

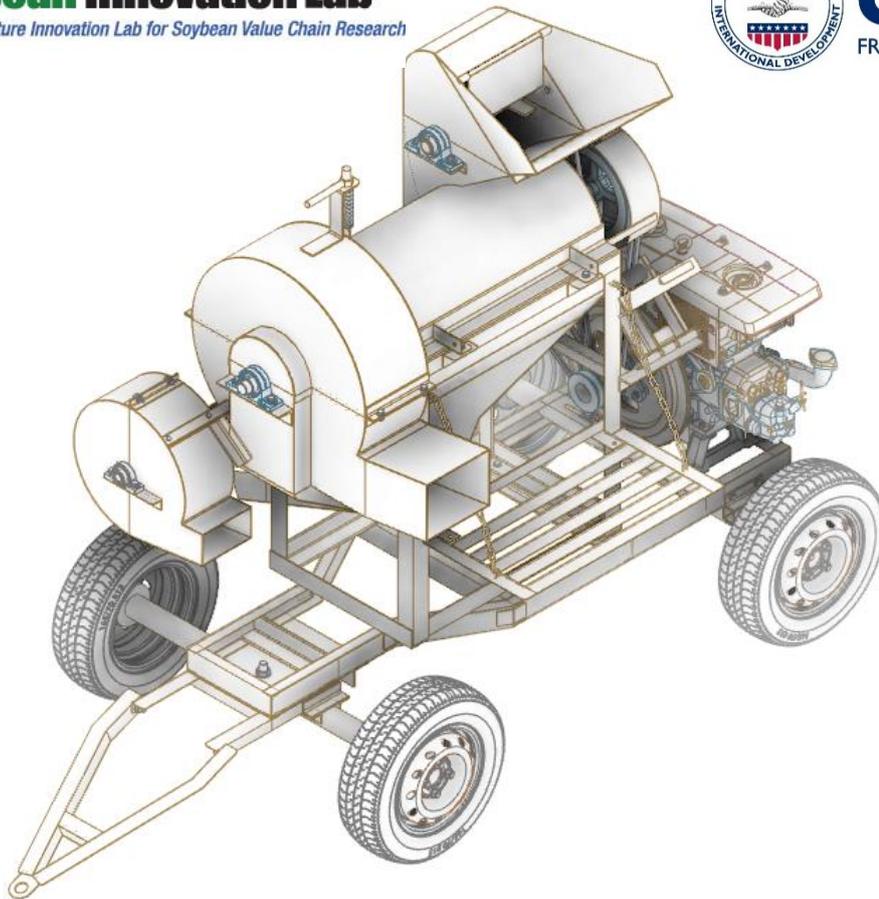


FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



USAID
FROM THE AMERICAN PEOPLE



SIL MULTI-CROP THRESHER

MAINTENANCE AND OPERATION MANUAL

Before using this product, please read these instructions carefully.

