

BASIC TEXTILE OPERATION

NTQF Level -I

LEARNING GUIDE-28

Unit of Competence: Operate Cotton

Ginning Machines and

Controlling Bale Press Operations

Module: Operating Cotton Ginning

Machines and Controlling

Bale Press Operations

LG Code: IND BTO1 M09 LO1-LG-28

TTLM Code: IND BTO1 TTLM 0919v1

LO-1: Prepare work station



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

- Cotton Cultivation
- Operating Cotton Picking and Harvesting machineries
- Identifying settings and preparation for machinery operation.
- Checking seed cotton for ginning requirements
- Recording and reporting non-conforming materials
- Keeping machine clean.

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, **you will be able to:**

- cultivate Cotton
- Operate cotton Picking and Harvesting machineries
- Identify settings and preparation for machinery operation.
- Check seed cotton for ginning requirements
- Record and report non-conforming materials
- Keep machine clean.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 20.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” **in page -.**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.



Information Sheet-1	Cotton cultivation
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1.1. Cotton cultivation and organic production

Cotton is natural fiber grown on plant related to the hibiscus. The seeds are planted in spring and cotton plant grows in to green bushy shrubs about a meter in height. The plants briefly grow pink and cream colored flowers that pollinated drop off and are replaced with fruit better known as cotton balls.

Cotton is one of the most important fiber and cash crop of Ethiopia and plays a dominant role in the industrial and agricultural economy of the country. It provides the Basic raw material (cotton fiber) to cotton textile industry. Cotton in Ethiopia provides direct livelihood farmers and about millions people are employed in cotton Trade and its processing.

In Ethiopia, there are major cotton growing regions. Afar, Amhara, SNNPR, Gambela

Cotton Species

There are four cultivated species of cotton viz. *Gossypium arboreum*, *G. herbaceum*, *G. hirsutum* and *G. barbadense*. The first two species are diploid ($2n=26$) and are native to old world. They are also known as Asiatic cottons because they are grown in Asia. The last two species are tetraploid ($2n=52$) and are also referred to as new world Cottons. *G. hirsutum* is also known as American cotton or upland cotton and *G. barbadense* as Egyptian cotton or Sea Island cotton or Peruvian Cotton or Tanguish Cotton or quality cotton. *G. hirsutum* is the predominant species which alone contributes



Self-Check -1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define the cotton (2 pts.)
2. What are the four species of cotton? (2 pts.)
3. The cotton briefly grow pink and cream colored flowers that pollinated drop off and are replaced with fruit better known as _____.(2 pts.)
 - A) Fiber
 - B) Yarn
 - C) Cotton fiber
 - D) Cotton balls
 - E) planting

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____



Short Answer Questions

1. _____

2. _____
3. _____



2. Cotton harvesting and picking

Cotton harvesting: is one of the final steps in the production cotton crops, It is one of the most important. The crop must be harvested before weather can damage or completely ruin its quality and reduce yield.

Cotton can be harvested by two ways; **Machine harvesting** and **manual harvesting**

Machine harvesting is harvesting cotton by using machines

Machine harvesting also requires more defoliant and lint cleaners. Depending on the differences, between daytime high and nighttime low temperatures, defoliant might be needed to induce. Leaf drop also, as mentioned, machine picking will result in more trash. Therefore, pre-cleaners (sometimes called lint cleaners) are needed at gins, and the weight of seed cotton per ton of lint will increase, resulting in higher costs for transporting seed cotton to gins. Gins will also have more gin trash to dispose of.

2.1. Precaution during harvesting

The modern mechanical cotton harvester is a large machine with many fast-moving parts. Skillful operation is necessary for the safety of people on and around the machine and for effective machine operation. Here are some general recommendations for operators of cotton harvesters.

- Before starting the mechanical harvester, put the mechanism or transmission in the neutral or park position. Engaging the starter with these systems in gear may result in a sudden, unexpected movement that could injure the operator or others.
- Avoid high-speed stops and turns, uneven terrain, and soft ground. Operation under these conditions may result in a roll over.
- Keep all safety shields in place when operating the harvester. They keep your hands and clothing out of moving parts.
- The harvester should be equipped with an effective fire extinguisher.
- Wear close-fitting clothing and stay alert to keep from becoming entangled in moving parts.
- Keep hands and feet away from moving parts Reduce travel speed when moving over rough or uneven Terrain.
- Cotton harvesters are top heavy even with empty Baskets.
- High-speed travel could result in a rollover.



