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DEPARTMENT OF EDUCATION

Technology and Livelihood Education Agri Crop Production

Quarter 2 – Module 1: Handling Materials and Equipment

ALTERNATIVE DELIVERY MODE
ADM

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Alternative Delivery Mode
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Quarter 2 – Module 1, Lessons 1-2: Handling Materials and Equipment
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Technology and Livelihood Education Agri Crop Production

Quarter 2 – Module 1: Handling Materials and Equipment

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

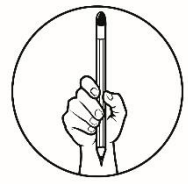
This module was designed and written with you in mind. It is here to help you understand the hazards present in the farm. Many hazards are present in the farm. If farmers are not aware of these hazards these may cause injury to their body or may cause diseases and even death. Farmers should always apply appropriate safety measures while working in the farm. Safety measures are applied based on work requirement and farm procedures. Tools and materials are utilized in accordance with specification and procedures. Outfit is worn in accordance with farm requirements. Shelf life and or expiration of materials are effectively checked against manufacturer's specifications. Hazards in the workplace are identified and reported in line with farm guidelines. Emergency and accidents are responded to and prevented.

Content Standard: The learner demonstrates an understanding of concepts, underlying theories and principles in the preparation of farm materials, tools and equipment and occupational health and safely operations in crop production.

Performance Standard: The learner uses farm materials, tools, and equipment and applies occupational health and safety practices in crop production.

After going through this module, you are expected to:

- Store waste material in a designated area according to workplace procedure/OHS procedure



What I Know

Directions. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which does **NOT** belong to the principles of waste storage?
   A. water storage
   B. physical storage
   C. chemical storage
   D. biological storage

2. If the materials are encased in the **anaerobic** digesters and sealed from oxygen, what kind of decomposition is it?
   A. NADEP system
   B. Vermiculture decomposition
   C. Anaerobically decomposition
   D. Recycling

3. There are different ways for decomposing agricultural waste. Which of them uses worm?
   A. NADEP system
   B. Vermiculture decomposition
   C. Anaerobically decomposition
   D. Recycling
4. What are wastes like fruits and vegetables from houses called?
   A. domestic waste
   B. natural waste
   C. animal waste
   D. palnat waste
5. You plan to do some construction works in the farm. What will you wear to prevent head injuries while working?
   A. helmet
   B. hard hat
   C. cap
   D. hair net

Lesson 1 Storing Waste Materials in a Designated Area

Many hazards are present in the farm. If the farmers are not aware of these hazards these may cause injury to their body or may cause diseases and even death. Farmers should always apply appropriate safety measures while working in the farm. Safety measures are applied based on work requirement and farm procedures. Tools and materials are utilized in accordance with specification and procedures. Outfit is worn in accordance with farm requirements. Shelf life and/or expiration of materials are effectively checked against manufacturer's specifications. Hazards in the workplace are identified and reported in line with farm guidelines. Emergency and accidents are responded to and prevented.

In this lesson the students should know:

- the proper use/handling of chemicals and hazardous tools and equipment;
- storing practices for materials and equipment; and
- waste materials storage and disposition according to workplace/OHS procedure

What's In

Directions. Write your answer in your activity notebook.

1. What are the problems or difficulties in completing work following required standards or timelines based on company reporting procedures?

2. What are the environmental aspects of horticultural production work?

What's New

1. Give the treatment process of waste materials.

_____
_____

2. What is NADEP?

_____
_____

3. Why is it important to follow farm equipment safety tips?

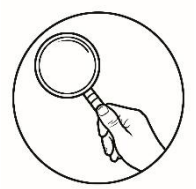
_____
_____

4. What do you think will happen if you will not follow safety handling of tools in the farm?

_____
_____

5. How is classification of storage being done?

_____
_____



What is It

Storage Practices and Principles for Materials and Equipment

Classification of Storage

- Duration of storage
- Size or scale of storage
- Principle of storage

Duration of Storage This involves time interval taken to preserve agricultural materials for further use as the need arises.

- Short-term storage - This involves storing of agricultural product for a short period of time.
- Medium-term storage - This type of storage involves storing of an agricultural product for a specific period of time which is not too long.
- Long-term storage - In long term storage, agricultural materials are preserved for a longer time.

Size or Scale of Storage

Size of storage is the amount of agricultural materials preserved at a specific time.

- Small scale storage - This method involves the storing of agricultural products that are of small scale e.g. storing of small quantity of rice in a jute bag in a warehouse.
- Medium scale storage - This is a kind of storage that involves certain amount of agricultural products at a time.
- Large scale storage- This involves commercial storage of agricultural product for further use.

Principles of Storage

- Physical storage
- Chemical storage
- Biological storage

AGRICULTURAL WASTE

Agricultural waste is composed of organic waste (animal excreta in the form of slurries and farmyard manures, spent mushroom compost, soiled water and silage effluent). It includes:

- Natural waste
- Animal waste
- Plant waste

Waste Management

- If wastes are not properly handled, they can pollute surface and groundwater and contribute to air pollution.
- Proper waste management on agricultural operations can contribute in a significant way to farm operations.
- Waste management helps to maintain healthy environment for farm animals and can reduce the need for commercial fertilizers while providing other nutrients needed for crop production.
- The waste which is reduced, recycled and made usable for different purpose is waste management.