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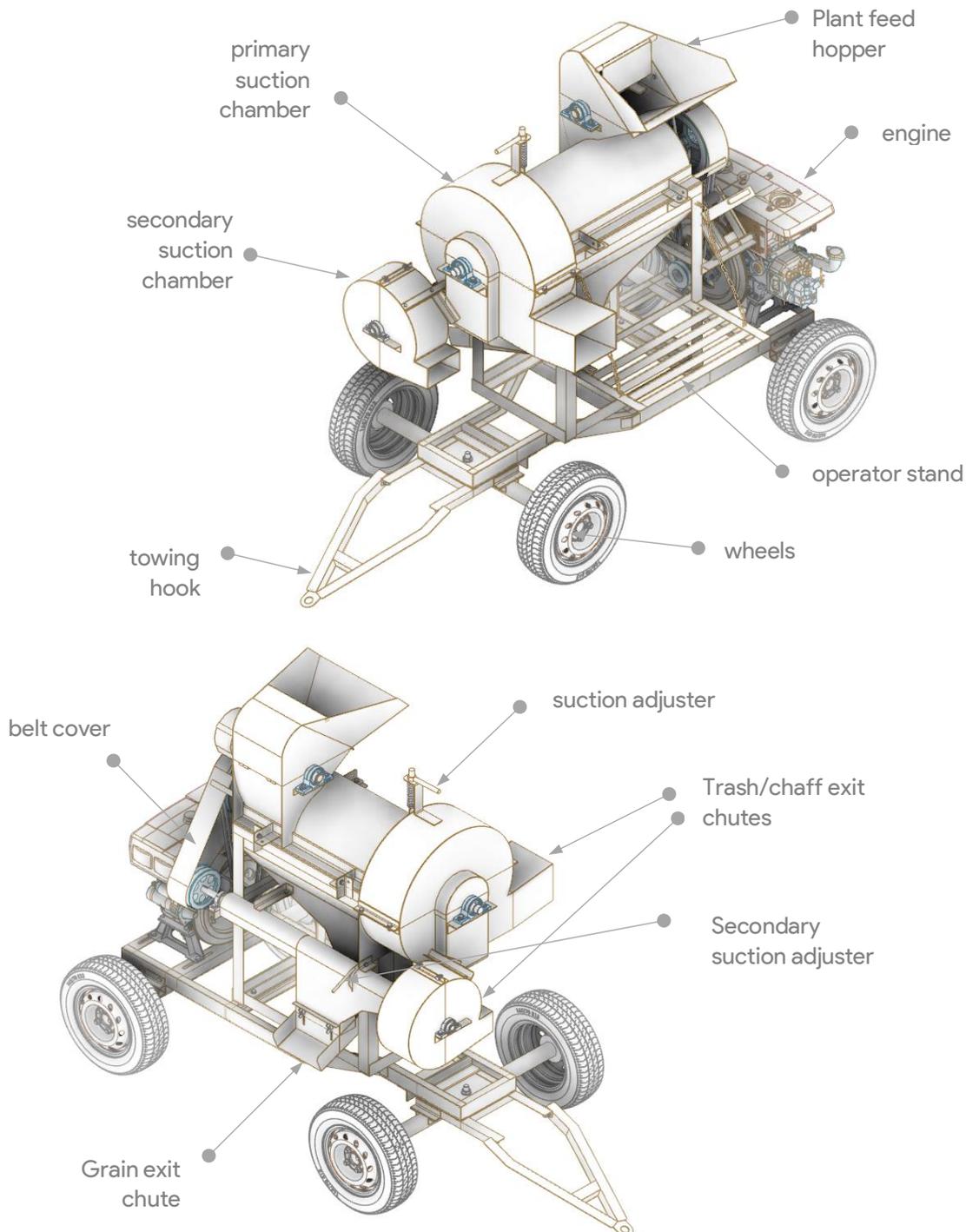
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Introduction

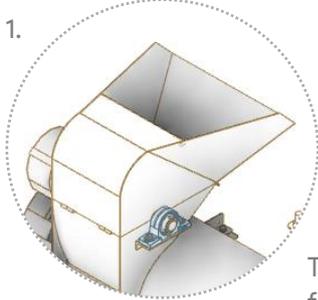
The multi-crop thresher is agricultural equipment that mechanically separates grains from the crop. It can thresh a variety of crops such as maize, soya, rice, millet, cowpea, bambara beans, sorghum, among others. It can be powered by a ZS1115 diesel engine from 16HP to 24HP with maximum speed around 2200rpm. The engine comes in two variants; a combination of key-start and hand cranking or an entirely hand cranking one.

Product Layout



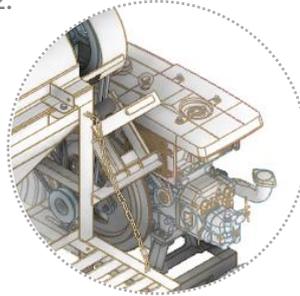
Functions of Parts

1.



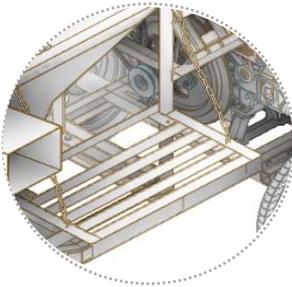
The **hopper** is used to feed the multi-crop thresher

2.



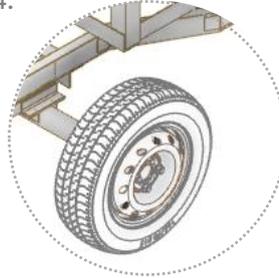
The **engine** powers the multi-crop thresher

3.



