Hurlstone Agricultural High School

Trees and Oats on Farms

AGRICULTURE

Authors:
Jonathan Lam
Riyan Fahim

Originally made for the 2012 year 9 agriculture yearly examination.

Latest Revised May 8, 2015

Contents

1 Trees on farms **2**

1.1 Aboriginal tree use . . . 2
1.2 Sustainable Farming . . . 2
1.3 Different types of tree plantings . . . 3
1.4 How trees on farms improve sustainability . . . 3
1.5 Trees on Hurlstone . . . 4
1.6 Good design features of a windbreak . . . 6
1.7 Agroforestry . . . 6
1.8 Hurlstone map . . . 6
1.9 Water tables . . . 7
1.10 How to plant trees . . . 8

2 Fodder Oats and Filling the Winter Feed Gap **9**

2.1 Locations of major oat growing areas and uses of oats . . . 9
2.2 Definitions . . . 10
2.3 Why fodder is conserved . . . 10
2.4 How does Hurlstone use oats . . . 10
2.5 Advantages and disadvantages . . . 10
2.6 Calendar of operations for oats . . . 11
2.7 Timing and purpose of the Oats calendar . . . 11
2.8 Parts of a mature oat plant . . . 12
2.9 Minimum/zero tillage implements vs conventional . . . 12
2.10 Problems associated with cropping . . . 13
2.11 Working parts of a tractor . . . 13
2.12 Tractor implements . . . 14
2.13 Main controls of the tractor . . . 14
2.14 Tractor Safety . . . 15
2.15 Starting and stopping a tractor safely . . . 15
2.16 Carrying out an experiment . . . 16
2.17 Connections of the Tractor . . . 16
2.18 Tractor terms . . . 16

1 Trees on farms

1.1 Aboriginal tree use

Contrast the use of trees by the hunter-gather Australian Aborigine with that of the early farmer of the European descent.

The Australian **Aborigine** protected and used tree sources. Uses include:
Kurrajong - The tap root of young trees is used as a food; the inner bark fibre is used for making nuts.
Paperbark - the bark is used for bedding.
Wattle - has an extremely tough wood and is used to make spears, clubs and boomerangs and the seeds are used for food.
Fig - the fruit are eaten.
Banksia and Grevillea - the nectar is eaten.

Early farmers of **European** descent

- Massive tree clearing for rapidly expanding cropping lands (predominantly wheat)
- Massive tree clearing for rapidly expanding grazing lands (predominantly sheep)
- Tree harvesting for timber products

1.2 Sustainable Farming

Sustainable farming is where the health of the farm's water, soil and natural vegetation remains in good condition, resources is maintained, the use of resources such as pesticides or artificial fertilisers is minimised. Recycling of matter and nutrients is maintained and the farm's productivity and profitability is maintained. The environmental state of the farm must improve over the years, or at least have the farm stay the same with no damage to it.

Clearing trees is considered unsustainable. It causes water run off to increase and soil erosion to accelerate. More water reaches the water table and as it rises, it brings salts up to the topsoil (salinity), soil is washed into rivers and creeks. This soil might be bad (harmful pesticides etc) and this reduces the water quality, and since there is sediment build up, the water depth decreases over time. Insect pests become more of a problem because fewer natural predators are attracted to the farm.

Early Aboriginal tree use is considered sustainable because tree resources were not destroyed but used sparingly and allowed to regenerate. The tribal groups would move around their lands to minimise pressure on the area's resources.

1.3 Different types of tree plantings

Windbreak	**Along the fence line of a high wind area**
Corner wood lot	Corner of cropping paddocks
Agroforest	Riverflats
Clumps	Grazing paddock
Remnants	Hilly areas, creeks and riverbanks
Wildlife corridors	Whole farm

1.4 How trees on farms improve sustainability

- Windbreaks reduce evapotranspiration reducing the need for irrigation water.
- Agro-forests lower saline groundwater reducing the risk of soil salinity.
- Wildlife corridors attract predatory birds reducing the risk of insecticides.
- Windbreaks protect animals from cold winds reducing animal cold stress and improving their performance and health.

1.5 Trees on Hurlstone

The fodder trees on the Hurlstone farm are: Kurrajong, Radiata pine, tagasaste, saltbush, willow, Casuarina (she-oak), Acacia aneura (Mulga), Acacia pendula (Weeping Myall).

Casuarina (Sheoak)

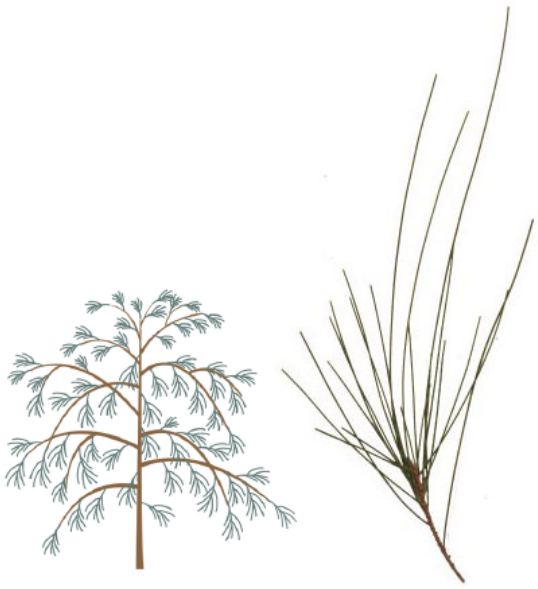


Figure 1.1: Tree profile and the leaf shape of a casuarina (sheoak)

Kurrajong

Figure 1.2: The kurrajong.

