

8. Harvesting Machineries

Traditional harvesting method

Harvesting with the sickle

- More laborious
- Time consuming
- Difficult task
- Dangerous

6 -12 labors are required to harvest 1 acre field



Harvesting Machinery

- Cutter bar – cutting only
- Paddy reaper – use to cutting and making rows
- Combine harvester – cutting, threshing, cleaning and collecting

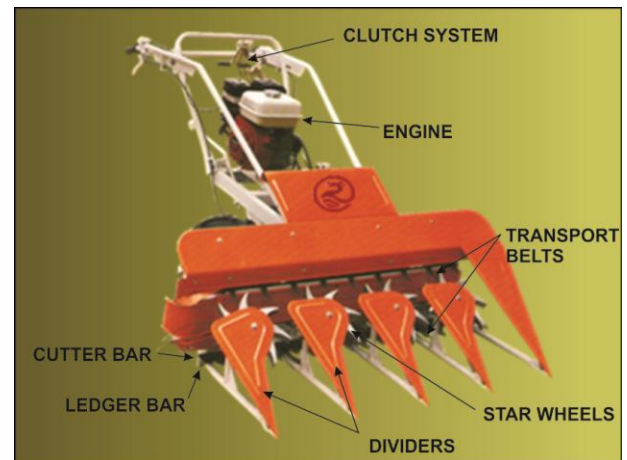
Cutter bar (two wheel tractor attachment)



- Compatible tractor – Kubota K75
- Cutting width - 1.2 m
- Suitable forward speed - 2.8 – 5 km/hr
- (speed should be decided according to the plant density)
 - If, plant density is high – lower speed
 - For dried plants – higher speed
- Field capacity – 0.2 -0.3 ha/ hr

Paddy reaper

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 - For dried plants – higher speed
- Field capacity – 0.2 -0.3 ha/ hr
- Number of workers – 3
- Loss – 1%



Main parts of the machine

- Dividers and star wheel - Dividing and lifting
- Springs – keep the cut plants vertically
- Transport belts – send the cut plants towards right side
- Cutter bar – Moving part of the blade
- Ledger bar – Non moving part of the blade
- Main drive pulley
- Clutch system

Important factors for a higher efficiency of the machine

- Large rectangular plots – to reduce the time wastage for turning
- Sort bunds – to move from plot to plot easily
- logging resistance varieties
- Uniform land
- Weeds free conditions
- Favorable moisture content in the plot –water supply should be stopped before 7-10 days
- Height of the plant – The height should be 60 cm – 90 cm

Combine harvester

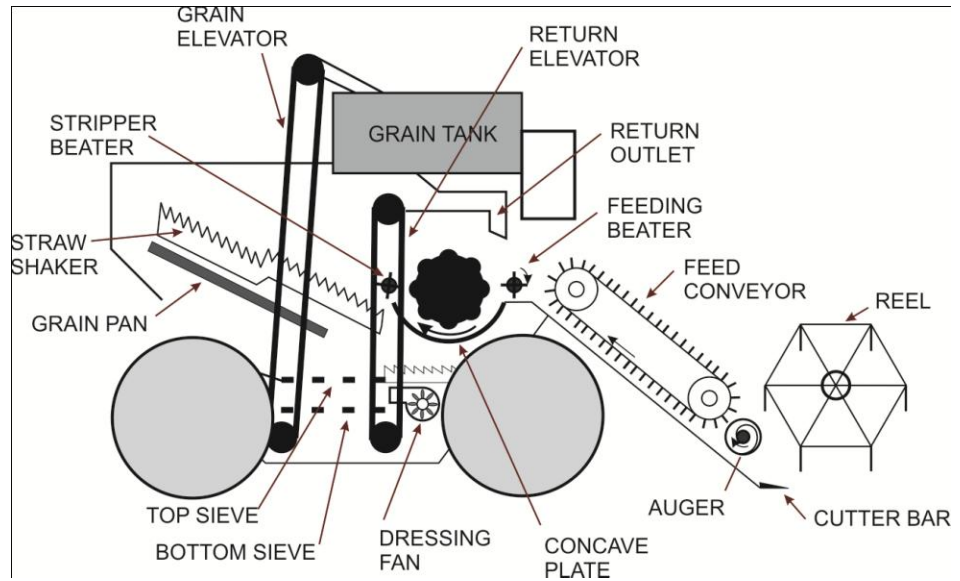
Two main types

- Full feeding combine harvesters
Matured plants are cut at the ground level and feed to the machine. Straw will be removed and grain will be collected to a storage tank

- Head feeding Combine harvesters
Matured plants are cut at the ground level and conveyed, but only panicle is feed to the threshing unit.