- Keep your harvester safely away from ditches, creeks, and other steep, sloping ground.
- Keep end rows smooth and firm. Steep slopes and plowed turn rows make turning Difficult, and may cause a rollover.
- Reduce engine speed before braking or turning. Quick stops with the high-profile cotton pickers can result in in a serious head injury to anyone standing in the Wrong place on the operator's platform.
- Keep everyone away from module builders in the field.
- Be sure there is no one in the module builders before dumping.
- A load of cotton falling into a module builder could seriously injure or suffocate someone trapped inside.
- Be sure you're clear of electrical wires before raising or dumping a basket.
- A raised basket may reach a height of 25 feet, and if it makes contact with a power line, you could be electrocuted

2.2. Hand picking

Manual harvesting is harvesting cotton by hand

Labor tends to be scarce; there is high demand for agricultural workers to harvest “secondary” crops (Rice, corn, vegetables). As a consequence, cotton pickers were needed from outside the area.

This particularly the case for the third or even fourth passes, which were said to draw few local pickers because of the low productivity at that point in the harvest.





Fig.1.1 hand picking

2.3. Mechanical harvesting

Cotton is defoliated or desiccated prior to harvest. Defoliants are used on the taller varieties of cotton that are machine picked for lint and seed cotton, and desiccants usually are used on short, storm proof cotton varieties of lower yield that are harvested by mechanical stripper equipment. More than 99 percent of the national cotton area is harvested mechanically. The 2 principal harvest methods are machine picking, with 70 percent of the harvest from 61 percent of the area, and machine stripping, with 29 percent of the harvest from 39 percent of the area. Picking is practiced throughout the cotton and stripping is limited chiefly to the dry plains.

Defoliation may be defined as the process by which leaves are abscised from the plant. The Process may be initiated by drought stress, low temperatures, or disease or it may be chemically induced by topically applied defoliant agents or by over fertilization. The process helps lodged plants to return to an erect position, removes the leaves that can clog the spindles of the picking machine and stain the fiber, accelerates the opening of mature bolls, and reduces boll rots.

Desiccation by chemicals is the drying or rapid killing of the leaf blades and petioles, with the leaves remaining in a withered state on the plant. Harvest-aid chemicals are applied to cotton as water-based spray, either by aircraft or by a ground machine.

Mechanical cotton pickers, as the name implies, pick locks of seed cotton from open cotton Bolls and leave the empty burs and unopened bolls on the plant. Requiring only 1 operator, typical modern pickers are self-propelled and can simultaneously harvest 2 rows of cotton at a speed of 1.1 to 1.6 meters per second (m/s) (2.5 - 3.6 miles per hour [mph]). When the



picker basket gets filled with seed cotton, the machine is driven to a cotton trailer at the edge of the field. As the basket is hydraulically raised and tilted, the top swings open allowing the cotton to fall into the trailer. When the trailer is full, it is pulled from the field, usually by pickup truck, and taken to a cotton gin. Mechanical cotton strippers remove open and unopened bolls, along with burs, leaves, and stems from cotton plants, leaving only bare branches. Tractor-mounted, tractor-pulled, or self-propelled strippers require only 1 operator. They harvest from 1 to 4 rows of cotton at speeds of 1.8 to 2.7 m/s (4.0 - 6.0 mph). After the cotton is stripped, it enters a conveying system that carries it from the stripping unit to an elevator. Most conveyers utilize either augers or a series of rotating spike-toothed cylinders to move the cotton, accomplishing some cleaning by moving the cotton over Perforated, slotted, or wire mesh screen. Dry plant material (burs, stems, and leaves) is crushed and dropped through openings to the ground. Blown air is sometimes used to assist cleaning



Fig.1.2. machine harvesting

Self-Check -1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. A form of harvesting which is done by hand is _____(2pts.)
 - A) Machine picking
 - B) Mechanical harvesting
 - C) Hand picking
 - D) None
2. One of the following is different from others. (2pts)
 - A) Machine harvesting
 - B) Hand picking
 - C) Mechanical harvesting
 - D) All are different from each other.
3. Write at least four precautions during harvesting. (4 pts.)

Note: Satisfactory rating - 8 points

Unsatisfactory - below 8 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____



Short Answer Questions

1. _____

2. _____

3. _____

_____.

Information Sheet-3	Identifying settings and preparation for machinery operation
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3.1 Pre-start up visual checks, including safety requirements

Row Unit Maintenance and Adjustment

Proper row unit maintenance and adjustment are critical to maximizing harvest efficiency and preserving fiber quality. Several crop conditions play a large role in determining correct machine settings, such as

- The level of defoliation
- stalk diameter
- plant height and width
- Stalk and branch moisture content (brittleness).
- “Stripping aggressiveness” describes the duration and intensity of the harvesting action applied to the plants by the row units

3.2. maintenance checks and product setting requirements

3.2.1. Daily Pre-harvest Maintenance Checks

Daily maintenance of stripper harvesters is critical to ensuring worker safety, maintaining productivity, and prolonging machine life. The following are basic daily critical checkpoints to address before operation:

- Clean seed cotton from deck area, engine compartment, alternator screens, radiator coils, fan shroud, etc.
- Clean cotton buildup from finger grates, basket screens, and sensors in basket.
- Check to make sure the direction vane at the top of the conveying duct is set as desired to direct cotton either into the field cleaner or into the basket, depending on desired operation.
- Check field cleaner for damaged saws, residue buildup on saws, loose or damaged grid bars, loose belts, buildup of large debris, etc.
- Fill fuel tank and inspect tires for proper pressure and damage.
- Check engine oil, hydraulic fluid, and coolant levels.
- Check row units for plugged grate panels, plant stalks, excessively worn or damaged bats and brushes, worn bearings and gears, etc.
- Lubricate basket hydraulic cylinder pivots, basket rock shaft pivots, and basket vane pivot points.
- Lubricate steering axle pivot points and ball joints.
- Follow all recommended maintenance procedures according to manufacturer suggested intervals in the machine operator’s manual



3.2.2. Product requirement setting

High harvesting efficiency (leaving as little seed cotton in the field as possible) is critical to maintaining profitability, especially for farmers growing no irrigated crops. Harvesting efficiency for brush-roll strippers is high, usually in the range of 98-99%. However, some aspects of fiber quality (such as micronaire and length uniformity) can be reduced for stripped cotton due to the presence of immature fiber from bolls located at the top of the plant. The presence of immature fiber can also influence fiber length, strength, and color grade.

3.3. start-up procedures

After you complete daily pre-operation maintenance and checks, the machine is almost ready for field use. Before entering the field for harvest, properly warm up the machine and power up the field cleaner, fan, and row-unit drive systems in sequence. With the engine at low idle speed, engage the field cleaner, followed by the main fan, and then the row-unit drive. Initiating operation in this sequence allows for material remaining in the system to pass through without causing a choke downstream.

3.4. machine cleaning

Field Cleaner Maintenance and cleaning Cotton strippers produced since the late 1980s have included onboard field cleaners to help remove foreign material from stripped seed cotton. Field cleaners used on modern stripper harvesters are similar to two-saw stick machines used in cotton gin seed cotton

Cleaning systems. Field cleaners can remove approximately 50-60% of the initial foreign matter content in stripped seed cotton. Seed cotton containing approximately 30-35% foreign material is fed to the machine through the pneumatic conveying duct where wads of seed cotton are dispersed by the feeder cylinder and fed onto the primary cleaning cylinder.

Channel-type saws affixed to the surface of the cleaning cylinder grab the seed cotton and pull it over grid bars located around the outside of the saw cylinder. Large foreign material (such as sticks and burrs) and some seed cotton are removed through centrifugal force as the cotton is pulled across the grid bars. The material rejected by the primary cleaning cylinder is fed onto the reclaiming cylinder and pulled over a second set of grid bars where mostly large foreign material and small amounts of seed cotton are removed through centrifugal force. Seed cotton on the primary and reclaiming saw is removed by the doffing



brush at the back of the machine and discharged into an air stream leading to the harvester basket.

3.5. minor running problems

The Adjustments Causing Non-Conforming Outcomes:

To avoid non-conforming product the following units must be adjusted properly in ginning machine.

- Stripper roll spacing
- Combing pan spacing
- Machine travel speed

Self-Check -3	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is start-up procedure of ginning machine? (3 pts.)
2. Write at least 3 advantages of cleaning machine before ginning. (3 pts.)
3. What are safety precautions during operating? (3 pts.)

Note: Satisfactory rating – 9 points

Unsatisfactory - below 9 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions

1. _____



2.

3.

Information Sheet-4	Checking seed cotton for ginning requirements
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4.1. Cotton fiber characteristics

The Selection Criteria of Seed Cotton: quality is one of the most important aspects of producing a profitable cotton crop. The factors that determine cotton quality are:

Leaf grade: Leaf grade refers to the leaf or trash content in the cotton. Graded on a scale of 1 to 8, leaf grade is determined by human classers who compare a lint sample to Universal



standards for the grades. A leaf grade of 8 is referred to as “below grade”, and can result in large price discounts.

Fiber length: Fiber length is primarily determined by cotton variety, but growing conditions and fertility can affect length as well. Night time temperatures of 60-70°F are optimum for fiber length development. Temperatures above or below this range result in shorter fibers. Reduced length can also result from deficit or excess soil moisture levels.

