Farm Machineries Operations Guideline

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Contents

Farm Mechanization ........................................................................................................... 4
Farm Machineries in Farm Operations ................................................................................. 6
Cautions in Operating Farm Machineries .......................................................................... 37
Managing Farm Machineries ............................................................................................. 40
Hand Signals for Machinery Operation .............................................................................. 43
Risks of Agricultural Machinery ...................................................................................... 48
Storing Farm Equipment ................................................................................................. 50
Repair and Maintenance .................................................................................................. 55
Selecting Machinery ......................................................................................................... 57
Replacing Farm Machinery ............................................................................................... 58
Annexes ............................................................................................................................ 61
Farm Mechanization

Farm mechanization refers to the use of tools, equipment, or other devices operated by human or animal power, or by an engine that would improve agricultural productivity, efficiency, quality of product, and reduce cost of production in agricultural production system. It is engineering intervention for production and productivity, percentage share of different power sources, level of mechanization of different operations.

Mechanization is the only solution for increasing farm production per hectare to enable us to meet the food requirement of growing population. There is a positive correlation between application of improved technologies and the land productivity. The effective mechanization contributes to increase production in two major ways: the timeliness of operation and good quality of work.

The requirement of power for certain operations like seed bed preparation, cultivation and harvesting becomes great that the existing human and animal power in the country appears to be inadequate. As a result, the operations are either partially done or sometimes completely neglected, resulting in low yield due to poor growth or untimely harvesting or both.

The economic progress of a nation depends directly upon availability of energy and its consumption for fruitful utilization. Increased energy input in agriculture directly or
indirectly increases the production of crops. In order to bring
more land under cultivation and to improve productivity, it is
necessary to introduce other sources of power like tractors,
power tillers, oil engines, self-propelled combine harvester,
electric motors and renewable energy; especially wind
mills for water pumping.
Farm Machineries in Farm Operations

Tractor

Tractor is a self-propelled power unit having wheels or tracks for operating agricultural implements. Tractor engine is used as a prime mover for active tools and stationary farm machinery through power take-off shaft (PTO) or belt pulley. It is the basic machine required for most mechanized farming activities, including plowing fields. The tractor acts as the power supplier and controller of the plowing machine just like a CPU controls a computer. Tractors also provide powerful traction to minimize the soil drag caused by the plowing machine during the process of plowing.

To be able to minimize risks, the operator should adequately understand the following issues practice precautions

- Read and follow safety procedures in the manufacturer's manual;
- Ensure an approved cab or rollover protective structure (ROPS) is fitted;
- Fit and use a seatbelt on tractors with ROPS;
- If there is a risk from falling objects, fit a fall-on protective structure (FOPS);
- To reduce risk of back strain, fit a seat with side restraints and a backrest;
• Wear hearing protection, and remember, not all tractor cabs are sound proof;
• Keep children away from tractors and machinery;
• Remove starter keys when tractors are not in use;
• Have an up-to-date maintenance schedule;
• Follow safe maintenance and jacking procedures;
• Ensure the operator is properly trained for each type of tractor work;
• Always mount and dismount on a tractor's left side - to avoid controls;
• Adjust the seat so all controls are safely and comfortably reached;
• Keep all guards in place, including the power take-off (PTO);
• Operate the self-starter from the operator position only; and
• Never carry passengers.

When operating a tractor the operator should be in a position to practice

• Drive at speeds slow enough to retain control over unexpected events;
• Reduce speed before turning or applying brakes;
• Watch out for ditches, logs, rocks, depressions and embankments;
• On steep slopes, without a trailed implement, reverse up for greater safety;
• Engage the clutch gently at all times, especially when going uphill or towing;
• Use as wide a wheel track as possible on hillsides and sloping ground;
• Descend slopes cautiously in low gear, using the motor as a brake;
• Never mount or dismount from a moving tractor;
• Ensure the park brake is on and operating effectively before dismounting; and
• Take short breaks regularly when working long hours.

When pulling implements the following should be considered satisfactorily

• Fit attachments according to the manufacturer's instructions
• Always attach implements to the draw bar or the mounting points provided by the manufacturer;
• Never alter, modify or raise the height of the draw bar unless provided for by the manufacturer;
• Regularly check safety pins on towed lift-wing implements, to ensure they are not worn;
• Ensure all guards on towed implements are in place before operating;
• Never hitch above the centerline of the rear axle, around the axle housing or to the top link pin;
• Never adjust or work on implements while they are in motion;
• Never attach implements unless the PTO shaft is guarded; and
• When parking, always lower the three-point linkage and towed implement.

To avoid strain injury:

• adjust the tractor seat for back support and comfort;
• ensure that seating is safe and comfortable;
• check seat height, seat depth, backrest height and angle, fore and aft movement, seat tilt, firm padding, partial pivoting and vibration-absorbing suspension;
• dismount every hour, and spend 5 or 10 minutes doing something active;
• plan for your next tractor to include suitably low steps, handgrips, adequate doorway and cab space, and a safe mounting platform; and
• dismount by climbing down - not jumping down - and use each provided foot and handhold.

**Moldboard plow**

This implement is commonly used for primary tillage operations. This plow performs several functions at a time such as cutting the furrow slice, lifting the furrow slice, turning the furrow slice, and pulverizing the soil.

The plow consists of share, moldboard, landside, and frog. It is designed to completely pull up the soil along with all the weeds and other plants growing in it. The moldboard plow then turns
the soil and buries the unnecessary weeds and other plants under the soil. Modern plowing machines have up to seven moldboards for fast and efficient preparation of large tracts of land because it automatically forms furrows with ridges for proper drainage of the soil. The hydraulic system of the tractor controls the action of the plow and, in advanced machines; the tractor can control the depth and size of furrows.

For proper utilization of moldboard plow

- Provide adequate front-end weight for tractor stability in transport and operation, particularly with integral and semi-integral plows;
- Never pull from any point higher on the tractor than the recommended hitch point;
- Use extreme caution and reduce speed when transporting the plow and the tractor over rough ground;
- Avoid sharp turns at high speeds, especially on slopes;
- On tight turns, avoid swinging rear of plow into fences or other obstacles;
- Turning stops on semi-integral plows limit turning radius. Shorter turns may severely damage plow frame and tractor hitch;
- Never carry passengers on the tractor or permit others to ride on the plow particularly plows with automatic reset;
- Lower the plow and securely pin the parking stand before detaching the plow from the tractor; and
• When hitching drawn plows, always use a hitch pin with adequate strength for the tractor plow combination.

**Reversible plow**

The reversible plow is another version of the moldboard type of plow. The difference is that this type of plow uses two, four or more blades. One blade or set of blades turns the soil to the left while the other blade or set of blades turns the soil to the right. One blade or set of blades is used at a time. One furrow is done with one blade. At the end of the furrow, the blades are switched, and a furrow is done in the other direction. These are generally large, heavy plows that need to have the power of a tractor in order to be operated.

