

Rice Production Manual

Tractor Operation and Maintenance

1. Introduction

Tractors are often the most expensive, sophisticated and potentially dangerous piece of equipment used on a farm. Tractor operators need to perform basic maintenance checks and be familiar with the location and understand the operation of each control lever or button on the tractor before attempting to use the machine. Regular maintenance checks will help to keep the machine in good working order and prevent unnecessary breakdowns at critical times. Care needs to be taken at all times when using a machine to prevent unnecessary damage to the machine, the operator and surrounding environment

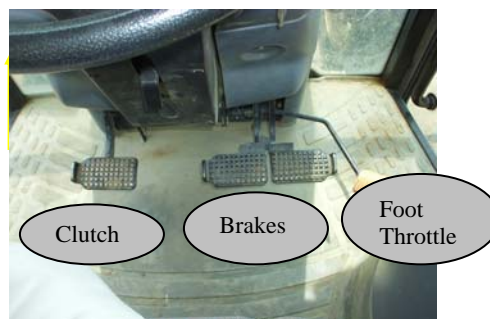
2. Common control and safety levers

The most common controls and safety levers used when operating a modern agricultural tractor are:

Stop button or key This is the most important control mechanism on the tractor. Before starting the engine locate the stop button or key and test how it works. Most stop buttons work by pulling them out. In many new tractors, the stop button has now been replaced by stopping the engine through turning off the start key.



Brakes Most tractors are fitted with 2 independent brake pedals that can be locked together. When using the tractor in transport mode the brake pedals must be locked together for safety purposes. During field operation, they should be disengaged to enable the operator to push either the left or right pedal to aid steering and improve the turning radius of the tractor.



Clutch pedal. The clutch is used to disengage the drive train from the engine and change gears. It is always good practice to depress the clutch before starting and stopping the engine. The clutch is also used to engage or disengage the power-take-off drive.

Throttle. The hand and foot throttle are used to control the engine speed. The hand throttle should always be used when using the tractor in the field. The foot throttle can be used when driving the tractor on a roadway but should not be used in the field.

Gear Levers. Most tractors have 2 gear levers to control ground speed. The first lever will be a high and low range lever and the second lever will normally have 3-4 forward and 1 reverse gear. Some tractors may have a forward and reverse lever and one gear lever to control ground speed. Others may have a hydrostatic or automatic gear box with up to 18 forward gears and 2 reverse gears



Light switches and warning lights. Most tractors will have head lights for working at night and they may have indicators and stop lights for travelling on roadway. The indicator light may also be used as hazard lights or used especially for road travel. Warning lights may also displayed on the dashboard to warn the operator of malfunctioning components and overheating.

Power-take-off lever(PTO). This lever activates the tractors PTO shaft, which is used to power the equipment attached to tractor like mowers, rotary tillers, and pumps. The PTO shaft is located behind the differential of the tractor and between to 2 rear wheels.

Front wheel engagement lever or button. This is used to engage the front axle of tractor to improve traction. This may work in conjunction with an indicator light when engaged.

Draft control lever – This activates the rockshaft (lift arm) to lift and lower the implement automatically as the draft load changes when the control lever is set at the sensitive position. However, the rockshaft will remain stationary in the pre-set position if the draft control is set in the non-sensitive position.

Position or height control lever This lever determines the depth of penetration of a soil engaging tool below ground level, or the height of the clearance above the ground of other types of implements such as 3pt linkage carry alls.

External Hydraulic control valve. This is used to activate the external hydraulic system to raise or lower drawbar attached implements such as plows, trailers and buckets on mounted on the front of tractors



Drop valve This controls the speed of drop of the implement attached to the tractor. Excessive speed of the drop may cause damage or injury. Adjust the speed of drop slow enough for safe operation.

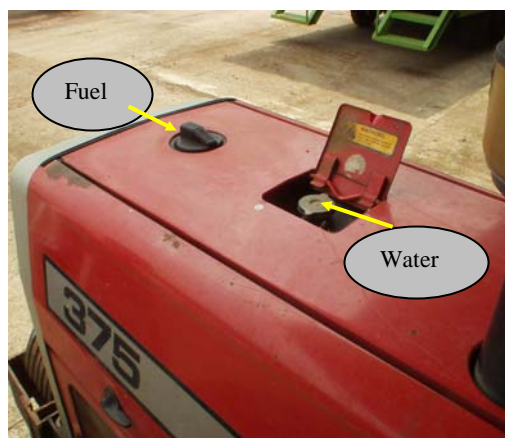
Differential lock –This locking device is a pedal normally under or to the side of the driver seat. The “diff lock” is used to lock the differential when the tractor drive wheels begins to slip and the machine bogs down. It makes both rear wheels rotate at the same time and helps forward propulsion. Make sure the lock disengages after use by stamping on it once the tractor is operating normally.

“Make sure you understand how all levers work and what they control before attempting to use the tractor”

Maintenance checks before starting the engine

A maintenance check should always be undertaken before starting a tractor or machine. A simple way to conduct a systematic check of the different systems on a tractor is to remember **WOGAM**. These initials stand for **w**ater, **o**il, **g**rease, **a**ir and **m**iscellaneous.

Water Check the coolant level in the radiator. Do not remove radiator cap unless the engine is cool. To check before removing the radiator cap, squeeze the radiator hose. If the hose can be easily squeezed this means that the system is not pressurized and it should be safe to remove the radiator cap. If the engine is hot turn the cap slowly to the “first stop” position and release the pressure before removing the cap. If in doubt use a rag to cover the cap and top of the radiator to stop hot water spray



The water level in the battery should also be checked. Check battery electrolyte level carefully and in some instances it may be necessary to wear eye protection and rubber gloves when doing so to prevent eye and skin injury.