Management Processes

- Source
- Generation
- Collection
- Transportation
- Treatment process
- Disposal

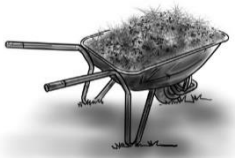
Generation:

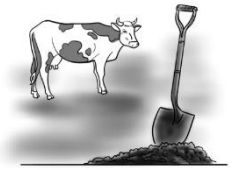
The major quantity of solid waste generated from agricultural sources are sugarcane baggage, paddy and wheat straw and husk, waste of vegetables, food products, tea, oil production, wooden mill waste, coconut husk, cotton stalk, etc.

Collection:

- Waste like fruits and vegetable wastes collected from houses (*domestic waste*)
- Waste collected from road streets or sides
- Collected wastes like dry refuse and green waste, animal dung from agricultural field

Stubble and straw waste | **Green waste** | **Roadside waste** | **Animal waste**



Transportation process:

- Waste collected from the side of roads, and agricultural field are transported to decomposed site and for further treatment by trucks, trailers, carts.
- Different types of waste are collected and then transported for further treatment and the waste which is not used is directly disposed to the sanitary land.
- Waste are not burned in open air, so it is then transported for incineration.

Treatment process:

Various treatment process performed on agricultural wastes are as follows:

- When dealing with agricultural waste, we must follow health and safety regulations.
- We should provide written instruction for storage and disposal of each type of waste we produce.
- We must dispose of waste if we have determined that we cannot use prevention, preparation for reuse, recycling or any other recovery method.

A. Composting- is a method in which organic matter present in agricultural waste is decomposed aerobically/anaerobically through a biochemical process and converted into humus.

Three-step operation in composting:

1. Preparation of agricultural waste

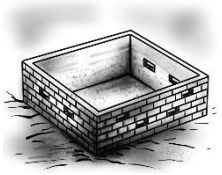
- shall be free of material that is not produced in agricultural field
- shall be reasonably free of dirt, soil and visible surface
- shall be arranged so that it will burn with a minimum of smoke

2. Decomposition

Waste is decomposed by three ways:

* NADEP system

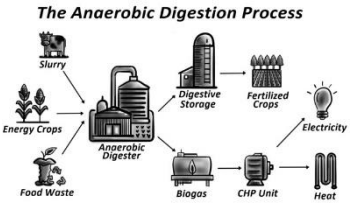
NADEP method of composting recycled agricultural crop residues to enhance soil fertility. In this aerobic method of composting, farmyard manure is mixed with agricultural crop residues and weeds, thereby enhancing the quantity of organic matter for soil application several times.



* Vermiculture decomposition

Vermicompost (**vermiculture**) is the product of decomposition process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a mixture of decomposing vegetable or food waste, bedding materials, and vermicast.

* Anaerobic decomposition



In an **anaerobic decomposing** process, the materials are encased in the **anaerobic** digesters and sealed from oxygen. The organisms begin breaking down the materials into sugars to make them accessible to other bacteria.

3. Product preparation and marketing

B. Recycling

- Process to change waste into new products
- Prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage
- Reduce air pollution from incineration and water pollution from land filling.
- Lower greenhouse gas emissions
- Key component of modern waste reduction and is the third component of Reduce, Reuse, Recycle

C. Incineration

Incineration is a waste treatment process that involves combustion of organic substances contained in waste materials. Incineration and other high-temperature waste treatment systems are described as "thermal treatment." Incineration of waste materials converts the waste into ash, flue gas and heat.

APPLY APPROPRIATE SAFETY MEASURES WHILE WORKING IN FARM

HAZARD, RISK AND EXPOSURE IN THE FARM

Agricultural crop production deals with a lot of activities to be done in the different workplace. While performing these activities we expose ourselves to a lot of risk. Workplace hazard is a major cause of accident, injury, or harm to a worker who performs such task. These hazards should be the major concern of all who are involved in a certain job or work.

It is important to distinguish hazard, risk and exposure when undertaking risk management.

- **Hazard** is the potential for harm, or adverse effect on an employee‘s health. Anything which may cause injury or ill health to anyone at or near a workplace is a hazard.

- **Risk** is the likelihood that a hazard will cause injury or ill health to anyone at or near a workplace. The level of risk increases with the severity of the hazard and the duration and frequency of exposure.
- **Exposure** occurs when a person comes into contact with a hazard.

Classifications of Hazard

- **Physica**l - includes floors, stairs, work platforms, steps, ladders, fire, falling objects, slippery surfaces, manual handling (lifting, pushing, pulling), excessively loud and prolonged noise, vibration, heat and cold, radiation, poor lighting, ventilation, air quality
- **Mechanical and/or electrical** - includes electricity, machinery, equipment, pressure vessels, dangerous goods, forklifts, cranes, hoists
- **Chemical** - includes chemical substances such as acids or poisons and those that could lead to fire or explosion, like pesticides, herbicides, cleaning agents, dusts and fumes from various processes such as welding
- **Biological** - includes bacteria, viruses, mold, mildew, insects, vermin, and animals
- **Psychosocial environment** - includes workplace stressors arising from a variety of sources

Farm emergency procedures regarding safety at working environment

1. Identify the potential emergencies (fire, flood, typhoon, machinery equipment, electrical shock, chemical exposure, farm injuries and the like).
2. Provide emergency facilities appropriate for the sorts of emergencies that might occur in the farm (e.g. deluge showers, eye washes, firefighting equipment, first aid kits).
3. Make sure that the correct equipment is available to contain and handle any chemical or other dangerous materials spills that might happen.
4. To help minimize the risk of personal injury or property damage in the event of an emergency, people working in and visiting the farm need to know and understand the emergency procedures and their responsibilities.
5. Instruct everyone working in the farm on the emergency response procedures.
6. Everyone should know the location of fire alarms, fire extinguishers and first aid kits; how and where to contact emergency services; and where to safely assemble in the event of an emergency.