**Sub-soiling plow**

A sub-soiling plow is another large plow that will need the power of a tractor for proper use. The purpose of a sub-soiling plow is to break up the ground beneath the top layer of a field without bringing the soil to the surface of the field. This is necessary because some modern chemicals that are used in farming cause hard crust of soil to form under a field, and this has to be broken up in order for plants to grow properly. In addition, drainage is greatly improved by plowing a field with a sub-soiling plow.

**Disc plow**
Disc plow is a plow which cuts, turns and in some cases breaks furrow slices by means of separately mounted large steel discs. A disc plow is designed with a view to reduce friction by making a rolling plow bottom. A disc plow works well in the conditions where moldboard plow does not work satisfactorily.

It is a very common type of plow that is used for the initial plowing of brush-covered fields or plowing of dry, rocky soil. This plow uses a large concave steel disc to break up the soil. The discs are slightly inclined at a backwards angle, which turn the soil as the ground is broken by the disc. The turning action of a disc plow is not as dramatic as that of a moldboard plow.

The commonly mentioned advantages of disc plow include the following:

- It can be forced to penetrate into the soil which is too hard and dry;
- It works well in sticky soil in which a mold board plow does not scour. It is more useful for deep plowing;
- It can be used safely in stony and stumpy soil without much danger of breakage;
- A disc plow works well even after a considerable part of a disc is worn off in abrasive soil; and
- It works in loose soil also without much clogging.

Disk plows are not suitable for covering surface trash and weeds affectively as mold board plow does. It leaves the soil in rough
and cloddy condition than that of mold board plow. The plow is heavier than mold board plow for equal capacities because penetration of this plow is affected largely by its weight rather than suction. There is one significant difference between mold board plow and disc plow i.e., mold board plow forced into the ground by the suction of the plow, while the disc plow is forced into the ground by its own weight.

In transporting disc plow to the field, the equipment should be raised, and all weight is carried by the tractor at 3-point hitch. Adequate tractor front-end weights are required to offset the plow weight. Semi-integral plows are long and caution must be used when turning to prevent swinging the plow into fences or irrigation ditches. The operator should reduce speed when transporting over rough ground, and avoid quick, sharp turns at high speeds. When transporting semi-integral or drawn plows, always install cylinder locks to prevent accidental lowering of the plow. Relieve the load on hydraulic cylinders before starting to transport. Lower the plow to the ground or install hydraulic cylinder locks when the plow is not in use. Watch for other people when raising, lowering, or indexing the plow. Never permit anyone to ride on the plow, and allow only the driver on the tractor. Do not permit children to play on or near the plow either when parked or in operation. Lower the parking stand and securely pin it in place before detaching integral or semi-integral plows from the tractor.

**Chisel plow**
The chisel plow prepares the soil for planting without as much upheaval of soil. The plow loosens soil but unlike the moldboard plow it does not turn the soil. The plow prepares fields that do not require too much tilling. The chisel plow needs a powerful tractor because it causes considerable soil drag.

The chisel plow helps to loosen the soil or till to prepare the ground for planting. Although not effective for weed control, the chisel plow mixes soil and surface residue such as manure. Chisel plows include curved shanks to determine how well the chisels go into the soil. Various points can be mounted on the shanks, depending on how much soil disturbance is needed. Chisel plow types are a three-point hitch-mount and a wheel-mounted pull-hitch.

When using Chisel plows the following should be considered by the operator

- Reduce speed when transporting chisel plows over rough or uneven terrain;
- Use lock-up straps or transport locks when transporting a chisel plow;
- Be sure wings are locked in the folded position before traveling;
- Allow only the operator to ride on the tractor. Never allow passengers to ride on the chisel plow;
- Never allow anyone to stand or work near the chisel plow when it is in operation, particularly when raising or lowering outriggers;
- Be particularly careful of escaping hydraulic fluid, which can penetrate the skin and may cause serious infection or reaction if not given immediate medical treatment;
- Do not unhitch from the tractor or store a chisel plow when outriggers are in the raised position; and
- Make sure raised outriggers will safely pass under power and telephone lines.

**Harrons**

A harrow is an implement that cuts the soil to a shallow depth for smoothening and pulverizing the soil as well as to cut the weeds and to mix materials with soil. It is an implement used to break the clods after plowing, to collect trash from the plowed land and to level the seed bed. The following are the different types of harrows:

**Disc harrow**

Disc harrow is a harrow which performs the harrowing operations by means of rotating steel discs, each set being mounted on a common shaft. It is found very suitable for hard ground, full of stalks and grasses. It cuts the lumps of soil, clods and roots. Discs are mounted on one, two or more axles which may be set at a variable angle to the line of motion. As the harrow is pulled ahead, the discs rotate on the ground.
Depending upon the disc arrangements, disc harrows are divided into two classes: single action, and double action.

*Single action disc harrow:* It is a harrow with two gangs placed end to end, which throw the soil in opposite directions. The discs are arranged in such a way that right side gang throws the soil towards right, and left side gang throws the soil towards left.

*Double action disc harrow:* A disc harrow consisting of two or more gangs, in which a set of one or two gangs follow behind the set of the other one or two, arranged in such a way that the front and back gangs throw the soil in opposite directions. Thus the entire field is worked twice in each trip. There are two types: i) Tandem, and ii) Off-set.

*Tandem disc harrow:* It is a disc harrow comprising of four gangs in which each gang can be angled in opposite direction.

*Off-set disc harrow:* It is a disc harrow with two gangs in tandem, capable of being off-set to either side of the center line of pull. Two gangs are fitted one behind the other. The soil is thrown in both directions because discs of both gangs face in opposite directions. It is very useful for orchards and gardens. It travels left or right of the tractor. The line of pull is not in the middle that is why it is called off-set disc harrow.
A disc harrow mainly consists of disc, gang, gang bolt, gang angle, gang control lever, spools or spacer, bearings, transport wheels, scraper, and weight box.