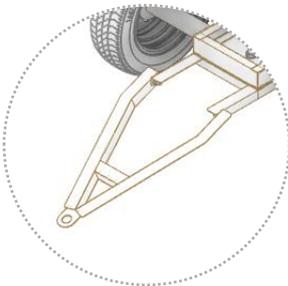
The **operator stand** serves as the platform the operator stands on to operate the product

4.



The **wheels** are used to easily transport the product

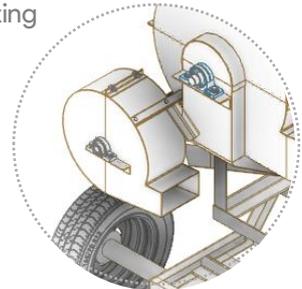
5.



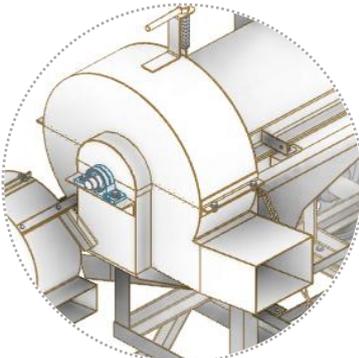
The **towing hook** is used to couple the product to a vehicle

6.

The **secondary suction chamber** comes in handy in further extracting chaff from the output.



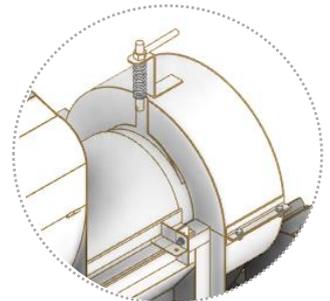
7.



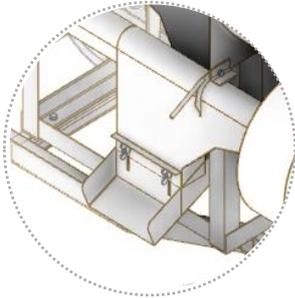
The **primary suction chamber** is the main extractor of chaff from the output.

8.

The **suction adjuster** regulates the amount of chaff to be sucked. Both suction chambers have air



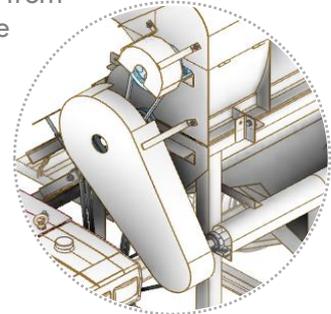
9.



The **chute** is the channel used to receive the threshed grains.

10.

The **belt cover** protects user from hazards of the moving belts.



General Instructions

Observe the following general rules DAILY before operating the multi-crop thresher

1. Wear protective clothing to fully cover the body and eyes and nose (e.g. overall coats, long-sleeved shirt with a pair of trouser, safety goggles, face mask). *The husks of crops being threshed are itchy and can be irritating when they get into contact with the skin, eyes or lungs. Seeds can fly out and damage unprotected eyes.*
2. Ensure DAILY that all bolts are tightened firmly.
3. Ensure that all bearings are greased DAILY
4. Inspect that the belts are in good shape without cracks and tear.
5. Put enough fuel into the fuel tank.
6. Check the engine oil level is adequate and add if necessary.
7. Put adequate clean water into the water tank.
8. Check DAILY for broken welds or other issues and fix immediately

What to Avoid When Operation Is On-Going.

1. DO NOT touch engine or engine water when hot
2. DO NOT touch belt while the pulley is rotating.
3. Avoid feeding earheads, cobs or pods by hand. Emptying from a bowl or bucket keeps hands away from moving parts
4. DO NOT operate under the influence of intoxicants such as alcohol.
5. DO NOT smoke or light fire near the threshing yard and thresher.
6. Discourage children and aged persons from feeding the hopper and loitering around the operation area.
7. Avoid wearing loose dress, bangles, watch, etc. while working.
8. The pulleys and belts are dangerous and can harm people. DO NOT operate machine without belt guards.

Engine Maintenance and Operation Instructions

Please note that the engine unit used on your machine may differ in form, however the parts are generally the same.

Assembling the engine

The engine purchased from the dealer would usually come not fully assembled, and would have to be assembled based on the instruction in the manual provided with the engine.

