that can cause amage or contamination. 7. Properly package for transportation: Use appropriate packaging materials to prevent physical damage during transportation and to maintain quality.

6.7 Bushfire prevention, control strategies and equipment (EG)

Bushfires are a common natural disaster that occur in many parts of the world, particularly in regions prone to hot, dry weather conditions. The extent of damage caused by a bushfire depends on the intensity of the blaze and the effectiveness of strategies put in place to prevent and control its spread. Here are some strategies and equipment that can be used for bushfire prevention and control:

1. Prevention

- Fuel management - Reducing the amount of dry vegetation, leaves, twigs, and other debris surrounding your property that may act as fuel for a bushfire can be an effective method of prevention.

- Property maintenance - Clearing the gutters and keeping the lawn trimmed regularly can help reduce the likelihood of a bushfire spreading to your property.
- Removal of debris - Remove dead trees, branches, and other plant debris from your property to minimize fuel load for bushfires.

2. Control

- Firebreaks - Firebreaks act as barriers between areas prone to fires and non-prone areas. They can be created by clearing vegetation or digging a trench around an area.
- Water tanks - Water tanks provide an effective source of water for firefighting efforts.
- Sprinkler systems – Sprinkler systems can help wet the vegetation, reduce fumes and heat accumulation in case of fires.

3. Equipment

- Fire retardants - Fire retardants are chemicals that slow down or prevent the spread of fire. They can be applied directly to buildings, vegetation or structures at risk of fire.
- Communication tools - Communication tools like walkie-talkies, mobile phones, satellite phones will help communicate with emergency personnel during a bushfire emergency.
- Protective clothing - This includes heat-resistant gloves and boots, flame-resistant overalls, and face masks that will provide protection to firefighters during bushfire fighting. These are just a few examples of bushfire prevention and control strategies as well as associated equipment and resources. It is important to note that effective bushfire prevention and control require a combination of strategies and maintenance.

6.8 Cleaning and maintaining tools, equipment and machinery

Here's an overview of how to clean and maintain tools, equipment, and machinery used for field crop harvesting and post-harvest practices:

1. Cleaning equipment after use: Dirt, debris, and other contaminants that build up on equipment after use can cause damage and corrosion over time. Therefore, it's important to clean equipment after every use. Here are some tips for cleaning different types of equipment: - Harvesters: Remove any crop residue and debris from the harvester using air pressure or water. Make sure to clean tricky areas such as the conveyors, chutes, and fans. - Trucks and trailers: Remove any debris from the trailer floor and walls with a broom or brush. Wash the exterior with soap and water or an appropriate cleaning agent. - Drying equipment: Remove any crop residue from screens, heat

exchangers, and fans. Clean screens using water or compressed air, and clean other parts with a soft brush and detergent.

2. Inspect equipment regularly: Regular inspections will help you identify any damage or wear and tear on the equipment. Here are some things to look out for during inspections: - Harvester blades: Check for worn or damaged blades that need to be replaced. - Filters: Make sure filters are clean and not clogged with debris. - Belts and chains: Check belts for signs of wear or slippage, and lubricate chains to prevent rust and corrosion.

3. Replace damaged or worn parts: Any damaged or worn parts should be replaced immediately to avoid further damage or malfunction.

4. Lubricate moving parts: Moving parts such as gears and chains should be regularly lubricated to avoid rust and corrosion.

5. Store equipment properly: Proper storage conditions are essential to prevent rust, corrosion, and other damage to the equipment. Store them in a dry, clean place when not in use.

6. Follow manufacturer recommendations: Each piece of equipment will have its own specific recommendations for cleaning and maintenance procedures. Following the manufacturer's recommendations will help ensure that your equipment remains in good condition

Self-Check 6	

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next pag

Test I: Choose the best answer

1. Which one of the following is label information?
   A. Country of origin
   B. Type of produce
   C. Grade
   D. All

2.……is the process of providing important information about the produce to the end consumers. A. Cleaning B. Labeling C. Drying D. Threshing

2. Which one is not modern grain storage structure?
   A. Bagged storage system
   B. Silo storage system
   C. Air tight storage system
   D. None

3. **Which factor affects Seed Longevity in Storage?**
   A. Kind (or) variety of seed
   B. Initial seed quality
   C. Moisture content
   D. All

4. Which one is not cleaning equipment used to clean threshed crops?
   A. Air Screen Cleaners
   B. Drum Cleaners
   C. Gravity Tables
   D. Sickle

Test II: Write True or False

1. Proper handling of crops during and after harvest is crucial to prevent damage and maintain quality.
2. Threshing is the process of gathering mature crops from a farm or field.
3. The storage area should be cool, dry, and well-ventilated to prevent spoilage and mold
4. Combine harvester is the machine used to harvest, thresh and clean the crop.
5. Threshing is the second activity of post-harvest operations.