In using disk harrows:

- Always lock safety lock during transport, if the disk is to be left raised for an extended period, or while working on the machine;
- Never depend on tractor hydraulic pressure to carry harrow weight in transport—use safety lock, and relieve pressure in cylinders;
- Lock the tractor drawbar in fixed position when transporting wheeled disks;
- Hydraulic fluid escaping under pressure can penetrate the skin and may cause serious infection or reactions. Never use hands to locate the source of a small leak which may be nearly invisible;
- Make sure wings are securely locked in transport position before moving the harrow;
- Provide adequate tractor ballast for front-end stability and to prevent excessive slippage;
- Never allow anyone to ride on tractor drawbar or harrow in operation or transport;
- Never allow anyone but the operator to ride on the tractor;
- Lower the machine or install safety lock when storing a disk harrow; and
- Never permit children to play on or near a disk harrow while it is in operation, transport, or storage.
**Spike tooth harrow**

Spike tooth harrows are either rigid or flexible. The basic frame of the harrow may be triangle. It has pointed steel pegs (teeth) about 23 cm long with their pointed ends towards ground. Each peg is rigidly clamped with the help of a U-bolt to the cross bars of the frame. In the case of harrows with a wooden frame, the pegs have threatened ends to be tightened from the top. Before operating the harrow in the field, adjustments should be made for efficient and effective operation. The pegs of the rigid harrows are fixed slightly tilted so that no arrangement is needed to change the angle. The spikes of the spike tooth harrow are either square or diamond shaped and are of the self-sharpening type.

**Spring tine harrow**

This equipment is used extensively to prepare plowed land before planting. They penetrate much deeper than spike tooth harrows and are generally used in the soil where obstructions like stones, roots and weeds are hidden a few centimeters below the surface. The basic frame of the harrow is mostly rectangular.

The spring tines are bolted staggered on to the frame to avoid clogging during operation. Spike tooth and spring tine harrows do not require lubrication. The harrow teeth, however, are adjustable and may be loosened and turned to present a new cutting edge when they wear out. Teeth may also be
removed for sharpening. Spring tine harrows can be sharpened by grinding.

**Cultivator**

**Spring loaded tine cultivator**

A tine hinged to the frame and loaded with a spring so that it swings back when an obstacle is encountered, is called spring loaded tine. Each tine of this cultivator is provided with two heavy coil springs, tensioned to ensure minimum movement except when an obstacle is encountered. The springs operate, when the points strike roots or large stones by allowing the tines to ride over the obstruction, thus preventing damage. On passing over the obstruction, the tines are automatically reset and work continues without interruption. The tines are made of high carbon steel and are held in proper alignment on the main frame members. A pair of gauge wheel is provided on the cultivator for controlling the depth of operation. The cultivator may be fitted with 7, 9, 11, 13 tines or more depending upon the requirement.

**Rigid tine cultivator**

Rigid tines of the cultivator are those tines which do not deflect during the work in the field. The tines are bolted between angle braces, fastened to the main bars by sturdy clamps and bolts. Spacing of the tines is changed simply by slackening the bolts and sliding the braces to the desired position. Since rigid tines are mounted on the front and rear
tool bars, the spacing between the tines can be easily adjusted without getting the tines chocked with stubbles of the previous crop or weed growth. A pair of gauge wheel is used for controlling the depth of operation.

**Rotivator**

This implement that cuts and pulverizes the soil by impact forces through a number of rotary times or knives mounted as a horizontal shaft. It is also called rotary tiller. It is suitable for shallow cultivation and weed control. It consists of a power driven shaft on which knives or tines are mounted to cut the soil and trash. Rotor has got several types of tines fitted on the shaft having a speed of 200-300 rpm. Generally, sharp edged L-shaped blades are used on the rotor. One or two operations of this implement are sufficient for good pulverization of soil depending upon soil and crop conditions. It is not meant for sandy soil. The power from the engine to rotor shaft is transmitted through chain.

**Seed drill**

It is a machine for placing the seeds in a continuous flow in furrows at uniform rate and at controlled depth with or without the arrangement of covering the seed with soil. Drills are used for sowing seeds in rows at 15-35 cm apart. The seed drill performs carries the seeds, open furrows to a uniform depth, place seeds in furrows in an acceptable pattern, and covers seeds and compact the soil around the seed.
Seed drills, fitted with fertilizer dropping attachment, distribute the fertilizer uniformly on the ground, is called seed cum fertilizer drills. It has a large seed box which is divided length wise into two compartments, one for seed and another for fertilizer.

The seed drill is pulled by a tractor to plant grains and vegetable seeds. Seed drills make different kinds of ditches to plant the seeds as well as covers the seed with soil after planting. The invention of the seed drill resulted in a large number of the seeds germinating, and crop yields increased.

A seed drill with mechanical seed metering device consists of frame, seed box, seed metering mechanism, furrow openers, covering device, and transport wheels.

**Furrow openers**

The furrow openers are provided in a seed drill to open up furrows before dropping the seeds, which facilitate the placement of seed and fertilizers at a desired uniform depth and spacing. The seed tube conducts the seed from the feed mechanism into the boot from where they fall into the furrows.

Multi-drills namely, rotating type openers, i.e., single disc and double disc type, and fixed type openers, i.e., shovel-type and shoe-type are used as furrow openers.
Shovel type furrow openers are widely used in seed drills. There are best suited for stony or root infested fields.

Shoe type furrow openers: works well in trashy soils where the seed beds are not smoothly prepared.

Single disc type furrow openers: It is a furrow opener consisting of one concave disc and set at an angle while operating, shifts the soil to one side making a small ridge. The disc is kept clean by two scrapers, one toe shaped at the convex side and one “T” shaped at the concave side. The disc penetrates well in the soil, cuts all the trashes and clods in the field. It works in sticky soils also, but the discs are costly and maintenance work is bit difficult.

Double disc type furrow openers: The discs open a clean furrow and leave a small ridge in the center. The seeds are dropped between the two discs, providing a more accurate placement. It is suitable for the trashy lands. Seed drills attached with tractors having high speeds, usually have this type of furrow opener.

Ridger

It is an implement which cuts and turns the soil in two opposite directions simultaneously for forming ridges. It is used for sowing row crop seeds and plants in well tilted soil, for forming field channels or furrowers, and similar other operations. It consists of beam, clevis, frog, handle, mold
boards, braces, share, and sliding shoe. The ridger generally has V-shaped or wedge shaped share, fitted to the frog. The nose or the tip of the share penetrates into the soil and breaks the soil. The mold boards lift, invert and cast aside the soil, forming deep channels and ridges of the required size.
**Ridging Plow**

The ridging plow consists of two moldboards facing away from each other. The plow makes a ditch in the soil with banks or ridges on each side. Ridging plows prepare the soil for planting crops like potatoes that are planted in ditches or furrows.

**Leveler**

Land leveling is an essential operation for farming. Level fields receive uniform penetration of irrigation water with high efficiency. The possibility of water logging and soil erosion is reduced considerably. Land leveling is usually done in the slack season when the field is free from crops.

**Sprayers**

Sprayer is a machine to apply fluids in the form of droplets. Sprayer is used application of fungicides to minimize fungal diseases; application of insecticides to control insect pests; application of herbicides to remove weeds; and application of micronutrients on the plants.