Before starting the engine

Before starting the engine, ensure the following is done;

1. The bolts holding the engine to the chassis are tight
2. The water level in the water tank is at the optimum level. Engine is run with coolant compartment open at top to allow venting of water vapor
3. The oil level in the engine is at the optimum level
4. There is sufficient fuel in the fuel tank.

Engine Maintenance

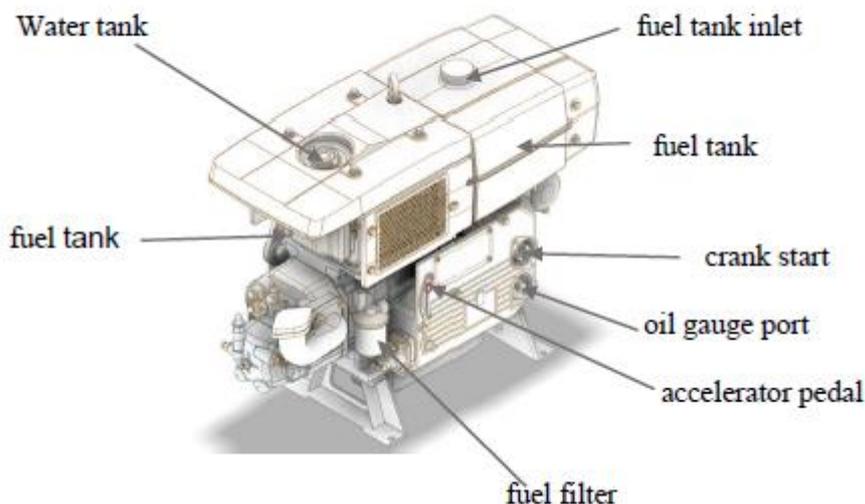
Engine takes 50 hours to break in well when new.

Use 30# engine oil. Engine oil reservoir holds 2.5 kg of oil.

Change engine oil after every 100 hours of use.

Check oil daily. Level should be between two marks on dipstick.

Check water daily and throughout the day. Float should be at highest position. Only use clean water

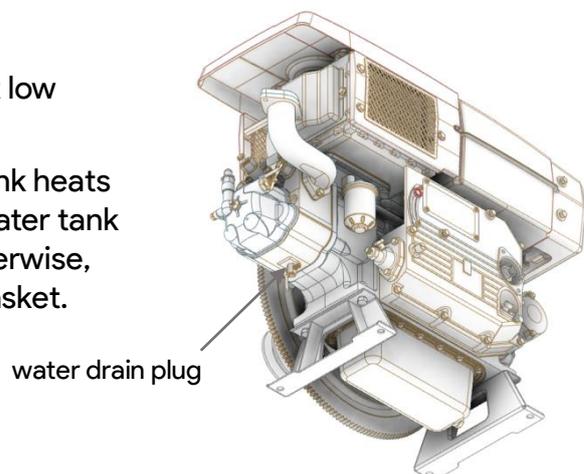
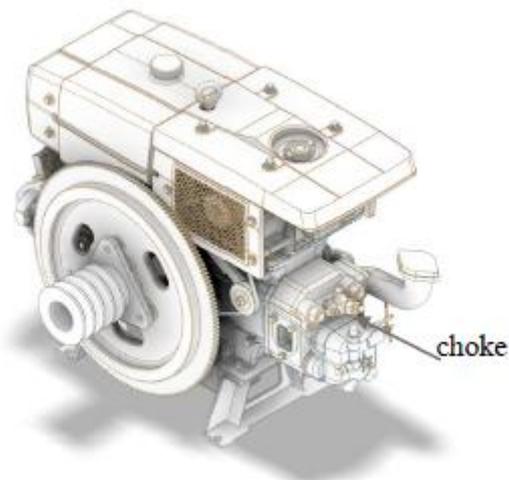