FARM WORKS THAT INVOLVE USING CHEMICALS AND HAZARDOUS TOOLS AND EQUIPMENT

1. Spraying Chemicals

Many different chemicals are used on a farm including pesticides. These chemicals are used to fertilize and control pests such as insects, weeds, mollusk, etc. Most of these chemicals are applied by spraying.

Examples of chemical hazards:

- Spraying in a strong wind and the spray drifting over a dam or the farmhouse
- Washing spray equipment and the water running into open drains, collecting in puddles, or running into stockyards or dams
- Containers or chemicals left lying around. Empty containers lying in a heap

Some ways to reduce the risk of hazards from chemicals:

- Use personal protective equipment such as respirators, waterproof clothes, rubber gloves, and waterproof footwear.

- Make sure chemicals are safely stored and cupboards locked.
- Never spray chemicals on days when there is a high wind.
- Know first aid procedures.
- Keep a list of all hazardous substances used in the farm.

Safe use of chemicals

- Consider if a chemical substance is really needed.
- Eliminate a hazardous substance, or if that is not possible, substitute it with less hazardous one.
- Safe work practices or personal protective equipment should be used.
- Keep records of farm chemicals.

2. Land Preparation Using Tractor

- Victims fall off or are thrown from the tractor
- Run over by either the tractor or an implement being towed, or both
- Overturn

Safety Reminders:

- Tractors are not passenger vehicles.
- Use seat belts when driving tractors.
- ROPS will protect the operator from serious injuries.

Causes of run over accidents:

- Sudden stops
- Driving over holes, stumps and debris, or a sharp turn

How to prevent runover:

- Never allow riders on tractors.
- Discuss with family members and farm workers the potential risks of riding a tractor.
- It's also helpful to post 'no riders' decals on all tractors to remind others about the policy.
- Use or provide other vehicles for passengers, such as trucks or cars, when transportation is needed to fields or remote work sites.

3. Cutting Trees Using Chainsaws

A chainsaw makes light work of felling and cutting up trees but treat it with respect. A chainsaw can easily slice through muscle or bone if it kicks back towards you. It's essential to get training from a qualified person before you use chainsaw.

Examples of chainsaw hazards:

- Chainsaw kickback caused when the upper part of the bar nose contacts a solid object or is pinched. This throws the guide bar back towards you and can cause serious injury.

- Using a small saw and bar to cut a big tree.
- Felling large shelterbelt trees, or trees with a heavy lean or on steep slopes.
- Felling trees with stem rot or a species prone to splitting

Some ways to reduce the risk of hazards from chainsaws:

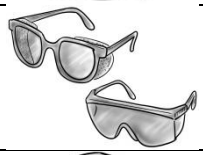
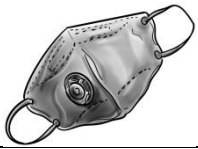
- Know your saw and how to use the safety devices.
- Wear and use the correct personal safety equipment. You need:

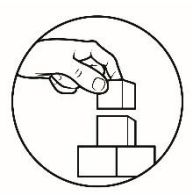
    1. FOOTWEAR - boots with steel toe caps
    2. LEG PROTECTION - chainsaw operator's safety trousers or chaps
    3. SAFETY HELMET. EARMUFFS rated Grade
    4. EYE PROTECTION - goggles in dusty conditions or a helmet visor if there's a danger of flying debris

- Check the work area for hazards such as branches or treetops that could fall.
- Check if your saw is in good order and adjusted to the manufacturer's specifications.
- Do not over-reach or cut trees above shoulder height.

Personal Protective Equipment (PPE)

Personal protective equipment (PPE) can reduce the number and severity of farm work- related injuries and illnesses. Personal protective equipment not only helps protect people but also improves productivity and profits. Farmers and ranchers can share in these benefits by using the appropriate protective equipment for themselves, family members and employees when the job and its potential hazards call for it.

	Protect your head with a *hard hat* when performing construction work, trimming trees, repairing machinery, and doing other jobs with head injury risks.
	Use a *sun safety hat* (one with a wide brim and neck protection) to assist in the prevention of skin cancer.
	Protect your vision with appropriate safety eyewear (safety glasses, goggles, face-shields) when applying pesticides, fertilizers, working in the shop, or in heavy dust conditions.
	Protect your hearing with acoustic earmuffs or plugs when operating noisy equipment such as grain dryers, feed grinders, older tractors, chain saws, etc.
 	Protect your lungs with the correct respiratory equipment (dust masks, cartridge respirators, gas masks, air packs) when working in dusty or moldy conditions, spray painting, applying chemicals, working in bins, tanks, silos, and manure storage places.