The main functions of sprayer are to break the liquid into droplets of effective size; distribute them uniformly over the plants, and regulate the amount of liquid to avoid excessive application.
Based on power source sprayers are classified as hand-operated machines: suitable for small area. They are operated at pressure ranging from 1 to 7 kg/cm²; power operated machines: suitable for treating a large area. They are operated at pressure ranging from 20 to 55 kg/cm²; and airplanes: suitable for large scale work.

Based on spray volume sprayers are classified as high volume sprayer, i.e., more than 400 liters of spray liquid per hectare is used; low volume sprayer- ranges between 5 and 400 liters per hectare is used, and ultra-low volume sprayer, i.e., less than 5 liters per hectare is used.

Knapsack sprayer is another common type of sprayer, is provided with a pump and a large air chamber permanently mounted in a 9 to 22.5 liters tank. The handle of the pump extending over the shoulder or under the arm of operator, which makes it possible to pump with one hand and spray with other hand. Spray liquid is delivered through the delivery system, consisting of lance and nozzle, which is connected with the pump by a flexible hose. A uniform pressure can be maintained by keeping the pump in operation. It is generally carried on the back of the operator. It is quite useful for spraying small trees, shrubs and row crops up to 2.5 m height. One person can spray about 0.4 – 0.5 ha in a day, thus spraying about 90 liters of spray liquid. A pressure of 3 -5 kg/cm² is maintained in the pressure chamber.

All washers and packing should be soaked in oil or water before use. The ends of the nozzle should be unscrewed and
cleaned before starting the work. When spraying is over, the sprayer should be operated for some time with clean water to remove sediments from the pressure vessel and the discharge tube.

**Combine harvester**

Combine harvester is a machine designed for harvesting, threshing, cleaning and collecting the seed/grain while it moves over the land. All the five operations are carried out in single operation of the harvester. The machine is versatile and with minor adjustments can handle a variety of crops. The size of the combine is indicated by the width of cut, it covers in the field.

A combine harvester has the following functions

- Cutting the standing crops;
- Feeding the cut crops to threshing unit;
- Threshing the crops;
- Cleaning the grains from straw; and
- Collecting the seed/grain in a container

**Operating a combine harvester**
Good safety habits are vital for anyone who operates a combine, corn picker or other grain-harvesting machine. Failure to observe safety practices can be fatal. However, constant alertness is also necessary to prevent machinery accidents that often happen in spite of machinery that is designed for safety. Machinery operators are not in top physical or emotional condition when they are tired, ill, worried, angry, or have their minds on something else. Accidents are most likely to happen under these conditions.

The combine operator is responsible not only for his safety but also for the safety of others who may be working on or just is near the machine. The operator must be aware of hazards and remain alert to situations that are potentially dangerous. This includes pre-operational checks, starting, transporting, towing, operating, field repair and maintenance and stopping the combine.

**Hand Signals**

A set of hand signals has been endorsed by several safety institutions. Since spoken instructions are very difficult to hear over the sounds of a combine, knowledge of hand signals can be extremely helpful to the operator when maneuvering a combine, especially in tight places.

**Safety before Starting**
Before attempting to operate a combine, study the operator's manual instructions. It has information on general safety rules, plus specific safety recommendations for the particular machine.

- Always clean the combine before starting. Trash around the exhaust system can cause fires. Oil, grease or mud on ladders or the platform can cause serious falls. If the combine is equipped with a cab, clean the glass to provide maximum visibility;
- Check the tire pressure each day. Under-inflation can cause buckling of the sidewall, which can cause dangerous tire failure. Over-inflated tire have a great deal of "bounce" and cause upsets more readily that tires with correct pressure;
- Check the brakes once a week. With hydraulic brakes, make sure that the master cylinder is full of fluid and that no air is present in the lines. Adjust the pedal free travel, if necessary, so that the brakes are engaged with the pedals an equal distance from the floor of the platform;
- Check the threshing cylinder-rocking bar to see it is clear of the cylinder;
- Make sure that all shields and covers are in place and fastened securely;
- Remove or stow all service equipment;
- Always use the handrails and ladders provided on the combine for safe mounting and dismounting; and
- Be sure that all PTO covers, safety stands and shields are on the machine before taking it to the field.
Starting the combine

Before mounting the combine, make sure that everyone is clear of the machine. Do not allow anyone to ride with you, unless combine is equipped with a passenger seat. Before starting the combine:

- Disengage header drive;
- Disengage separator drive;
- Place gearshift in neutral;
- Depress clutch pedal;
- Be careful when using diesel starting fluid. It is extremely flammable; and
- If it is necessary to use jumper cables to start the combine, be careful to avoid sparks around the battery. Hydrogen gas escaping from the battery can explode.

Transporting the combine

- Always keep your mind on the dangers of driving the combine on public roads. Besides maintaining control of the machine, you must watch for obstacles on the road, pedestrians and traffic;
- High speed is the leading cause of accidents. Never drive faster that the road conditions allow for safe operation. Anticipate dangers and slow down to avoid accidents;
- Make sure you are familiar with local traffic laws;
• Always lock the brake pedals together. If the combine is not equipped with locking mechanism, be sure to depress both pedals at the same time evenly. Applying only one brake or applying one harder than the other can cause the combine to change direction and perhaps tip over;
• Be careful when applying brakes when a header is attached to the combine;
• Always check headlights and safety flashers to make sure they are properly adjusted and in working order;
• Put the unloading auger in the transport position. Be certain it is not blocking a safety flasher;
• On self-propelled combines, never use the header safety support when transporting the machine. Raise the header enough for safe ground clearance, but not high enough to reduce visibility;
• Watch for low power or telephone lines, bridges, buildings and any other obstacles, to make sure you can pass under them safely. Always keep as far to the right of the roadway as possible;
• Be careful when making turns. Make sure that the rear of the combine will clear obstacles when it swings around. Avoid sharp turns. Turning too sharply at high speed can cause the machine to turn over; and
• Never depress the clutch pedal or take the combine out of gear to coast downhill. When the combine is moving it is impossible to shift the transmission back in gear. Always maintain complete control of the combine. The same applies to tractors that are towing pull-type combines.
Towing the combine

- If the combine must be transported over long distances, it is safer to pull it on a large truck or a special low trailer;
- Never tow the combine at speeds higher than 20 mph;
- Always keep the transmission in neutral or in the "tow" position, if the combine is so equipped; and
- Never tow a combine equipped with hydrostatic drive. Towing can cause damage to the drive unit. Instead, haul the combine

Operating the combine

- Never operate the combine if you are ill or sleepy. Operating safety depends on alert, efficient handling of the combine;
- Wear safety glasses at all times;
- Wear clothing that fits securely to avoid catching clothing in moving parts;
- Never let anyone ride on the combine unless it is equipped with a passenger seat;
- Before starting to harvest a field, check it carefully for ditches, fences or other obstacles. Be aware of weather conditions, which present safety hazards;
- Be especially careful when operating on hillsides. Avoid sharp turns that could tip the combine over. Beware of ditches or obstacles they are doubly dangerous on slopes;
• If grain tank extensions are used, remember that the added weight may make the combine top heavy and more subject to upsets;
• Never travel over 16 km/h with a full grain tank; and
• When using the steering brakes, always turn the steering wheel before applying the steering brakes.