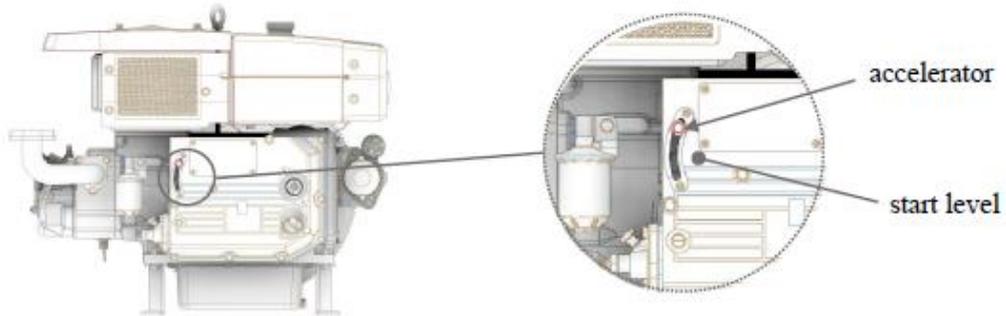
Engine Maintenance Chart

Item	Description	Hours		
		8	100	300
Diesel system	Clean and wash filling screen	X		
	Clean or replace filter			X
	Clean fuel tank		X	X
Engine Oil	Check and fill engine oil	X		
	Replace with new oil and clean sump		X	
	Clean or change oil filter		X	X
	Clean or change air filter		X	X
Cooling Water	Check and fill water	X		
	Drain out cooling water	X		
	Clean water channel	X		
Other	Adjust gaps of valves			X
	Check and tighten bolts and nuts	X		
	Check wear of all moving parts			X

Starting the engine

1. Pull down the accelerator pedal to the start level and tighten the knob.
2. Insert the crank handle into the crank start port.
3. While holding down the choke, crank the engine progressively until smoke appears from the exhaust and the engine starts
4. Quickly release the choke and pull the crank handle out at this point. Leaving the crank handle in a running engine can cause injury or death from it becoming a flying projectile.
5. After starting, let engine run for 5 minutes at low speed
6. As the engine runs, the water in the water tank heats up, at such points it is advised to leave the water tank inlet open to allow the water evaporate. Otherwise, you could risk burning up the engine head gasket.
7. Stop engine immediately if abnormal sounds are heard or if there is persistent black smoke



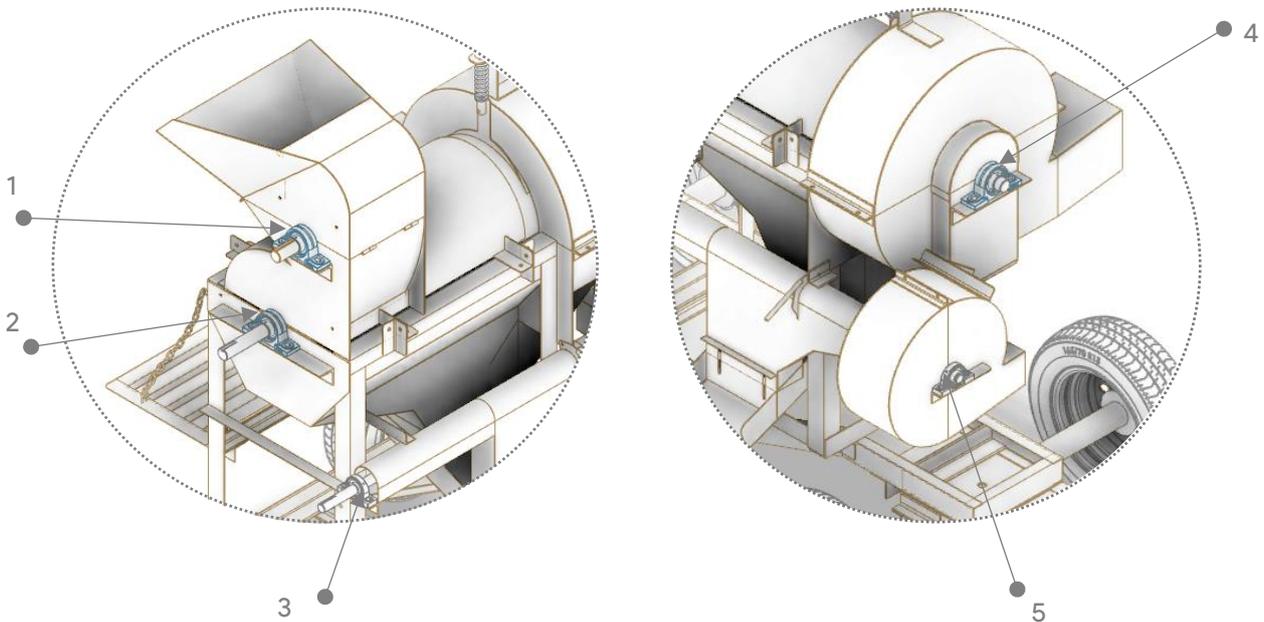


Maintenance of the Thresher

Lubrication of bearings

Grease bearings daily: Grease should move into bearing and should not come out around grease nipple. If it does come out around grease nipple, grease gun may need to be placed more tightly on the nipple. Failure to apply regular grease will lead to early bearing failure