Oil. The tractor should be parked on a level surface and the engine oil checked via the dip stick on the side. The hydraulic oil level should also be checked via the dip stick at the rear of the tractor either between the rear tires or on the side of the hydraulic housing. If the tractor incorporates an oil bath for cleaning the intake air to the engine, this should be changed when contaminated with soil or dust.



Grease Lubricate standard tractor grease fittings regularly, especially when using the tractor in extremely wet and muddy or dusty conditions. Grease nipples will be found on the 3pt linkage arms, steering arms and wheel hubs

Air Check tires daily for damage or low pressure. In two wheel drive tractor the front tires should be 25psi(175Kpa) and rear tires 14psi(100Kpa) while uneven 4 wheel drive should have 18psi (125Kpa) in the front tires and 14psi(100Kpa) in the rear tires.



The radiator grill and must be kept screen clean. This prevents the engine from overheating and allows good air intake for the air cleaner.

Miscellaneous

Check wheel nuts, cowlings and look for loose nuts and bolts and improper or poor implement connections. Make sure all implements are securely fastened with proper clips and pins and safety cowlings are in place especially when using PTO driven and 3 pt linkage driven equipment

"Refer to the operator's manual on the use and maintenance of a tractor or machine before attempting to use."

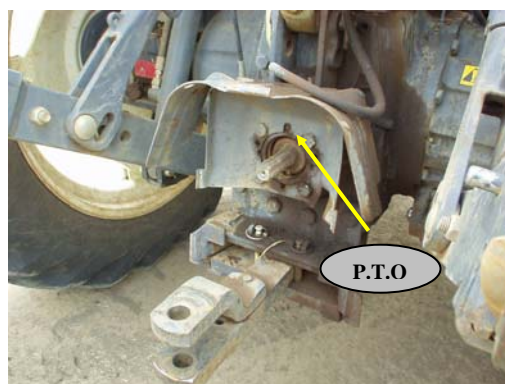
Safe Tractor Operating Procedure

Operational efficiency and safety should always be paramount in a tractor operator's mind. Most accidents occur because operators have not attached the equipment correctly, travel too fast or under estimate side slopes when operating on undulating country.



When operating a tractor the following procedure should be followed:

1. *Check the tractor and implement before going to the field.* Ensure that the implement is securely hitched and that tires are properly inflated. Check the oil, water and fuel level and air cleaner condition.
2. *Lock the rear wheel brakes together for traveling* so the wheels cannot brake separately. Do not go too fast and plan ahead especially for stoppages and when driving in congested or built up areas.
3. Upon reaching the work area, *check if the field conditions are suitable* for the assigned task.
4. *At the field, unlock the brake pedals* so wheels can brake separately for improved turning ability .
5. *Do not change gears* when the tractor is moving.
6. *Ensure the PTO shaft is covered*
Uncovered PTO shafts are a major cause of tractor accidents.
7. When operating a 4-wheel drive tractor *engage the front drive in the field*. Do not drive on the highway with all 4 wheels driving as this may cause "wind up " which could damage the transmission.



8. *Select the operating gear.* In a dry work situation a good starting gear is normally 3rd low or 1st high. Most field operations are undertaken at ground speeds between 6-8km/hr. In a wet situation the gear selection may be lower.
9. *Set the throttle to mid-range* using the hand throttle and slowly release the clutch. At the same time lower the implement into the soil. Then increase throttle setting to full throttle using the hand throttle control. Foot throttles should only be used for transport situations.
10. If the implement is operating at the desired depth and the engine cannot hold its engine rpm then select a lower gear.
11. *When operating on slopes, avoid sudden starts and stops.* Operate up and down the slope on steep slopes, not across the slope. Slow down when changing directions. Do not operate where machine could slip or tip. Stay alert for holes, rocks and roots in the terrain.

“Only operate as fast as you feel confident to control the equipment in a safe manner “

Indicators of efficient tractor operation

When a tractor and implement are properly matched, the tractor should be using 70-80% of its maximum power.

Engine RPM. This means an allowable rpm drop of no more than 10% of the full non loaded engine speed when operating at ground speeds of 7-8km/hr. For example, if the full throttle unloaded engine speed is 2500 rpm, then the loaded speed should not drop below 2300 rpm. If the engine speed drops by more than 200 rpm select a lower gear or lighten the load.



Smoke. Whilst excessive black or blue smoke coming from the exhaust is not always indicative of overloading, in general the load should be reduced. If this situation arises continuously then the tractor checked for excessive oil or fuel usage.

Fuel consumption. The fuel usage of a well maintained and operated engine can be easily calculated. Fuel consumption should not exceed the rated engine power (kW) x 0.25. This means a 30kw (40 hp) tractor should not use more than 7 liters / hour or a 12kW stationary engine should not use more than 3l/hr



Wheel slip levels for all wheel tractors operating in the dry farming conditions should fall in the range of 8-15%. In wet paddy situation obviously these figures will be higher and wheel slip is often used for puddling the soil when cage wheels are fitted..

Tire wear. Excessive tire wear especially on front wheel assist tractors may indicate poor set up and operation. Tire wear is increased when tire pressures are not set correctly

"Check your tractor and implement performance continuously to maximize work efficiency"