**Field repair and maintenance safety:**

• Always keep the machine clean. Field trash around the exhaust system can cause fires. Mud, grease or oil on the operator's platform or ladders can cause falls;
• Before lubricating or adjusting the combine, disengage all drives and stop the engine. Never leave the operator's platform with the engine running;
• Make sure that the header drive and separator drive are disengaged before attempting to clean the combine;
• Keep all shields in place. After working on the combine, make sure the shields are fastened securely;
• When operating in very dusty or noisy locations, wear goggles and ear plugs to insure safe visibility and prevent hearing loss. Never wear loose clothing that can become entangled in moving parts;
• Keep belts and chains properly adjust and aligned;
• Do not rely on the hydraulic system for support when working under the machine header. Always use the stops or supports provided on the machine. If no safety device is provided, block the header securely;
• When adjusting the wheel spacing, make certain the machine is blocked. Never rely on jacks alone for support;
• Always support the reel arm securely when adjustments are being made;
• When operating in dry fields. Install a spark arresting muffler to prevent fire;
• Avoid sparks or open flames when working the battery;
• When possible always refuel the combine outside the field. Let the engine cool before attempting to refuel and never smoke around fuels;
• Allow the system to cool and remove the radiator cap slowly, turning it until pressure escapes through the overflow pipe; and
• Always carry a first aid kit and fire extinguisher on the combine.

**Stopping the combine safely:**

• Disengage header drive;
• Disengage separator drive;
• Place gearshift lever in neutral;
• Lower header;
• Apply parking brake; and
• Remove ignition key to prevent tampering or accidental starting.

**Mower**
Mower is a machine to cut herbage crops and leave them in swath. The conventional mower has the following main parts.

- frame to support moving parts;
- power transmitting unit to receive and transmit motive force;
- cutter bar to cut crops and separate it from uncut portion;
- wheels for transport and for operating the cutting mechanism; and
- auxiliary parts to lift and drop the cutter bar

**Rotary Slasher**

It is one of the best machines for cutting unwanted wild grass, tall weeds and small bushes and used for clearing the field. It is tractor-driven, having reversible steel blades. Cutting width: 1.50 - 1.80m, Height adjustment: 5x30cm.

**Baler**

It is a machine used to gather cut hay and compact it into dense, manageable parcels for efficient transport. In general, there are three types of balers: small square/rectangular, large round, and large square/rectangular. Small square bales weigh
between 18 and 32 kg and can be manually transported. Large balers produce bales that can weigh more than 454 kg.

This machine pull-type or self-propelled gathers hay through a pickup. Behind the pickup is a compressor bar to hold the hay into place while the auger feeds it into the bale chamber.

In operating a baler the operator should make sure that

- the baler properly connected to the tractor;
- adequate safety guards fitted;
- nobody allowed riding on the baler;
- prevent others getting too close to the baler.;
- build-up of loose, combustible material in the baler;
- disengage PTO and apply fly wheel brake prior to making baler adjustments; and
- stop engine and apply fly wheel brake before repairs or "stringing up" the baler.

In transporting the machine

- Restrain frames back and front of trailer;
- Hooks fitted so ropes can be used to secure load;
- Rough terrain causing bales to become unstable;
- Safe speeds at all times;
- People riding on loaded hay trailers - highly dangerous;
- Do not allow people to ride on stacked trailers;
- Avoid rough ground that could cause bales to dislodge; and
- Ensure loads are adequately secured.
Handling a baler requires the fulfillment of the following operations and attentions

- Keep children away from hay baling and stacking operations;
- Make sure operators and handlers are properly trained and physically capable of tasks;
- Use tractors with four-poster ROPS, FOPS or cabs for protection against falling bales;
- Replace risky attachments with manufacturer approved attachments;
- Ensure loader or forklift operators transport bales close to the ground; and.
- Avoid sharp turns and unsafe speeds.
Cautions in Operating Farm Machineries

- Never operate machinery under the influence of drugs or alcohol;
- Before allowing anyone to use a power tool or piece of equipment the person should have complete training in the item to be used, and be made aware of hazards that may occur with its misuse;
- Protective clothing should be worn during the operation of farm machinery. Never wear baggy or loose fitting shirts or pants;
- Do not allow anyone to ride on machinery except the driver because they can easily be thrown or knocked off the vehicle;
- Persons should not be allowed to ride in the bucket of loaders, on tongues between truck/tractor and the implement, or on any implement being towed;
- Motors should be shut-down on any piece of equipment that is being refueled;
- Farm equipment used on public roadways require lights conforming to state motor vehicle codes;
- Often because of the high level of noise associated with machinery it is advisable to develop a system of hand signals to use during operation;
- All implements and attachments should be used in the proper manner for which they were designed, and lowered completely to the ground when exiting or shutting-down the tractor. Never over-load wagons;
• If a piece of equipment becomes clogged or jammed, never attempt to clean out the blockage until the machine is shut off and all moving parts come to a complete stop;

• Never tow an implement improperly hitched to a tractor or truck. Equipment being towed should be hitched directly to the draw bar with a hitch pin secured in place by a cotter pin. Do not tow implements with chains, cables or ropes. The breakage of chains, cables and ropes while towing can cause severe, even fatal injuries to the driver and bystanders;

• Many tractor accidents involve excessive speed. Drive at a speed appropriate for the job you are doing; the terrain over which you are traveling; and the piece of equipment you are using. Remember to slow down whenever making turns;

• When traveling on public roadways, obey traffic laws. Many tractor related accidents occur when traveling on roadways;

• If the tractor has a ROPS, securely fasten the seat belt. Do not use seat belts on tractors that do not have ROPS;

• As much as possible, avoid operating the tractor near ditches, embankments, and holes;

• Reduce speed when turning and crossing slopes and on rough, slick, or muddy surfaces;

• Stay off slopes that are too steep for safe operation;

• Watch carefully for obstacles and other hazards in the tractor's path, especially at the end of rows, on roads, around trees and in other blind corners;

• Operate the tractor smoothly, avoiding jerky turns, starts, or stops;

• Hitch only to the drawbar and hitch points that the manufacturer recommends;
- When the tractor is stopped, set the brakes securely and use park lock, if the tractor is equipped with it;
- Lower hydraulic equipment. If hydraulic lines lose pressure, raised equipment lowers suddenly crushing anything or anyone underneath;
- Never dismount from a tractor when the engine is running, unless the operation requires it;
- Properly mount and dismount from the tractor; slips and falls cause many injuries; and
- Do not consume alcohol or drugs, including medications that may impair judgment, during work hours or for four hours before starting work.
Managing Farm Machineries

Good management of farm machineries is a substantial portion of a farm’s economic success. It includes understanding the mechanical principles and limitations of each machine, efficient operations in the field, appropriate machine maintenance, timely repair and replacement, and selection of a machine system. It also requires an economic analysis of the actual or proposed management activities.