Lubrication Points



Bearings Used

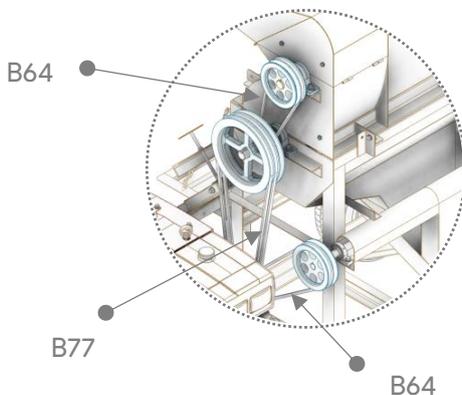
1. Pillow Block Unit: UCP205
2. Pillow Block Unit: UCP208
3. Pillow Block Unit: UCP205
4. Pillow Block Unit: UCF208
5. Pillow Block Unit: UCF205

Frame and Structure

- Tighten all nuts and bolts on machine and frame before use each day
- Failure to tighten nuts and bolts daily may result in machine failure
- Check for worn or damaged welds or metal parts and fix immediately
- Tire air pressure should be checked and maintained daily
- Cut up tire pieces can be placed under the engine mounts and the frame to reduce vibration

Belts used: B - Type Belts

Three belts are used on the thresher and are approximately the sizes listed below. Measure your belts before buying new ones as some belt sizes are dependent on manufacturing processes and may differ between machines. Use type B belts



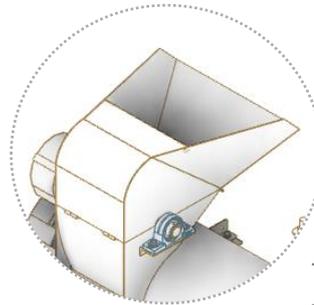
Operation of the Thresher

Operators and Set-Up

1. About 3 people (including operator) are needed for a smooth threshing operation. *The more hands you have, the faster the machine can be fed.*
2. The operator should stand firmly on the operator stand provided for feeding the thresher.
3. About 2 people should fetch the crop (earheads, cobs, pods, plants, etc.) into a container eg. basin to feed the thresher while the operator collects the container and empties the content into the hopper.
4. One other person collects the threshed grain through the chute into another container (bowl or bag).
5. Cover the immediate ground where threshing would take place to about 2m radius away from the thresher with a plastic sheet or tarpaulin for a cleaner operation. *Some grains may fall from the hopper and the outlet*

Threshing Crops

- Feed plants into the hopper at the top
- Do not use a stick or hands to force plant material in. Let it feed in naturally
- Sticking your hand into the hopper could result in serious injury or death.
- Do not shove large amounts of plant material into the hopper at one time or the thresher will jam and stop.
- Feed in an even and consistent pattern.
- If the thresher jams and stops, you will have to open the lid and remove the jam by hand.
- Causing the thresher to jam by overfeeding it crop material slows down the threshing operation significantly.
- Grain and plants that are threshed at high moisture are likely to jam.
- Overly dry crops may experience seed breakage when threshed.



The **hopper** is used to feed the multi-crop thresher

Preferred Moisture Content for Threshing by Crop Type

Crop	Moisture Content in Percentage (%)
Bambara bean	5.3-12.2
Cowpea	10-15
Maize	< 20
Millet	14-20
Rice	20-25
Sorghum	13-14
Soybean	10-14

Crops

- Leave the dried husk on the maize ears (cobs)
- Soya plants can be threshed whole
- Cut heads off millet and sorghum stalks to feed into machine
- Rice stalks can be threshed whole but less stalk makes faster threshing with less straw produced
- Bean plants can be threshed whole or pods can be threshed