Test III: Short Answer Questions

6. Write bushfire prevention, control strategies and equipment**.**
7. Write the types of grain storage structures.
8. White the methods of grain storage
9. Write post-harvest treatments of field crops
10. What are the information that should be labeled on the package of crops>

LG #7	LO #7- Implementation of packing and storage requirements of produce

Instruction sheet 7

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

- Reviewing package and storage requirements
- Marketing plan and production best practice
- Anticipating and prevent or control the possibility of emergencies
- Monitoring and remedial action packing and storage processes
- Recording packing and storage processes

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:

- Review package and storage requirements
- Market plan and production best practice
- Anticipate and prevent or control the possibility of emergencies
- Monitor and remedial action packing and storage processes
- Record packing and storage processes

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
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information sheet 7

7.1 Reviewing package and storage requirements

Reviewing package and storage requirements for field crops produce deals with ensuring that the crops are properly packaged and stored in order to maintain their quality and freshness for as long as possible. This includes checking of:

- Proper packaging materials,
- Storage temperature, humidity levels, good ventilation and
- Pest control measures are all crucial factors.

These must be taken into account to ensure that the crops are protected from damage and spoilage during storage and transportation. Inadequate packaging or storage conditions can lead to reduced quality, spoilage or loss of the crops, which can result in significant economic losses for farmers, distributors, and retailers. Therefore, it is essential to pay close attention to package and storage requirements for field crops produce in order to ensure that the crops are well-protected and in good condition when they reach their intended destination. Here are some general package and storage requirements for field crops produce:

4.1.Packaging materials: For field crop produce, packaging should be:

- moisture-resistant,
- lightweight,
- easy to transport.
- Good quality to prevent damage to the produce during transportation.

2. Storage temperature: Field crops like grains, oilseeds, and pulses require cool and dry conditions for storage. The ideal temperature range for these crops is between 12℃ to 18℃.

3. Humidity control: Field crop produce should be stored in environments where the humidity is low – typically around 60% or below.

4. Good ventilation: Air circulation is essential for field crop storage. Proper ventilation can help in maintaining the ideal temperature and humidity levels within the storage unit.

5. Pest control: Field crop storage facilities should also be well-protected from pests like insects and rodents. Pest control measures such as fumigation may be necessary to prevent infestations.

7.2 Marketing plan and production best practice

Creating and executing effective marketing strategies to promote products or services and increase sales. Production best practices, on the other hand, refer to the most efficient and effective processes for manufacturing, assembling, or delivering goods to customers. Together, these areas are critical for businesses that want to achieve success in competitive markets

7.3 Anticipating and prevent or control the possibility of emergencies

Anticipating preventing emergencies is an important part of risk management. Here are some best practices that can help you prevent or control the possibility of emergencies:

1. Conduct a risk assessment: Identify potential risks and hazards that could lead to an emergency situation and assess their likelihood and potential impact.
2. Develop an emergency response plan: This plan should outline the actions that should be taken in case of an emergency, including evacuation procedures, communication protocols, and contact information for emergency responders.
3. Train employees: All employees should receive appropriate training on emergency procedures and be familiar with the emergency response plan.
4. Maintain equipment and facilities: Regular maintenance, testing, and inspection of equipment and facilities can help prevent accidents and emergencies.
5. Implement safety protocols: Put in place safety protocols to manage the risk of incidents or accidents occurring.
6. Monitor risks: Regular monitoring of risks can help identify any potential issues before they become emergencies.
7. Review and update emergency plans: Reviewing and updating emergency plans regularly is important to ensure they reflect any changes in the business or environment.

7.4 Monitoring and remedial action packing and storage processes

The monitoring remedial action of packing and storage processes of field crop produce deals with identifying and addressing issues that may arise during these processes in order to preserve the quality and safety of the crops. This may include measures such as:

- Proper sorting/ grading,
- Cleaning of stored produce and storage materials ,
- Packaging procedures,
- Appropriate storage conditions such as temperature and humidity control.

Ensuring these steps are taken correctly can help to prevent spoilage, contamination, and other issues that can impact the quality and safety of the crops.

The monitoring and remedial action of packing and storage processes of field crop produce deals with ensuring that the quality and safety of crops are preserved throughout these processes, and taking corrective measures when issues arise. This involves monitoring factors such as:

- temperature of storage materials and the surrounding,
- humidity of storage materials and the surrounding
- ventilation with in the storage
- pest control,
- Inspecting crops for signs of spoilage, damage, or contamination.

Remedial actions may include proper sanitation procedures, repairing damaged packaging, improving storage conditions, and removing affected crops. By implementing effective monitoring and remedial action protocols, farmers and food producers can help to minimize losses and ensure the safety and quality of their crops..