What's More

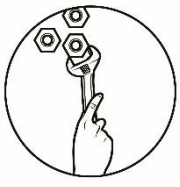
Activity:
Directions. Classify the following hazards listed below according to where they belong. In your activity notebook, write each hazard in the box provided for.

slippery surfaces	electricity	pesticides
workplace stressors	bacteria	insects
herbicides	machinery	manual handling
falling objects	pressure vessels	cleaning agents
viruses	poisons	vibrations

PHYSICAL	MECHANICAL / ELECRICAL	CHEMICAL	BIOLOGICAL	PSYCHOSOCIAL ENVIRONMENT

What I Have Learned

1. Can personal protective equipment (PPE) reduce the number and severity of farm work- related injuries and illnesses?
2. How can personal protective equipment (PPE) reduce the number and severity of farm work- related injuries and illnesses?
3. What is the potential for harm, or adverse effect on an employee's health?
4. What occurs when a person meets a hazard?
5. What kind of waste is composed of organic waste (animal excreta in the form of slurries and farmyard manures, spent mushroom compost, soiled water and silage effluent)?



What I Can Do

Show Time!
Directions. Write your answer in your activity notebook.
From your output in activity **What's More** re: "classify hazards," create at least 1 situation among the five hazards showing what will happen if not following occupational health and safety practices in crop production and give solutions to the problem. Write it in your activity notebook. Discuss it with family or friends around you. Let them rate your performance through this rubric.

Rating Scale:

SCORE	RATING	CRITERIA
5	Excellent	Following occupational health and safety practices in crop production and give solutions to the problem
4	Very Good	Following occupational health and safety practices in crop production and give some solutions to the problem
3	Good	Following some occupational health and safety practices in crop production and give some solutions to the problem
2	Poor	Following some occupational health and safety practices in crop production but doesn't give solutions to the problem
1	Very Poor	Not following occupational health and safety practices in crop production and doesn't give solutions to the problem

Assessment

Directions. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which is NOT one of the principles of storage?
   A. water storage
   B. physical storage
   C. chemical storage
   D. biological storage

2. If the materials are encased in the **anaerobic** digesters and sealed from oxygen, what kind of decomposition is it?
   A. NADEP system
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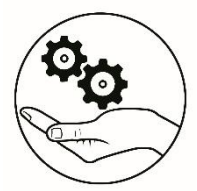

Additional Activities

Interview some farmers about how they store their waste materials in a designated area according to workplace/OHS procedure. Compare their answers and determine if they follow workplace procedure.

What I Need to Know

This module was designed and written with you in mind. It is here to help you understand the hazards present in the farm. Mishandling and transporting of materials, equipment and machinery may cause lives and destruction in the farm. If the farmers are not aware of these problems these may cause injury to their body. Farmers should apply appropriate safety measures while working in the farm.

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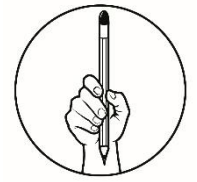
Performance Standard: The learner uses farm materials, tools, and equipment and applies occupational health and safety practices in crop production.

After going through this module, you are expected to:

- Handle and transport materials, equipment and machinery according to enterprise guidelines
- Maintain a clean and safe work site while working in accordance with OHS procedures



What I Know

Directions. Write your answers in your activity notebook.

1. Give 5 tips in safe handling of tools.

   _____

   _____

2. What are the 10 Farm Equipment Safety Tips?

_____
_____

3. What are the functions of materials handling systems?

_____
_____

4. Why do we keep children and animals away from working areas?

_____
_____

5. Why must we follow safety precautions in handling and transport of materials and equipment following enterprise standards in the farm?

_____
_____

6. Why is it important to keep your work area clean and tidy?

_____
_____

Lesson 2	Handling, Transporting Materials/Equipment and and Maintaining a Clean and Safe Work Site

Mishandling and transporting of materials, equipment and machinery may cause destruction of lives in the farm. If the farmers are not aware of these problems these may cause injury to their body. Farmers should apply appropriate safety measures while working in the farm.

What's In

Directions. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Works are very engaging in the farm while you see children running around. What will you do with these children?
   A. Scold the children for playing around.
   B. Let the children continue playing.
   C. Ask the children to continue playing but not in the farm.
   D. Explain to the children why they are not allowed to play in the farm.

2. You have a new equipment delivered in your farm. To be able to know the correct functions and its maintenance, what will you do?
   A. Use the equipment right away.
   B. Ask someone about the equipment.
   C. Do not use the equipment.
   D. Read and follow the manual.

3. Rice have been harvested. Where is the best place to store rice grains?
   A. silos
   B. hoppers
   C. bins and drawers
   D. sacks

4. Some farm materials are being delivered and left outside the stockroom. Some are big and heavy. What will you use to transport them?
   A. platform trucks
   B. side loader
   C. conveyors belt
   D. order picker

5. Sharp and pointed tools are needed also in the farm. How will you carry them with you?
   A. Place them in the pocket.
   B. Hold them with your hands.
   C. Place them in a toolbox.
   D. Tie them around the waist.

What's New

Directions. Write your answers in activity notebook.

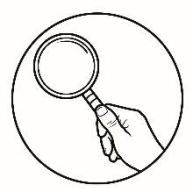
1. What are the functions of materials handling systems?
   _____
   _____

2. Why should we keep children and animals away from working areas?
   _____
   _____

3. What is the importance of selecting standard materials?
   _____
   _____

4. What is material handling equipment?
   _____
   _____

5. Why must we follow safety precaution in handling and transport of materials and equipment following enterprise standards in the farm?
   _____
   _____



What is it?