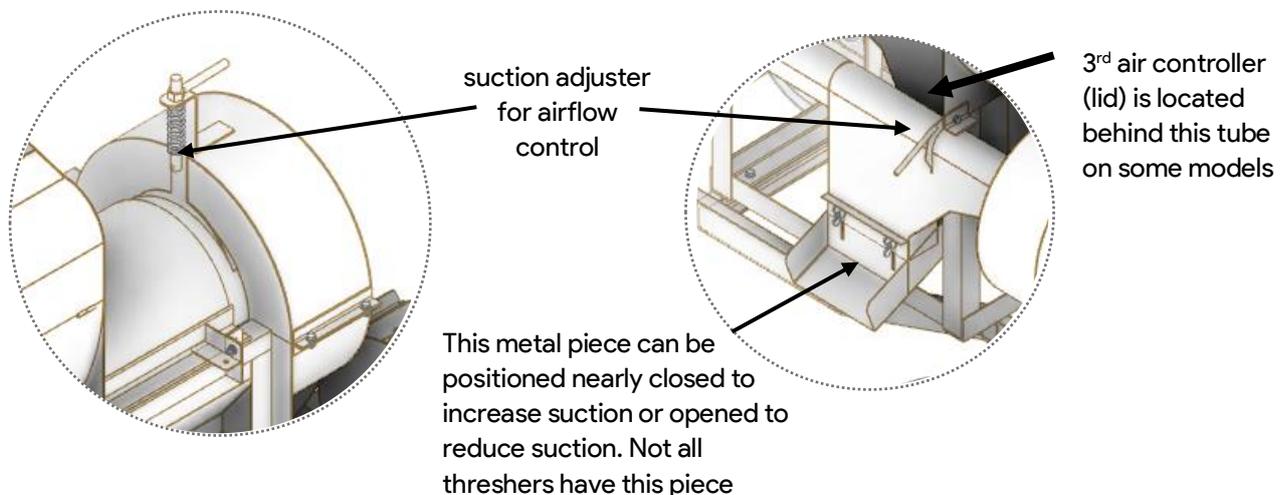
Speed of Operation

- The speed at which to run the engine during threshing depends on the crop being threshed
- Maize, sorghum, millet and rice can be threshed at higher speeds
- Beans, including cowpea, pigeon pea, common bean and soybean must be threshed at a much lower speed or the seeds will break.
- At low speed, the thresher will not remove chaff (straw) as well as it does at high speed.
- The thresher should be run as fast as possible but at a speed that does not lead to seed breakage

- If seeds are being broken, slow the engine speed down until breakage stops
- Breakage can also be a result of the sieve holes being too small compared to the grain size.

Air Flow Control

- There are 2-3 air flow controllers on the thresher that control the removal of chaff (straw) and can also affect grain loss
- There is one controller on the main suction fan and 1-2 controllers on the secondary suction fan (depends on the model of thresher you have).
- The two main controllers should be open to remove the most chaff and closed when grain is being lost.
- During threshing, multiple and ongoing adjustment of the air controllers may be necessary
- If grains are being thrown out with the chaff, close the air controller doors enough to get this to stop. Complete closure may result in incomplete chaff removal and straw trash in the end product
- On the secondary fan, one controller is on the air delivery tube
 - The second is a small lid (no shown in diagrams) behind the air delivery tube on the secondary suction fan and it should be closed for maximum chaff removal and opened if grain loss is a problem (this is the opposite of the main controllers).

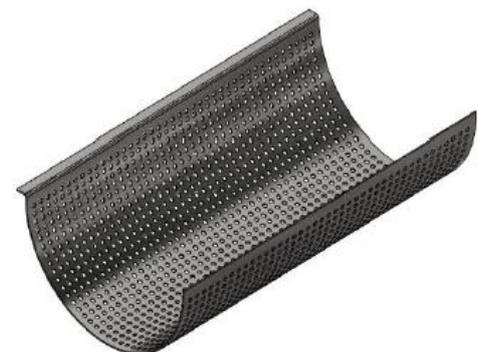


Concave Sieve Use

The concave sieve sits under the threshing cylinder and is a curved metal piece with many holes drilled in it.

Different concave sieves are used in threshing different crops and hole sizes are determined by grain size.

The concave sieve is changed by opening the thresher lid and sliding the sieve out in the direction towards the opening (you will need to remove feeder shaft belt to open lid).



In general, maize uses a sieve with larger holes than most other crops except for large sized beans.

Most crops the size of cowpea or smaller can use the small-holed sieve

If the sieve holes are too small for the grain, it will result in grain breakage

If the sieve holes are smaller than the grain, the seed will not be damaged, but excess chaff (straw) may end up with the grain.