7.5 Recording packing and storage processes

Recording packing and storage processes of field crop produce involves documenting the steps taken during these processes, from harvesting to transportation and storage. This information can help farmers and food producers to track the quality and safety of their crops over time, identify areas for improvement, and meet regulatory requirements by maintaining thorough records of their packing and storage processes, farmers and food producers can enhance their ability to manage risks, communicate with customers, and improve overall efficiency.

During packing and storage processing, the following information can be recorded.

- Crop Name:
- Date of Harvest:
- Location of Harvest:
- Quantity of Harvest:
- Farmer Information:
  - ✓ Name
  - ✓ Contact Information:
  - ✓ Farm Address:
- Packing Process:
  - ✓ Date of Packing:
  - ✓ Location of Packing:
  - ✓ Quantity of Crop Packed:
  - ✓ Packaging Materials Used:
  - ✓ Name of Packer:
- Storage Process:
  - ✓ Storage Facility Name:
  - ✓ Storage Capacity:
  - ✓ Date of Storage:
  - ✓ Location of Storage:
  - ✓ Temperature and Humidity Control Measures:
  - ✓ Name of Person in Charge of Storage:

Self-Check 7	

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Test I: Choose the best answer

1. For field crop produce, packaging should be:
   A. Moisture-resistant,
   B. Light weight,
   C. Easy to transport.
   D. All
2. Which practices can help you prevent or control the possibility of emergencies:?
   A. Conduct a risk assessment:
   B. Develop an emergency response plan
   C. Train employees
   D. All
3. Which one is not monitoring and remedial action packing and storage processes?

A. Proper sorting/ grading,
B. Cleaning of stored produce and storage materials ,
C. Packaging procedures,
D. None

Test II: Write True or False

1. Anticipating preventing emergencies is not an important part of risk management.
2. Recording packing and storage processes of field crop produce involves documenting the steps taken during these processes.
3. Regular monitoring of risks can help identify any potential issues before they become emergencies.
4. Air circulation is not essential for field crop storage.
5. Reviewing package and storage requirements is not mandatory for field crop.

Test III: Short Answer Question

1, What are the information recorded during packing and storage process?
2. Write monitoring and remedial action measures of packing and storage processes
3. What are the practices that can help you prevent or control the possibility of emergencies?
4. What is production best practices?

LG #8	LO #8- Implementing hazardous waste disposal guidelines

Instruction sheet 8

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

- Reviewing principle of waste disposal
- Monitoring, collection and disposal of waste
- Reporting conditions impact on business viability

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:

- Reviewing principle of waste disposal
- Monitoring, collection and disposal of waste
- Reporting conditions impact on business viability

Learning Instructions:

7. Read the specific objectives of this Learning Guide.
8. Follow the instructions described below.
9. Read the information written in the information Sheets
10. Accomplish the Self-checks
11. Perform Operation Sheets
12. Do the “LAP test”

Information sheet 8

8.1 Reviewing principle of waste disposal

Here is a brief overview of the principles of waste disposal for field crop harvesting and post-harvest handling: Field Crop Harvesting: - Crop residues such as leaves, stems and vines should be left on the field to decompose and provide nutrients to the soil. - In cases where crop residues are removed, they can be used for animal feed, biomass energy production, or composting. Post-Harvest Handling: - Proper sorting and grading of produce can help reduce waste by ensuring that only high-quality produce is sold or processed. - Technologies such as cold storage and drying can help preserve produce for longer periods of time, reducing spoilage. - In cases where produce is spoiled, damaged or excess, it can be used for animal feed or composting. Here are some principles of waste disposal for field crop post-harvest management:

1. Reduction of Losses: Managing postharvest losses is key to achieving food security and sustainability. Understanding and addressing factors that contribute to postharvest losses, such as poor storage facilities or lack of proper handling practices, can help reduce the amount of waste generated during the postharvest phase.

2. Efficient Handling and Storage: Proper handling, sorting, and storage practices can help minimize waste by improving the quality of crops and reducing spoilage. This includes using ventilated storage structures, monitoring temperature and humidity levels, and maintaining sanitation standards.

3. Value Addition: Some crops may not be fit for consumption due to poor quality or damage. In such cases, value addition opportunities such as processing into products like flour or animal feed can be explored to avoid wastage.

4. Recycling and Composting: Organic waste such as crop residues, spoiled produce, and postharvest byproducts can be recycled or composted to create organic fertilizers and soil amendments. This can help improve soil health, save costs on commercial fertilizers, and reduce environmental pollution.