Safe handling of tools

Workers should be trained on safe procedures for working with tools. However, safe practices when carrying or storing those tools may not be thoroughly covered. Tools can pose a safety risk when they are misplaced or improperly handled by workers. The National Safety Council offers the following tips for safe handling of tools when they are not in use:

- Workers should never carry tools up or down a ladder in a way that inhibits grip. Ideally, tools should be hoisted up and down using a bucket or strong bag, rather than being carried by the worker.
- Tools should always be carefully handed from one employee to another – never tossed. Pointed tools should be passed either in their carrier or with the handles toward the receiver.
- Workers carrying large tools or equipment on their shoulders should pay close attention to clearances when turning and maneuvering around the workplace.
- Pointed tools such as chisels and screwdrivers should never be carried in a worker's pocket. Acceptable ways to carry them include placing these in a toolbox, pointed down in a tool belt or pocket tool pouch, or in the hand with the tip always held away from the body.
- Tools should always be put away when not in use. Leaving tools lying around on an elevated structure such as a scaffold poses a significant risk to workers below. This risk increases in areas with heavy vibration.

MATERIALS HANDLING IN AGRICULTURE

Materials handling in agriculture is concerned with the movement and handling of materials and products in a systematic manner from point of origin to destination. Movement may be in any direction--horizontal, vertical or any combination of the two.

Handling of agricultural materials and products is important, not only because of the work involved, but because of its effect on costs, product quality and management.

Materials handling costs account for as much as 25 percent or more of the total production cost for certain agricultural crops. These costs can be lowered with efficient materials handling systems in which the components are integrated to provide a smooth flow of materials. A thorough analysis of materials handling can oftentimes offer great opportunities for reducing costs. Consider a 100,000-bushel production orchard operation. Product handling alone involves almost 2,500 tons and in many cases this tonnage is handled six or more times before it reaches market destination so that a total of 15,000 tons or more will be handled. In addition, production materials and supplies such as fertilizers and chemicals involve considerable handling.

Functions of Materials Handling Systems

A material handling system should have several functions, none of which will add anything to the value of the product, but which, if not properly planned, can reduce the value of the product, particularly perishable agricultural products.

1. Reduce Production Costs

A properly designed materials handling system can reduce costs by integration of components of the system and by substitution of mechanical power for manpower. A man serving as a power source is not very efficient. Materials can be handled less expensively with machines if volume is sufficient to spread high fixed costs. Small operations will be limited in the degree of mechanization feasible for handling materials.

2 Effect on Other Inputs

Materials handling is a part of the total cost of production and can have a direct effect on other production costs. Improvements and better efficiency in other operations are possible with good materials handling methods and equipment.

3. Productive Capacity of Labor

Volume of business can be increased without additional labor if materials handling is improved and mechanized to the fullest. Mechanizing materials handling to expand productive capacity rather than adding workers, even if they were available, avoids adding labor management to the business, a problem which many operators cannot cope with successfully. It also lessens the chance of subjecting the operation to a lower management level because of a changing labor force. Systems which embody a relatively high degree of mechanization perform some functions, the results of which are difficult to measure. Working conditions may be improved and disagreeable tasks may be eliminated making it easier to employ and keep competent workers. More young people may choose to stay in agricultural work rather than seek other occupations.

4. Other Functions

Questions which should be considered when analyzing materials handling systems are listed. If the answer to any of these questions is “yes” it is likely that some improvements can be made to make the system more efficient.

1. Can the number of times in handling the material be reduced?
2. Can the system be more continuous for a smoother flow of materials?
3. Can the speed of handling be increased?
4. Can the material be handled in larger containers or in greater volume?
5. Can distances the material is handled be reduced?
6. Are workers kept waiting for material to be moved?
7. Are there times when the equipment is not used to full capacity?
8. Can gravity be used more to move material?
9. Do workers have to make unnecessary movements?
10. Can hand operations be done mechanically at the same or less cost?
11. Can layout and material flow patterns be improved?

12. Can the system be made more flexible?
13. Does the system damage the product?

Planning Materials Handling Systems

1. Use Mechanical Equipment. Mechanize handling wherever feasible to reduce labor costs, increase capacity, reduce worker fatigue, improve safety and speed up handling of perishable products.

2. Utilize Equipment Fully. Materials handling equipment costs money and should therefore be utilized to the fullest capacity. If present equipment is inadequate, additional equipment should be added, or a new system planned.

3. Equipment Selection. Improvements in material handling will depend on proper selection of equipment and methods. Economics is the controlling factor. The main objectives, namely reducing costs, increasing capacity and improving working conditions, should be kept in mind. Decisions should be based on facts about methods and equipment, and selection made with care and without prejudice.

4. Select Standard Equipment. Use of standard equipment is important because it allows for easier training of operators and permits interchangeability of equipment. In addition, parts are more readily available, maintenance and servicing will be easier, and standard equipment will be more economical to purchase.

5. Integrate Equipment. A single piece of equipment, or a single handling system is not applicable to all materials handling operations. Equipment should be integrated into a smooth, efficient, over-all materials handling system.

6. Provide Alternate Methods. Thought should be given to alternate methods and equipment in case the desired equipment is not economically feasible, readily available or the system breaks down.

7. Consider Unit Cost. Material handling equipment should be selected on the basis of comparative unit costs of handling-- not on initial cost of equipment. Check Limiting Factors. Doorway sizes, ceiling clearances, elevators, ramps, terrain and other farmstead conditions must be considered before selecting equipment.

8. Plan for Future. Nothing is surer than change. When planning a materials handling system, try to anticipate changing needs.

9. Don't Forget Maintenance. Adequate maintenance programs should be set up for materials handling equipment, and then followed through. Preventive maintenance cuts equipment costs, improves equipment performance, and lengthens equipment life.