Main units of a Combine harvester

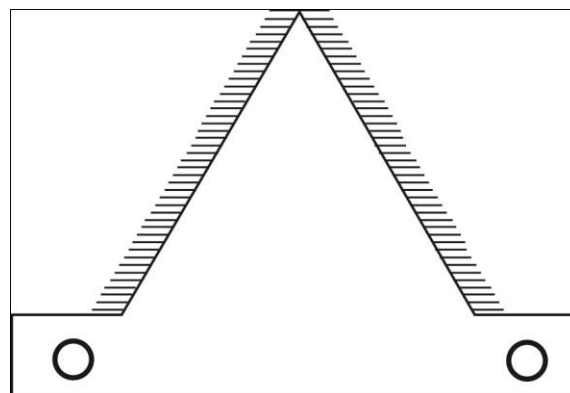
- Header unit
- Conveyor unit
- Threshing unit
- Winnowing unit
- Straw discharging unit
- Grain discharging unit
- Traveling unit with engine
- Transmission unit



Cutter Bar

Its' series of fingers are spaced at equal intervals. In some combine harvesters, the fingers are longer, as also are the knife sections.

This increased length of section influences the angle of the cutting edges, giving a slightly greater shearing, as opposed slicing action.



Reel

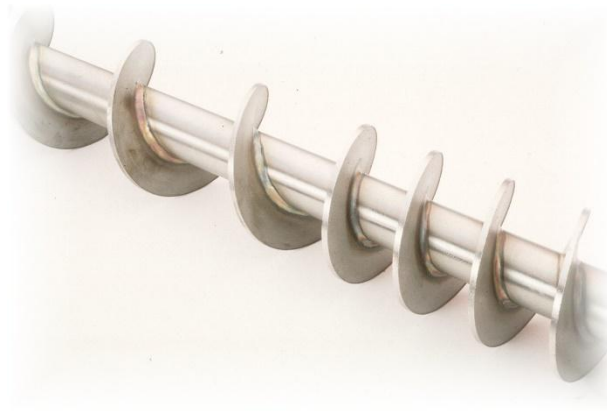
Positioned above the knife, where it rotates & gathers the crop into the machine as the cut is made.

It is chain or belt driven & its position is adjustable to accommodate different straw lengths & crop conditions.

Auger

Only on combines harvesters

Width is equal to the cutter bar width and substantially greater than the threshing cylinder width.

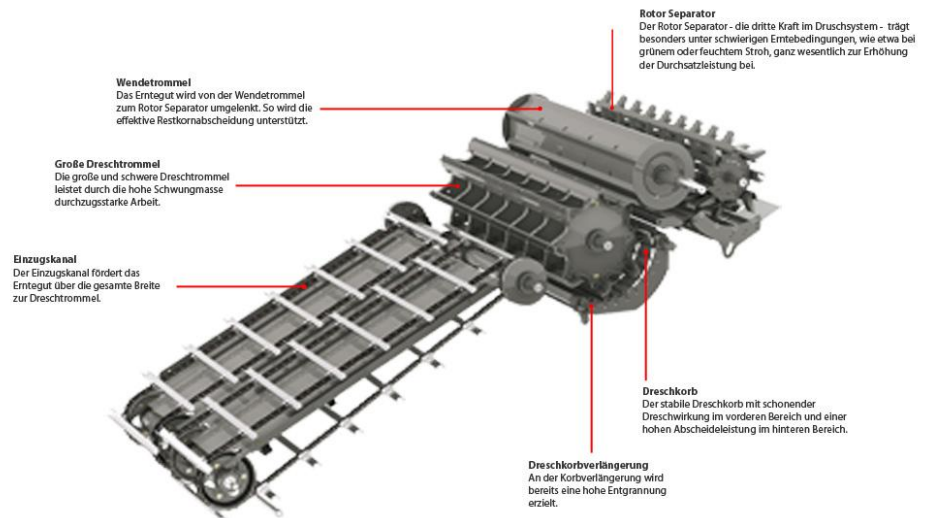


Feed conveyor

Carries the crop upwards & backwards to the feeder, beater & threshing-cylinder.

On machines with auger, it is usually of the chain & slat type.

On machines without an auger it takes the form of a rubber or canvas conveyor fitted with wood or metal cross salts.



Header

The header is the complete assembling which embodies all the above-mentioned components namely the cutter bar, the reel, the auger & the feed conveyor.

Feeder beater

Is positioned between the top of the feed conveyor & the front of the threshing mechanism. It rotates in the same direction as cylinder, speeding up the flow of the crop & evening out slight irregularities in its volume.

Cylinder (Drum) & concave

They are two vital components, comprising the threshing mechanism of the machine, & are sometimes referred to as the heart of the combine.

They perform two functions.

- The extraction of grains from the ear
- Separation of grains from straw

The cylinder (drum) has its periphery made up of a series of beater bars

Cylinder rotates on its spindle at high speed.

This rotation draws the crop in between the beater bars of the cylinder & the cross bars of the concave & rubs the grain out of the ears in the process.

Once extracted from the ear, the bulk of the grain passes down through the grid structure of the concave formed by the wire separators, on to the sieves located in the shaker shoe beneath, whilst the straw is directed by a delivery grid on to the stripper beater.

Controllers of threshing intensity

Cylinder speed

Concave/ beater bar clearance

Stripper beater

Similar to feeder beater.