Length uniformity: Length uniformity is the ratio between the mean length of fiber and the upper half mean length expressed as the field has to be subjected to various treatments in the ginning factories depending upon its inherent characteristics such as trash contents, moisture contents, length of the fiber, variety of seed i.e. fuzzy or black, method of seed cotton transportation, storage practices, handling a percentage. Low uniformity values are a function of fibers that are more easily broken.

Strength: Strength is measured by clamping and breaking the beard of fibers with an 1/8-inch gage spacing between the clamp jaws. The strength reported is the force in grams required to break a bundle of fibers one tex unit in size.

Micronaire: Micronaire (mike) is a measure of the fineness of the cotton fiber. Unlike fiber length, mike is determined more by environmental conditions than variety. Mike is developed after the full fiber length is obtained.

Trash: Trash is a measurement of trash present in the lint. The measurement is made by the HVI video trash meter which measures the percentage area and particle count of trash on the sample surface. This measurement provides an estimate of the total amount of trash in the bale.

Color: Color is the measure of grayness and yellowness of the lint. Reported as a two-digit code as measured by the HVI, color usually is not affected by variety.

Moisture: The Roller Gins can take up to 10-11% moisture but above that the drying process should be adopted before feeding the seed cotton to the ginning machines and the moisture contents should be brought down to below 10% before ginning.

Self-Check –4	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. The measure of grayness and yellowness of the lint is_____. (1 pts.)
A) Maturity



- B) Fiber length
- C) Color
- D) Strength
- E) none

2. _____ is a measure of the fineness of the cotton fiber. (1 pts.)

- A) Color
- B) Trash content
- C) Macronaire
- D) Strength
- E) all

3. _____ is measured by clamping and breaking the beard of fibers with an 1/8-inch gage spacing between the clamp jaws. (1 pts.)

- A) Strength
- B) Trash
- C) Color
- D) All of the above

4. List down the quality parameters of cotton fiber. (4 pts.)

Note: Satisfactory rating -above 5 points points

Unsatisfactory - below 5

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions

1. _____
2. _____
3. _____



4. _____

Information Sheet-5	Recording and reporting non-conforming materials
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5. Recording and reporting non-conforming materials

The following table summarizes how to record and report the non-conforming material in ginning process:

Please list all non-conformities (NCs) in the table blow

Chain	of	Description of non-	Grading	Deadline to	comments
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custody Requirement no.	conformity	major	minor	close NC	
<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		

Note: a non- conformity (NC) is graded as minor if it is isolated event that is limited in temporal and spatial scale where an effective management was in place that should have prevented and detected the issue. A NC can also be graded as **minor** if it does not result in fundamental failure to achieve the objective relevant requirement

A non-conformity (NC) is graded as **major** if it result in, or is likely to result, in a fundamental failure to achieve the objective of the relevant requirement.

Self-Check –5	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:



1. What are non-conforming materials in ginning process? (4 pts.)
2. Complete the above table as a sample. (6 pts.)

**Note: Satisfactory rating -above 7 points
points**

Unsatisfactory - below 7

Score = _____

Rating: _____

Name: _____

Date: _____

Answer Sheet



1. _____

2. Draw the table and fill the elements

Information Sheet-6	Keeping machine clean
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6. Keeping area/machine clean

Area around the machine is kept clean during setting and loading as per standard and safety procedures.

This includes



- Cleaning dust from machine
- Checking and lubricating moving parts
- Removing cotton and other process remains
- Applying kaizen principle to the working area

Preventive maintenance and good housekeeping are essential to an effective loss control program because they increase production and help reduce the chance of fires, property loss, and injuries due to accidents. In addition to cleanliness, good housekeeping also means an orderly flow and arrangement of all materials. The following is an example of gin housekeeping procedures that include some preventive maintenance:

1. Clean floor and coffee area daily.
2. Empty trash cans.
3. Clean heater screens.
4. Clean restrooms each shift.
5. Check magnets when gin is shut down.
6. Clean air compressor air filters.
7. Empty barrels under rock catcher.
8. Blow out all motors at least every other day.
9. Blow down gin each shift, including all catwalks.
10. Clean the following daily: battery condenser, lint flue, lint cleaners, extractor feeders (back and front), incline cleaners, conveyor distributor, V-trench and seed conveyors, field control paddles, oil chains (when needed), and air conditioner filters.
11. During downtime, clean the following: all pits, seed cotton separators, airline separators, lint cleaner fans, humid air units, and the seed blower filter.
12. Also during downtime, do the following: Check for wads in tower dryers, blow down gin, blow out motor brakes, clean counter flow belly and check vacuum, and oil chains in seed pit.

Self-Check –4	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. How can you make working area clean? (5 pts.)



Note: Satisfactory rating -above 3 points points

Unsatisfactory - below 3

Score = _____

Rating: _____

Name: _____

Date: _____

Answer Sheet

1. _____