Materials Handling

The National Safety Council suggests that employers relay the following information to employees to help reduce workplace incidents when handling and moving materials:

- Avoid lifting materials from the floor or while seated.
- Make use of available handling aids.
- Refrain from using sudden or jerky movements.
- Never lift a load over an obstacle.
- Perform lifts in areas with adequate footing, space and lighting.
- Modify objects and redesign jobs to make moving easier.
- Seek assistance from co-workers.
- Stay in good physical shape.
- Begin lifts close to the body.

- Use containers made of lighter materials.
- Reduce load sizes when possible.
- Do not twist or bend while lifting objects.
- Ensure repetitive, heavy and bulky lifts are not performed.
- Keep lifts between shoulder and knuckle height.
- Use conveyors, slides or chutes to eliminate pushing or pulling.

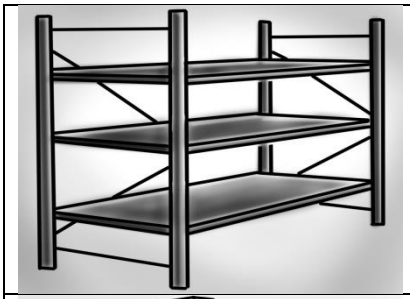
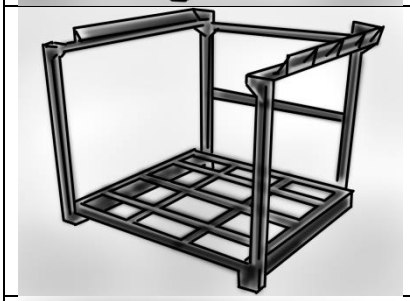
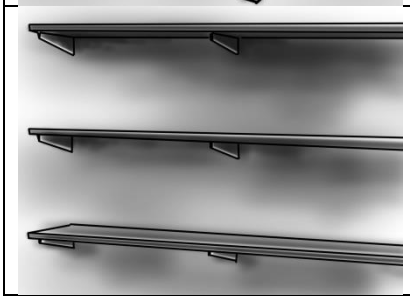
4 Types of Materials Handling Equipment

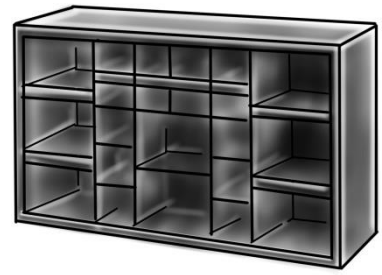
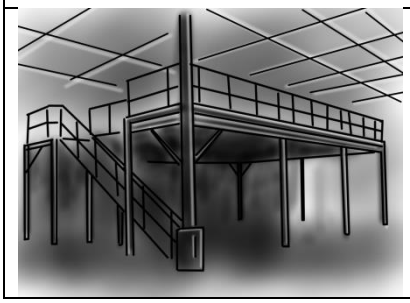
Material handling equipment is any tool used to aid in the movement, protection, storage, and control of materials and products. The equipment used to do so can be broken down into four main categories. Each category has a wide variety of useful equipment that makes moving heavy materials or large volumes of materials safe and easier.

1. Storage and Handling Equipment

Storage equipment is used to hold materials while they wait to be transported from the manufacturer or wholesaler to their final destination. Having the right storage equipment can increase efficiency in the production floor and maximize space utilization- two very important factors in any production environment.

Examples of storage and handling equipment include:

	**Racks**: such as pallet racks, drive-through or drive-in racks, push-back racks, and sliding racks
	**Stacking frames**: these are interlocking units that enable stacking of a load, so crushing doesn't occur
	**Shelves:** a flat length of wood or rigid material, attached to a wall or forming part of a piece of furniture, that provides a surface for the storage or display of objects

	**Bins and drawers:** - a container, case, or receptacle, usually rectangular, of wood, metal, cardboard, etc., and often with a lid or removable cover - a piece of furniture, that may be drawn out in order to gain access to it
	**Mezzanines**: elevated floor systems that are installed between the production floor and ceiling in order to provide additional storage space. Most of these structures can be dismantled and moved with ease.

2. Engineered Systems

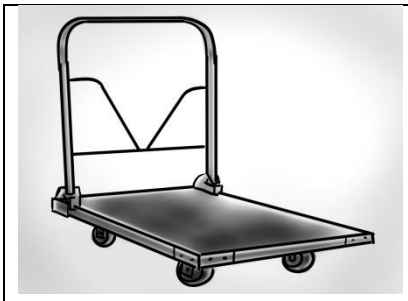
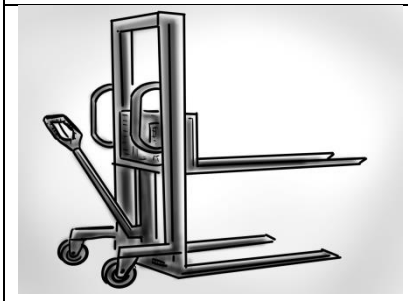
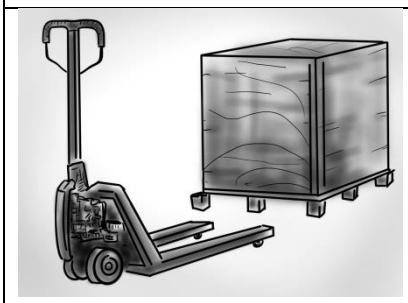
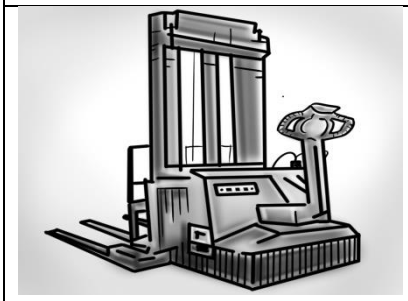
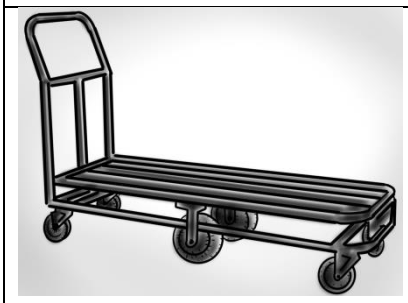
This type of material handling equipment are typically automated units that work together to enable efficient storage and transportation of large materials or large volumes of materials around the production floor. Examples of engineered systems include:

- **AS/RS**: Automated Storage and Retrieval Systems (abbreviated as AS/RS) are large automated structures that involves racks, aisles and shelves that are accessible by a type of mechanized shuttle system (like a cherry picker) for quick retrieval of items.
  • **Conveyor systems**: Automated conveyor systems carry heavy materials to specified destinations using belts, flexible chain, or live rollers. It is a highly efficient equipment to move large volumes of material quickly.
  • **Robotic delivery systems**– These automated systems are ideal for moving products on an assembly line or transporting goods throughout a plant or warehouse.

  • **Automatic guided vehicles**– These vehicles are mobile robots that follow specific markers or wires in the floor to move large materials around a manufacturing facility or warehouse. Vision, magnets, or lasers can also be used as methods for AGV navigation.

3. Industrial Trucks

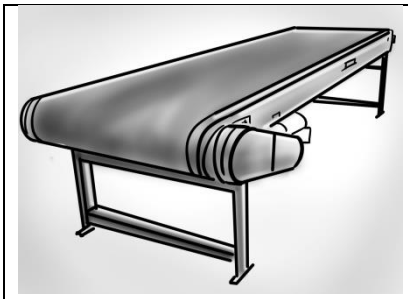
Powered industrial trucks, such as forklifts, are used to move large materials or large quantities of materials around the manufacturing floor. They are also utilized to efficiently load (or unload) heavy objects onto delivery trucks. Industrial trucks are very useful when there is insufficient flow volume to justify the implementation of a conveyor system. Examples of industrial trucks include:

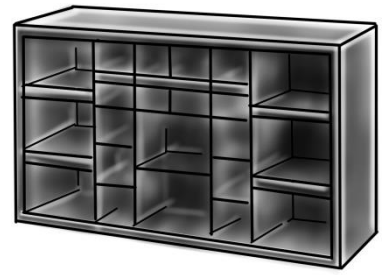
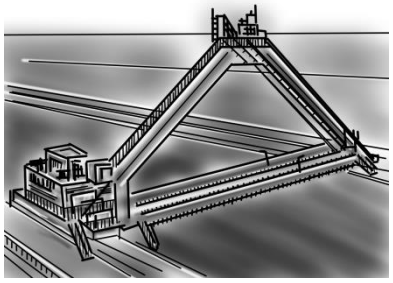
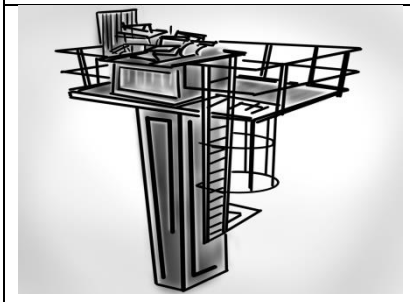
	**Hand trucks**– Also known as a trolly, or box cart, hand trucks are l-shaped box-moving handcarts with handles at one end, wheels at the base, and a ledge to set objects on.
	**Pallet jacks**– These tools are the most basic form of a forklift and used to lift and move pallets within a warehouse.
	**Pallet trucks**– Manual-operated or powered industrial forklifts
	**Walkie stackers**– A pedestrian walk-behind stacker with a mast for lifting pallets to heights
	**Platform trucks**– These are similar to a two-wheeled dolly, but with an extended deck.

	**Order picker**– An electric lift truck specifically designed for filling individual customer orders. This requires piece-part picking rather than selecting full pallets or unit loads.
	**Side loader**– Automated tool similar to a fork lift that loads and unloads from the side of the machine rather than the front.
	**Automatic guided vehicles-** They are most often used in industrial applications to transport heavy materials around a large industrial building, such as a factory or warehouse.

4. Bulk Material Handling Equipment

This equipment deals with bulk handling aids in the control and transportation of large volumes of material either in bulk or loose form. In general the equipment is used to move loose parts from one area of the production floor to another. Drums and hoppers can also be used to funnel loose items so they can be easily manipulated or packaged. Bulk Material Handling Systems can also utilize conveyor belts for horizontal transportation and elevators for vertical transportation. Examples of bulk material handling equipment are:

	**Conveyor belts -** a continuous moving band of fabric, rubber, or metal used for moving objects from one place to another (baggage conveyor belt).