Farm operations

One aspect of machinery management is that of efficient operation of implements in the field. Casual tractor steering and inappropriate tractor speeds can reduce an implement’s efficiency. Effective steering of the tractor implement combination or self-propelled machine consists of several factors. Steering assistance mechanisms are available for tractors and are helpful if their costs can be applied over many hectares. The speed of field operations is under the control of the tractor driver and is another important factor in efficient field operations.

Farm power

Various types of agricultural operations are performed on a farm can be broadly classified as:
• **Mechanical work:** such as seed bed preparation, cultivation, harvesting and transportation; and

• **Stationary work:** such as silage cutting, feed grinding, threshing, winnowing and lifting of irrigation water.

These operations are done by different sources of power, namely human, animal, mechanical power, electrical power.

**Human power**

Human beings are the main sources of power for operating small tools and implements at the farm. They are also employed for doing stationary work like threshing, winnowing, chaff cutting and lifting irrigation water.

**Advantages**

Easily available and used for all types of work.

**Disadvantages**

Costliest power compared to all other farms of power, very low efficiency, requires full maintenance when not in use and affected by weather condition and seasons.

**Animal power**
The most important source of power on the farm all over the world is animal. It is estimated that, nearly 80% of the total draft power used in agriculture throughout the World is still provided by animals.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easily available.</td>
<td>Not very efficient.</td>
</tr>
<tr>
<td>Used for all types of work.</td>
<td>Seasons and weather affect the efficiency.</td>
</tr>
<tr>
<td>Low initial investment.</td>
<td>Cannot work at a stretch.</td>
</tr>
<tr>
<td>Supplies manure to the field and fuels to farmers.</td>
<td>Require full maintenance when there is no farm work.</td>
</tr>
<tr>
<td>Live on farm produce.</td>
<td>Creates unhealthy and dirty atmosphere near the residence.</td>
</tr>
<tr>
<td></td>
<td>Very slow in doing work.</td>
</tr>
</tbody>
</table>

**Mechanical power**

It is available through tractors, power tillers and oil engines. The oil engine is a highly efficient device for converting fuel into useful work. The efficiency of diesel engine varies between 32 and 38%, whereas that of the carburetor engine (Petrol engine) is in the range of 25 and 32%.

**Advantages**

Efficiency is high; not affected by weather; cannot run at a stretch; requires less space and cheaper form of power.
Disadvantages

Initial capital investment is high; fuel is costly and repairs and maintenance needs technical knowledge.

Electrical power

Electrical power is used mostly for running electrical motors for pumping water, dairy industry, cold storage, farm product processing, and cattle feed grinding.

Advantages

Very cheap form of power; high efficiency; can work at a stretch; maintenance and operating cost is very low and not affected by weather conditions.

Disadvantages

Initial capital investment is high; require good amount of technical knowledge and it causes great danger, if handled without care,

Hand Signals for Machinery Operation
The common hand signals should be used to communicate with others in the area. Hand signals have been developed to provide a uniform means of communication between workers on the ground and equipment operators. They are especially useful when noise, distance, or language barriers make voice communication difficult.

There are eleven recognized hand signals.

**This far to go**

Place palms at ear level facing head and move inward to show remaining distance to go. Use this signal to assist a tractor operator in backing a loaded wagon or hitching to a wagon.

**Come to me**

Raise the arm vertically overhead, palm to the front, and rotate in large horizontal circles. Someone has opened the gate for the cows to be brought forward: You will signal in this manner.
**Move toward me – Follow me**

Point toward person, vehicle, or unit. Signal by holding arm horizontally to the front, palm up, and motioning toward the body. Use this signal to motion an equipment operator to move toward you to position or move equipment in a crowded area where side visibility is poor.

**Move out – Take off**

Face the desired direction of movement; hold the arm extended to the rear; then swing the arm overhead and forward in the direction of desired movement until the arm is horizontal with palm down. You have hitched the machine for the operator and connected the PTO; signal the person to move out for field work.

**Stop**

Raise the hand upward to the full extent of the arm, palm to the front. Hold that position until the signal is understood. The tractor and forage wagon are now positioned for unloading into the silage blower. You signal the operator to stop.
**Speed it up – increase speed**

Raise the hand to the shoulder, fist closed; thrust the fist upward to the full extent of the arm and back to the shoulder rapidly several times. Move the unit out now; the way is clear. We need to move on.

**Slow Down – Decrease Speed**

Extend arm horizontally sideward with palm down; wave arm downward at 45 degrees minimum several times. Do not move arm above horizontal. You are going too fast; slow down.

**Start the engine**

Move arm in circular motion at waist level to simulate cranking engine. You need to signal the operator to start the engine after some adjustment has been made.
**Stop the engine**

Draw right hand, palm down, across the neck in a “throat-cutting” motion left to right. You need to have the operator stop the engine for some adjustments to the machinery.

**Lower equipment**

Use circular motion with either hand pointing to the ground. Use this signal to have operator lower high lift or machine header.

**Raise equipment**

Make circular motion with either hand at head level. Use this signal to have operator raise high lift or machine header.

Risks of Agricultural Machinery

Farm machineries use power to do work. This creates many possible hazards for both operators and bystanders. Minor and serious injuries can occur when workers are not paying close attention, taking shortcuts, ignoring warnings or failing to follow safety rules. The wide variety of warning, caution and instructional decals placed on machinery are there for your safety. There are many different types of farm machinery, so operators must use caution when operating them.

Shear points

Shear points exist when the edges of two objects move toward or next to each other closely enough to cut relatively soft material. Shear and cutting points are hazards because of their cutting force. They often move so rapidly that they may not be visible, so it is easy to forget that they are there.

Pinch points

Pinch points exist when two objects move together, with at least one of them moving in a circle. They are common in power transmission devices, such as belt and chain drives, feed rolls and gear drives. Be aware of these hazards and wear clothing that cannot be caught. Never reach over or work near rotating parts. Turn off machinery to work on it and replace any missing shields.
**Wrap points**

Any exposed, rotating machine component is a potential wrap point. Protruding shaft ends can also become wrap points. Universal joints, keys and fastening devices also can snag clothing. Be aware of potential wrap points and shield those that can be shielded. Place warnings on those that cannot be covered or paint them a bright color.