5. Alternative Uses: In cases where crops cannot be used for food, alternative uses such as animal feed or fuel for biomass energy production can be explored to reduce waste Monitoring, collection and disposal of waste.

Proper waste management in post-harvest handling is essential to reduce environmental pollution and prevent the spread of disease. The report highlights that the key steps in waste management

include collection, transportation, storage, and disposal. In field crop post-harvest handling, waste collection is achieved through the use of containers such as bags or bins. Collection points should be strategically placed throughout the field to ensure that waste is easily accessible and does not accumulate in one area. The waste should be sorted and separated into organic and non-organic material to facilitate proper disposal and recycling. Transportation of waste from the field to the disposal site should be done using vehicles that are suitable for carrying the volume of waste generated. Appropriate safety measures should be taken during transportation to prevent accidents and minimize contamination. Waste storage is an important aspect of waste management, particularly in situations where waste needs to be stored temporarily before disposal. Waste storage facilities should be designed to prevent wildlife intrusion, minimize odors, and facilitate efficient waste disposal. The disposal of waste can be achieved through various methods such as composting, burning, burying, or recycling. Each method has its advantages and disadvantages, and the choice of disposal method will depend on factors such as available resources, environmental considerations, and local regulations. Overall, effective management of waste in field crop post-harvest handling is crucial for maintaining a clean and healthy environment for workers and consumers alike.

8.2 Monitoring, collection and disposal of waste

The monitoring, collection, and disposal of waste during post-harvest operations deals with managing waste that is generated during the processing and storage of agricultural products after the harvest. This can include monitoring waste generation rates, collecting waste such as crop residues and spoiled produce, transporting the waste to disposal facilities, and properly disposing of the waste in accordance with local regulation Post-harvest operations in field crop production generate a significant amount of waste that needs to be managed properly to prevent environmental and health risks. The following practices are recommended for monitoring, collection, and disposal of waste during field crop post-harvest operations:

1. Monitor the amount and type of waste generated during post-harvest operations.
2. Segregate waste into different categories, such as organic waste, plastic waste, and hazardous waste.
3. Collect and store waste in proper containers or storage areas to prevent contamination and odors.
4. Transport waste to a designated disposal facility or recycling center for proper disposal or treatment.

5. Compost organic waste and use it as a soil amendment to improve soil fertility. 6. Recycle plastic waste or use it in non-food applications.

7. Dispose of hazardous waste according to local regulations and guidelines. Proper monitoring, collection, and disposal of waste during post-harvest operations will not only minimize environmental and health risks but also help reduce production costs and increase sustainability.

8.3 Reporting conditions impact on business viability

The impact of reporting conditions on business viability refers to how specific reporting requirements affect a company's sustainability and profitability. These reporting conditions can come from various sources, including regulatory bodies, industry standards, and internal company policies. Such conditions may include financial reporting requirements, data security measures, environmental regulations, and health and safety guidelines, among others. A failure to comply with these reporting conditions can result in penalties, legal action, and damage to the company's reputation, leading to significant economic losses. Conversely, complying with these reporting conditions can help a company build a positive reputation with customers and investors, increase trust, and potentially lead to increased profitability over the long term. Overall, ensuring compliance with reporting conditions is essential for maintaining a company's viability and reputation, which is crucial for long-term growth and success. Reporting conditions impact on business viability

Financial reporting requirements can have a significant impact on a company's financial viability. For example, if a company is required to report its financial statements in a certain format or on a certain timeline, it may incur additional costs to comply with those requirements. Additionally, if a company fails to comply with reporting requirements, it may face penalties or fines, which can further impact its financial health.

Self-Check 8	

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

I. Choose the best answer

1. Which one is principles of waste disposal for field crop post-harvest management?
   A. Reduction of Losses
   B. Efficient Handling and Storage
   C. Value Addition
   D. . All
2. When we dispose wastes, we have to consider the guideline and environmental health.
   a. True B. False

Test II: Write True or False

1. Waste storage is an important aspect of waste management, particularly in situations where waste needs to be stored temporarily before disposal.
2. The impact of reporting conditions on business viability refers to how specific reporting requirements affect a company's sustainability and profitability
3. Collect and store waste in proper containers or storage areas to prevent contamination and odors
4. Proper sorting and grading of produce cannot help reduce waste by ensuring that only high-quality produce is sold or processed.
5. Proper monitoring, collection, and disposal of waste during post-harvest operations will not only minimize environmental and health risks but also help reduce production costs and increase sustainability

Test III: Short Answer Questions

6. What does mean by monitoring, collection and disposal of waste?
7. Why it is important reporting conditions impact on business viability**?**
8. What are the practices that we should conduct to minimize waste?
9. How can we dispose of hazardous waste?
10. How can we recycle wastes in to important product while disposing?

Reference Materials

Books

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