Sieve Replacement Guide

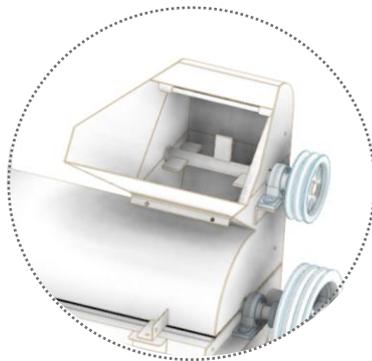
Crop Type	Sieve Diameter
Bambara bean	20 mm
Maize	14 mm and above
Rice, Millet, Sorghum, Soybean	10 mm

The Feeder Shaft

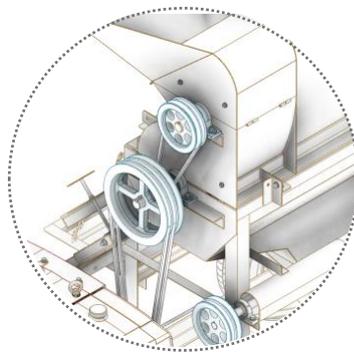
The feeder shaft is located on the feeding hopper on some thresher models and is positioned to pull crop plants into the machine faster (especially soya).

When threshing crops that are harvested with the plant (such as soya) you have to engage the feeder shaft by leaving the belt on the pulley connected with the shaft.

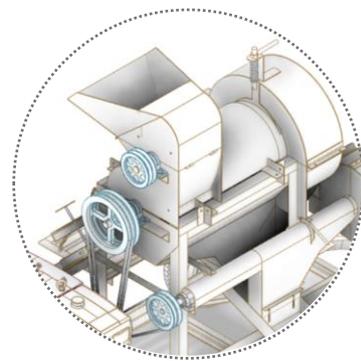
However, with crops where only the head or ear is threshed, like maize, you should disengage the feeder shaft to prevent maize ears being thrown out from the hopper.



feeder shaft



feeder shaft engaged



feeder shaft disengaged

After the Threshing is Done

1. Allow heated parts to cool down before carrying on any of the subsequent activities.
2. Tighten loose bolts and moving parts.
3. Clean the thresher after use.
4. Remove water and extra fuel at end of season
5. Remove belts at end of season to prevent stress and stretching

Troubleshooting

Problem	Cause	Remedy
Grain breakage	Threshing cylinder moving too fast	1) Slow Engine Down 2) Machine should be run at highest speed possible that does not create breakage 3) Manufacturing problem: smaller pulley on threshing cylinder shaft turns thresher faster
Grain breakage	Concave sieve holes too small causing grain to hit edge of hole leading to breakage	Use sieves with holes that are properly sized for local crops
Throwing seed out of exit shoot with chaff (seed pulled through fan with suction)	Too much suction	Adjust air regulator (one of the 2) to reduce suction. Depends on weight of seed/chaff
Too much chaff	Air regulator not set right	Open air regulators
Too much chaff	Engine running too slow to power fans	Turn engine speed up. Engine should always be running at maximum possible speed that does not cause seed breakage
Too much chaff	Concave sieve holes too large	Sieve holes too big, all chaff going down, too much for suction to pull out, try smaller holes on sieve
Broken bearings	Lack of grease in bearings	Grease bearings every day (grease gun & grease)
Pulley/belt wears out quickly	Mis-aligned belt	Check every day that engine pulley and thresher pulley are aligned vertically
Bolts fall out	Vibration	Tighten bolts or check daily Place cut up tire rubber under engine and frame to reduce vibration
Overheating	Overworked engine	Set up water stand to circulate through Make sure water vapor can vent to outside
Welds break	Movement Excessive Vibration	Drive slower Bring to shop for welding repairs Place cut up tire rubber under engine and frame to reduce vibration
Engine dies	low oil	Check oil 1-2 times per day
Machine tipping over	Narrow chassis	Drive slowly
Machine metal breaking	Driving too fast	Drive slowly
Breaking tongue holding thresher to truck	Fatigued metal from fast turning	Check every day for worn looking metal. Pull thresher slowly and carefully
Internal banging when machine is running	broken or misaligned part	Check for broken threshing spikes and repair Ensure that fans or other moving parts are not damaged or bent

