TKP3501
Agricultural Mechanization

Topic 6e: Crop Production
  >>Harvesting

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Outline

- Purpose of harvesting
- Type of machinery in
  - Grain i.e. Rice
  - Other crop (e.g. Tapioca)
  - Oil palm
  - Bailer
Combine harvester

Price tag: $$$K
Harvesting equipment is equipment used to pick, reap, or otherwise gather crops. Different types of crops require different types of equipment. Harvesting equipment includes combines, pickers, balers, and mowers.

A combine is a machine used to harvest crops as it moves across a field.

– The head of the combine runs through the crop rows and cuts the stalks of the plants. The plants are then pulled through the machine and the grain is separated from the plant material.

– Corn, soybeans, wheat, barley, and rice are typically harvested with combines.
Combine harvester

- Involves
  - Cutting
  - Threshing
  - Grain cleaning
    - winnower
Fig. 4: Details of a tractor operated combine harvester.
Fig. 5: Cutter bar assembly of a combine harvester.
Thresher system

Source: CIRAD

http://www.fao.org/docrep/t1838e/t1838e0p.htm
Fig. 6: Threshing unit of a combine harvester.
Fig. 7: Cleaning unit of a combine harvester.
Fig. 8: Crop flow in combine
Total grain input (kg) - unthreshed grain from all outlets (kg)

Thresholding efficiency (%) = \frac{\text{Quantity of threshed grain obtained at ‘Bhusa’ outlet (kg)}}{\text{Total grain input (kg)}} \times 100

Blown grain (%) = \frac{\text{Quantity of damaged grain from all outlets (kg)}}{\text{Total grain input (kg)}} \times 100

Healthy grain obtained at sieve overflow + sieve underflow + struck grain (kg)

Sieve loss (%) = \frac{\text{Healthy grain obtained at sieve overflow + sieve underflow + struck grain (kg)}}{\text{Total grain input (kg)}} \times 100

Cleaning efficiency: It is the percentage clean grain in the total grain obtained from the main grain outlet. It is affected by various factors such as crop mat thickness, crop mat velocity, cylinder speed, concave clearance, spike shape etc.

Total grain received at main grain outlet (kg) - refraction

Cleaning efficiency (%) = \frac{\text{Total grain received at main grain outlet (kg)}}{\text{At main grain outlets (kg)}} \times 100

Total Loss = Unthreshed grain + blown grain + cracked grain + sieve loss
Grain collected from 1 m$^2$ area after harvest – grain
Collected from same area before harvest

Header Loss ($\%$) = \[\frac{\text{Unthreshed grain collected from straw rack & sieve}}{\text{Gross Yield}}\] \times 100

Cylinder Loss ($\%$) = \[\frac{\text{Unthreshed grain collected from straw rack & sieve}}{\text{Gross Yield}}\] \times 100
Picker
A picker is a machine used to harvest crops by picking. Cotton is the most common crop harvested with a picker.

A mower is a piece of equipment used to cut standing vegetation. Mowers are used to harvest forage crops, such as grass and alfalfa. After mowing, the crop may be left in rows to dry and be picked up by a baler.
A baler is a piece of equipment used to harvest forage crops that have been cut, dried, and placed in rows. The baler is pulled behind a tractor and picks the dried vegetation up off the ground.

Inside the baler, the material is tightly packed or wound into round or rectangular bales. When the bale reaches the proper size, the machine wraps the bale with wire or twine to secure it.
Bailer
GPS

- Distances from satellites to the receiver can be quickly measured. Computers calculate the exact location of the receiver.
  - GPS receivers are generally located on equipment that moves over a field.
  - GPS systems can precisely guide tractors and equipment through a field and program computers to deliver precise amounts of seed, fertilizer, or herbicide to plants in variable amounts.
A Geographic Information System (GIS) is a system used with GPS to make maps or grids of a field. These maps give a farmer data about soil conditions, crop yield, and other information so he or she can make decisions needed to improve the crops in the field.
When to harvest? What crop? Factors to consider?
Grain harvesting
Small scale vs large scale production
Benefits
The crop should be harvested at its correct ripeness with minimum damage and taken out of the field or farm as soon as possible.

Various kinds of harvesting machines have been developed including the combined paddy harvester, sugar cane harvester, hand-held tea leaves harvester, tree shaker and equipment for harvesting oil palm fresh fruit bunch and loose fruit collection.
Harvest equipment
Sickle-bar Mower
Rotary Mower

New double-decker rotary cutters
Flail Mower
Windrower
Round Baler
Square Baler
Side-delivery Rake

Note the Windrow
Compact thresher

• 10 HP Electronic Motor or 5 HP Electric Motor & also with 8-10 Diesel Engine.
• Capacity of 1 Acre per hour
• thresh Maize & throw out corn cube
Fig. 2: Different types of crop feeding systems.
Fig. 3: Different types of threshing cylinders.
Power source

- Manual-simple machine
- Tractor
- Motor or
- Engine
Trailed-type

Independent power source from tractor
Drawbar mounted

Source: CIRAD
Forage Harvester
QUESTIONS/REVIEWS

- Advantage and disadvantages of using machineries in harvesting
- How to harvest the crop for fiber? What machine suitable and mechanism involve?
Thank you.