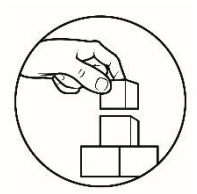
	**Stackers**– Similar to forklifts, stackers help to lift and stack heavy loads on the dock or in the warehouse.
	**Reclaimers**– These are large machines used to recover bulk materials from a stockpile.
	**Bucket elevators**– Also known as a grain leg. These elevators haul flowable bulk materials vertically.
	**Grain elevators**– This type of equipment is used to store and move grain and other similar materials throughout a production pathway.
	**Hoppers**– Hoppers are a container for bulk material such as grain, that tapers and discharges its materials at the bottom.

	**Silos**– A tower used to store grain and other materials such as coal, sawdust, woodchips, and food products.

10 Farm Equipment Safety Tips

Keep these tips in mind to avoid accidents when operating equipment and machinery on your farm.

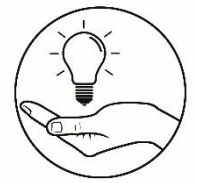
1. **Read and follow the manual.** Always thoroughly read the manual for each piece of equipment. Your new tractor may function differently than your old one, for example. Then, comply with the instructions and rules
2. **Follow and keep up with federal and state laws.** These laws are in place to protect both you and the citizens around you, and it's best to make sure you're keeping up with changes to avoid fines. For instance, Wisconsin recently changed its lighting and marking requirements for all Implements of Husbandry (IoH) to further protect both operators and drivers on public roads.
3. **Always keep your slow-moving-emblem (SMV) clean, visible and properly mounted.** This is an important law. Following it can prevent rear-end collisions while transporting and potentially save a life. Road safety is so important.
4. **Dress appropriately.** An untied shoelace, flowing long hair and stray threads from an old shirt have led to horrendous injuries when operating farm equipment. Dressing appropriately can mean reducing risk of such injuries.
5. **Ensure you're well-rested.** Feeling fatigued when operating machinery can be dangerous. Make sure you're taking breaks from work when you need rest.
6. **Avoid alcohol.** Even one drink can affect your ability to operate machinery. Keep alcohol out of the picture until you're done for the day
7. **Maintain awareness.** Stay focused. Be aware of what you are doing and where you are going.
8. **Adjust equipment accordingly.** This means keeping all guards, shields and access doors in place when operating equipment, and making necessary alterations to equipment to fit operational conditions.
9. **Keep children and animals away from working areas.** Farms offer a world of adventure for curious kids. To avoid any disastrous accidents, keep your child's play area separate from your work area. Know where your children are even when you are mowing the lawn. Don't let a split-second accident impact your child forever.
10. **Read up about planter equipment safety.** Although operators should bear in mind similar safety precautions when using planter equipment, it's good to read about the specifics.



What's More

Activity

Interview some local farmers and get some information from them on what are their ways in handling and transporting materials, equipment and machinery. Make some discussion within your group on what suggestions and recommendations you can give to them.



What I Have Learned

Directions. Write your answer in your activity notebook.

1. What are the planning materials handling systems?

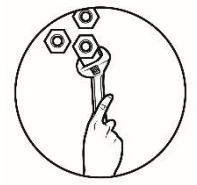
   _____

   _____

2. Why will you avoid drinking alcohol when operating farm equipment or machines?

   _____

   _____



What I Can Do

Directions. Write your answers in your activity notebook.

1. How do you maintain a healthy, safe and secure working environment?

   _____

   _____

2. Why is it important to keep your work area clean and tidy?

   _____

   _____

3. What are the 5 tips in safe handling of tools?

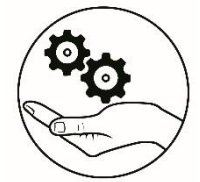
   _____

   _____

Assessment

Directions. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. While works are very engaging in the farm you see children running around. What will you do with these children?
   A. Scold the children for playing around.
   B. Let the children continue playing.
   C. Ask the children to continue playing but not in the farm.
   D. Explain to the children why they are not allowed to play in the farm.
2. You have a new equipment delivered in your farm. To be able to know the correct functions and its maintenance, what will you do?
   A. Use the equipment right away.
   B. Ask someone about the equipment.
   C. Do not use the equipment.
   D. Read and follow the manual.
3. Rice have been harvested. Where is the best place to store rice grains?
   A. silos
   B. hoppers
   C. bins and drawers
   D. sacks
4. Some farm materials are being delivered and left outside the stockroom. Some are big and heavy. What will you use to transport them?
   A. platform trucks
   B. side loader
   C. conveyors belt
   D. order picker
5. Sharp and pointed tools are needed also in the farm. How will you carry them with you?
   A. Place them in the pocket.
   C. Place them in a toolbox.



Additional Activities

Activity 1

In a piece of bond paper, draw/sketch floor plan of your farm, observing the areas where you can handle and transport material, equipment and machinery well to prevent any accident in the farm. *Note: attach your output in your activity notebook.*

Activity 2. Essay: Answer the question below in a minimum of 100 words. Write your answer in your activity notebook.

Why do you need to maintain a healthy, safe and secure working environment?

Answer Key

Lesson 1

What I Know

1. A
2. C
3. B
4. A
5. B

What's More

Physical
Slippery surfaces, Manual handling, Falling objects, vibrations

Mechanical/electrical
Electricity, machinery, pressure vessels,

Chemical
Pesticides, herbicides, cleaning agents, poisons

Biological
Bacteria, insects, viruses

Psychosocial environment
Workplace stressor

Assessment

1. A
2. C
3. B
4. A
5. B

Lesson 2

What I Know

1.
2.
3.
4.
5.

What's More

1.
2.
3.
4.
5.

Assessment

1. D
2. D
3. A
4. A
5. C

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