**Crush points**

Crush points exist when two objects move toward each other, or when one object moves toward a stationary object. Hitching tractors to implements may create a potential crush point. The head or chest of an operator may be crushed between the equipment and a low beam or other part of a farm building. Usually, these accidents occur when the machine is operating in reverse. Tree limbs are also potential hazards.

**Free-wheeling parts**

Rotary mower blades, baler flywheels and various other farm machinery components will continue to move after power stops. Workers must allow time for these wheels or blades to stop before approaching them. This may take as long as two and a half minutes.

**Pull-in points**
Pull-in points usually occur when someone tries to remove plant material or other obstacles that have become stuck in feed rolls or other machinery parts. Always shut off the power before attempting to clear plugged equipment.

**Springs**

Springs may harbor potentially dangerous stored energy. Know what direction a spring will move and how it might affect another machine part when released, and stay out of its path.

**Hydraulic systems**

Hydraulic systems store considerable energy. They lift implements, such as plows, change the position of implement components, such as a combine header, operate hydraulic motors and assist in steering and braking. Careless servicing, adjustment or replacement of parts can result in serious injury. High pressure blasts of hydraulic oil can injure eyes or other body parts by burning or penetrating the tissue. Leaks are a serious hazard. Never inspect hydraulic hoses with your hands because a fine jet of hydraulic fluid can pierce the skin. Use a piece of cardboard to test the hose for leaks.

**Storing Farm Equipment**
General maintenance

All equipment should be thoroughly cleaned with a high-pressure washer to remove dirt and trash residue. Accumulated trash and dirt can create fire hazards, electrical malfunctions, corrosion and rust of equipment, which may result in breakdowns next season. Important areas to clean on all self-propelled machines are the engine compartment, heat exchangers/radiator fans and the area under the control centers. Off-season is the time to make those necessary repairs and adjustments to avoid undue downtime during the next busy season.

Engine

After cleaning the outside of the cooling system, check the coolant level amount of anti-freeze protection and its condition. Dependent upon your service interval, it may be necessary to drain the system, flush the radiator and refill with proper coolant.

Harmful acids can accumulate in your equipment's oil pan, particularly during light-load applications. These acids can damage engine compounds over the long winter months. Regularly service your engine and replace both oil and fuel filters.
Operators should check their tractor or combine fuel tanks, Drain the condensation often and keep tanks as full as possible. Always filter the fuel and keep it clean and fresh for operation.

**Electrical**

Cleaning the battery, its posts and cable connections is advised. On an idle machine, the battery ground cable should be disconnected from the battery to avoid corrosive buildup and possible battery discharge.

**Harvesting machine**

Combine headers require special storage care. We suggest closely inspecting header units, both corn and grain types, for worn, bent or broken parts and replacing them as needed. Proper adjustment of belts and chains is critical to prolong wear.

**Corn heads**

Stalk roll knives should be sharpened or replaced and lubricated, and auger systems checked for proper function. Top off your corn head check up by lubricating all main points including chains and other moving parts.

**Grain headers**
Operators should check the reel drive, sickle wobble box drive, auger, retractable fingers and stripper bars of the grain header. Knife guards and other parts should be inspected for wear and replaced as needed. Check tire pressures before storing equipment and inflate them as necessary.

**Tillage tools**

Operators are placing greater demands on their tillage equipment. Before storing the unit, all ground-working tools and mold boards should be cleaned and coated with a lubricant to guard against rust. Do not forget to check the shanks on field cultivators. Worn shank bushings or pins should be replaced. Do not go into your next season with bent or worn shanks that can leave skips in the fields.

**Planters/Drills**

Planters and drills should be cleaned of any buildup, especially in the seed or fertilizer boxes. Make sure all movable parts are free and not stuck due to chemical corrosion. Operators should check all moving parts for excessive wear. Lubricate all moving parts and inspect all chains and other drive mechanisms for excessive wear or misalignment. Proper off-season storage will add value to farm equipment, increase its lifespan and decrease your operating costs.

**Off-season storage checklist**
• Thoroughly clean all equipment with a high-pressure washer;
• Lubricate all points;
• Coat all parts that rust easily, such as plow shares or chrome hydraulic cylinder rods, with a high-quality protecting;
• Inspect all equipment for broken, bent or worn parts. Repair or replace as necessary;
• Store equipment in a shed;
• Check or drain, flush and refill the radiator with correct coolant;
• Drain engine oil and analyze it to determine the presence of contaminants;
• Check hydraulic system fluid. Replace if needed;
• Check the transmission fluid level. If needed, drain and refill. Install new filters;
• Check fuel tanks for condensation. Fill tanks with high-grade fuel; and
• Disconnect battery ground cables if the machine is idle for several months.
Repair and Maintenance

Maintenance

- Operators are responsible for the following activities daily pre-operational checks of their tractors and a shop mechanic has responsibility for servicing it;
- Check oil, fuel, and other fluid levels;
- Check for any oil, fuel or fluid leaks;
- Check tire condition and inflation levels;
- Make sure that platforms and steps are clean and free of debris and tools;
- Check to see that lights, brakes and the steering mechanism are working properly;
- Make sure that all gauges are giving proper readings and that the engine transmission and hydraulic system aren't making any unusual sounds;
- During the repair of any machinery, appropriate protective clothing should be worn. This includes helmets, goggles, gloves, hearing protection and safety shoes;
- All machinery should be maintained regularly. Any worn or broken parts should be replaced immediately, not fixed in a temporary manner;
- Brakes, hitches, safety chains, springs and shackles, should be inspected regularly for wear, broken or missing parts and cracks in the welds;
• Hydraulic and air lines should be inspected for wear and cracks;
• Whenever parking or leaving a machinery for any length of time, the motor should always be shut off, brakes engaged, the transmission in park-lock or in gear, keys removed and any attachments disengaged; and
• Safety guards should always be in place when operating any machinery.

Some ways of improving tractor maintenance safety include the following

• Routinely adjust brakes, clutches and drives, according to the manual;
• Ensure steering, exhaust system and brakes are in top condition;
• Stop the motor before re-fuelling, servicing or greasing and, if possible, wait until the engine is cold before re-fuelling;
• Never remove or replace belts while pulleys are under power;
• Keep steps and working platforms free of grease and oil to avoid slips and falls; and
• If the engine overheats, allow time for it to cool off before removing the radiator cap.
Selecting Machinery

Selection of machines to use on a farm is an important duty of a machinery manager. The decision includes judgment of the material efficiency of the machine, availability of dealer service, and the economic worth of the machine to the farm. The machinery manager can only predict such costs assuming average weather, soil conditions, and crop growth.