It is behind & slightly above the cylinder, & it controls the transfer of the threshed straw from the concave to the straw shakers.

Without the beaker, straw would be thrown clear of the front of the shakers & receive inadequate agitation.

Helps to prevent straw wrapping around cylinder a tendency which can arise in certain crop conditions.



Straw shaker

During threshing process, some kernels of grain inevitably fail to pass through the concave & are instead discharged along with the straw.

To receive this grain the straw is agitated either by wide, one-piece reciprocating shaker or by number of narrow shakers working with an oscillating action.

Extended well forward to collect also the main flow of grain from the concave.

On some machines, it reciprocates in opposing directions to shaker shoe or to the one-piece straw shaker to reduce vibration. The pan discharges the grain on to the top sieve.



Top (chaffer) sieve

The next stage in the process is the sifting& cleaning of the grain.

Although most of the straw will have been diverted, there will still be short lengths of this, together with carvings, dust & size & weights of these materials enable them to be separated by sifting & winnowing.

Bottom (cleaning) sieve

The bottom sieve performs the second & on most machines, final sifting & winnowing of the grain, although some machines do have facilities for further cleaning & grading of the sample. Action is similar to that of the top sieve, & it is located in the same shaker shoe.

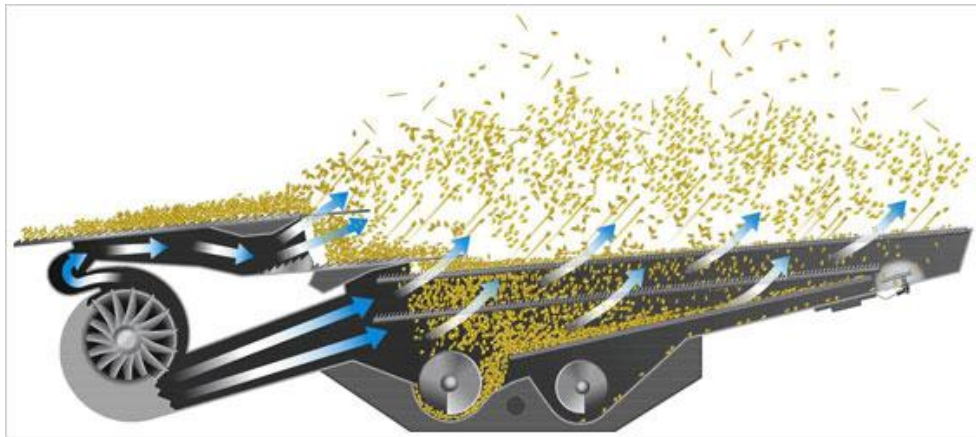
May be adjustable or inter-changeable for the harvesting of the harvesting of various sized cereals.

Dressing fan

Works in conjunction with the sieves to separate light trash from the grain.

The conventional position for the fan is approximately beneath the concave & in front of the shaker shoe.

Various adjustments are provided to control the volume & direction of the air stream it delivers.



Shaker shoe

Is a frame work & housing which embodies the top & bottom sieves.

It reciprocates by means of a pitman connected to a crank or concentric drive.

Grain trough and elevator

The grain trough is located immediately beneath the bottom sieve to collect grain.

At the bottom of trough, an auger conveys the grain to one side of the machine & discharges it into the base of an elevator.

Returns system

The ears of some varieties of wheat & barley have tendency to break off, & it is possible for these to pass through the concave, & to reach the sieves un threshed.

This tendency can be further aggravated by incorrect concave, setting & by the absence of one or more wires which form the grid structure of the concave.

Normal sieve settings don't allow such un threshed heads to pass through to the grain hopper, so without the returns system they would be discharged on to the ground at the rear of the machine.

To prevent this, a separate hopper is fitted at the rear of the shaker shoe & beneath the top sieve extension which as mentioned earlier, has wider apertures than the sieve proper.



Important factors for a higher efficiency of the machine

- Skilled operator
- Large rectangular plots – more than 0.25 acres
- Sort bunds – to move from plot to plot easily
- logging resistance varieties
- Uniform land
- Weeds free conditions
- Favorable moisture content in the plot –water supply should be stopped before 7-10days
- Moisture content of plants – 23% - 28%
- Height of the plant – The height should be 60 cm – 90 cm
- Proper daily maintenance

Safety precautions

Ensure that all guards are correctly fitted before work begins & after any adjustments necessitating their removal.

Don't attempt to either lubricate or adjust the machine's mechanism while it is running.

Don't smoke when refueling petrol- engine machines. Clear the exhaust manifold of chaff & straw frequently.

Avoid placing limbs under the feed table when carrying out repairs or when fitting the pick-up attachment.

Ensure that threshing mechanism is out of gear, and even then check that no one is in contact with moving parts of the machine before starting the engine or P.T.O. drive.

Don't pull away or stop abruptly with a man riding on the bagger platform.

Never attempt to clean blockages at the cutter bar, feed table or grain elevators with the mechanism running.