The following are some of the economic issues to be considered in selecting farm machineries:

- cost,
- benefits;
- Comparable benefit with conventional machines;
- Number of machines needed;
- Insurance;
- Labor impacts;
- Risk;
- Environmental impacts; and
- Energy consumption
Replacing Farm Machinery

Farm machines may need replacement because of accidents, obsolete, and they no longer have the capacity needs of an expanded farm, or a new design has a superior material efficiency. The replacement decision depends on the analysis of a continuing record of actual (not estimated) repair and maintenance expenditures and a realistic evaluation of the current market value of the current machine. Fuel, labor cost, and oil need not be considered in there placement decision. Such costs are an important part of production expense and should be recorded and examined for other management decisions.

Farm machinery replacement decisions are initially important in farm machinery operation management. In most cases the reasons for machinery replacement, are due to;

- lessening chances of getting a purchaser of the equipment;
- inadequacy with the consequential incapacity of the existing machine to meet the new requirements;
- deterioration through excessive operating cost, increased maintenance costs, high reject rates, high frequency of stoppages as well as increased safety hazard; and
- obsolescence arising from technological advancement which makes the existing machines to be less efficient in
performance and difficulties in finding required spare parts of the machine.

The costs of a new machine are high the first year because market place depreciation is very high. The repair and maintenance costs are usually low during the early life of a machine. Developing a good machinery replacement policy is indispensable as this will allow investment to be planned to span a period of twelve years and or thereabout. The aims of a good policy are to:

- enable the purchases of machine to be planned in advance;
- avoid peaks of borrowing by forecasting the cash flow;
- ensure that the machine fleets are maintained and are in good order;
- maximize the use of investment capital; and
- replace machines regularly over the period.

Steven, J. and Murphy, D. J. (1985) “Agricultural Hand Signals”. Penn State University.


### Appendix

**Operational norm calculation sheet**

<table>
<thead>
<tr>
<th>Operation →</th>
<th>Plowing</th>
<th>Disking</th>
<th>Fertilizer application</th>
<th>Seed broadcast</th>
<th>Seed Drilling</th>
<th>Seed covering</th>
<th>Produce transport</th>
<th>Harvesting</th>
<th>Transport</th>
<th>Loading and leveling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters ↓</td>
<td>Machinery Type</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Tractor</td>
<td>Tractor</td>
<td>Tractor</td>
<td>Tractor</td>
<td>Tractor</td>
<td>Tractor</td>
<td>Tractor</td>
<td>Combine</td>
<td>Tractor</td>
<td>Loader / grader</td>
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<tr>
<td>Total hectare (D)</td>
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<tr>
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<tr>
<td>Hectare / day</td>
<td>(F = D / (C/A))</td>
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<tr>
<td>Fuel / hour (G = B / C)</td>
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<td>Fuel / hectare</td>
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</tbody>
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61
### Machinery fleet calculation sheet

Center: __________________________

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>W. Hr. / day (75% efficiency) (A)</td>
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<tr>
<td>Total ha (B)</td>
<td>385</td>
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<tr>
<td>Hour/ ha (C)</td>
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<tr>
<td>Total working hours (D = B * C)</td>
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<td>ha/ day (E)</td>
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<td>Total working days (F)</td>
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<td>Total fleet (I = G + H)</td>
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Example: Plowing schedule from Megabit 1 – Miazia 15
Daily machinery performance log

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<thead>
<tr>
<th>Date</th>
<th>Tractor hr</th>
<th>Type of operation</th>
<th>Section</th>
<th>Fuel</th>
<th>Oil and lubricants</th>
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<tbody>
<tr>
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<td>Grease</td>
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Total

63
Daily machinery performance sheet

Center________________         sub center_________________
d/m/y________________

<table>
<thead>
<tr>
<th>Description</th>
<th>Tractor /combine plate number</th>
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<tbody>
<tr>
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<td>Type of implement</td>
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<td>Operators name</td>
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<td>End diff.</td>
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**Daily machinery performance summary sheet**

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<th>Area (ha)</th>
<th>Fuel</th>
<th>Oil type</th>
<th>Grease</th>
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Monthly summary of farm machinery performance

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<th>Area (Ha)</th>
<th>Mach. Type and Model</th>
<th>Mach-Hour</th>
<th>Down Hour</th>
<th>Net Hour</th>
<th>Fuel</th>
<th>Oil and Lubricants</th>
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<td>Combine</td>
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</table>
Repair order of agricultural machinery

Center___________ machinery type ________________ number ____________
Defects______________________________________________________________
_________________________________________________________________

Requested by ________________ date______________ signature______________
Ordered by __________________ date______________ signature______________
Labour:
Technician’s name: 1. ___________ hrs. _________ cost ____________
                       2. ___________ hrs. _________ cost ____________
                       3. ___________ hrs. _________ cost ____________
                       Total cost ____________
Work done: __________________________________________________________________

Spare parts:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part no.</th>
<th>Quantity</th>
<th>Price</th>
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Sub total

Consumables:

|             |         |          |       |       |
|-------------|---------|----------|-------|
|             |         |          |       |       |
|             |         |          |       |       |

Sub total

Cost of spare parts and consumables- ________________________
Cost of labour:- _______________________________________
Total:- ________________________________________________

Farm machinery maintenance cost record sheet

68
<table>
<thead>
<tr>
<th>Machinery type</th>
<th>Property number</th>
<th>Material cost</th>
<th>Labor cost</th>
<th>Total cost</th>
<th>Remarks</th>
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</tbody>
</table>
Condemnation of agricultural machineries data sheet

Organization ______________
Center _________________

A) Farm Machinery Data:

1) Type ________________________________
2) Make ________________________________
3) Model ________________________________
4) Inventory code Number _____________
5) Property Number _____________________
6) Chassis/ Serial Number _____________
7) Engine Number ______________________
8) Year of Manufacture ________________
9) Date of Purchase _____________________
10) Purchase Price _______________________
11) Replacement Cost ___________________
12) Rehabilitation Cost __________________
   Spare part cost _______________________
   Labor cost __________________________
13) Cumulative maintenance cost _________
14) Dead lined since _____________________
15) Current market value ________________
16) Cause of Failure _____________________
B) Present condition of the machines/implements/equipment:


C) Reason of condemnation:


D) Ways of Condemnation:

| Sale as it is (present condition of the machine is outdated technology) |  |
| As a spare part use for the same machinery |  |
| Sale as a scrap |  |

E) List of Missed/Existing/Parts/Components of the machine:

<table>
<thead>
<tr>
<th>No.</th>
<th>Part number</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit price</th>
<th>Total price</th>
<th>Remarks</th>
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Total value
F) Requested By:

Directorate___________________ Case team___________________
Name ______________________ Signature ____________________
Date ______________________

G) Comment and Decision of the institute/ center committee:

____________________________________________________________________________
____________________________________________________________________________

H) Institute/ Center Condemnation Committee:

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<th>No.</th>
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<th>Signature</th>
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I) Comment and Decision of the Institute/ Center Director:

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Name ______________________ Signature ____________
Date_______________________