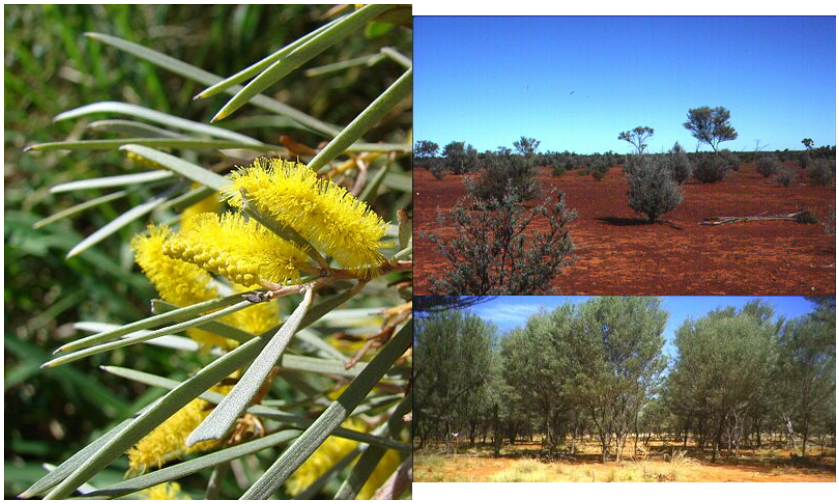
Radiata pine

Figure 1.3: The radiata pine.

Acacia Pendula (Weeping Myall)

Figure 1.4: The Acacia Pendula or the Weeping Myall.

Acacia aneura (Mulga)



1.6 Good design features of a windbreak

A good windbreak is permeable (allows water to travel through) and is 2-4 rows. It is at a gradual slope of 60° on windward side.

1.7 Agroforestry

Agroforestry is the use of the same piece of land to grow trees for timber and either to grow crops or to graze animals. That is, the combination of agriculture and forestry.
Cypress pines are often used in agroforests and they are used to produce high quality saw logs in a short amount of time. They will also provide shade and shelter for livestock.

Benefits of agroforestry

Agroforestry will provide shade and to some degree shelter to livestock. It can assist with the control of erosion and salinity and recycle nutrients.

1.8 Hurlstone map

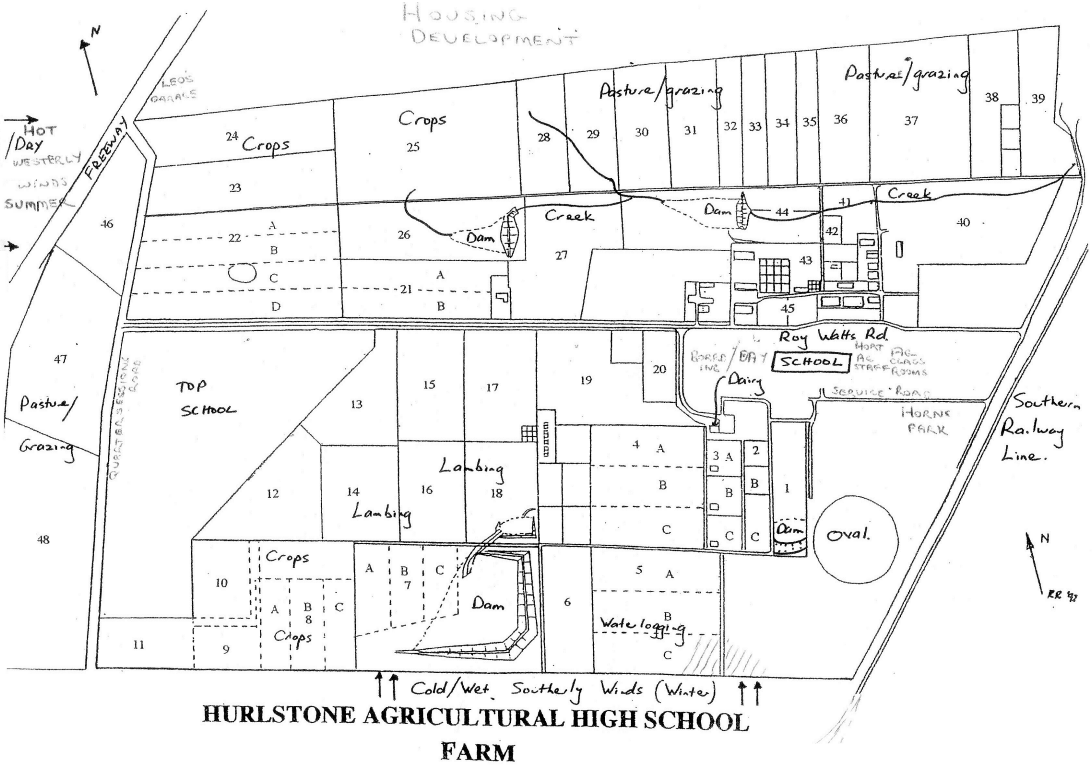


Figure 1.5: This map shows the farm of Hurlstone, with the uses of each field/paddock. Zoom in for clearer images.

1.9 Water tables

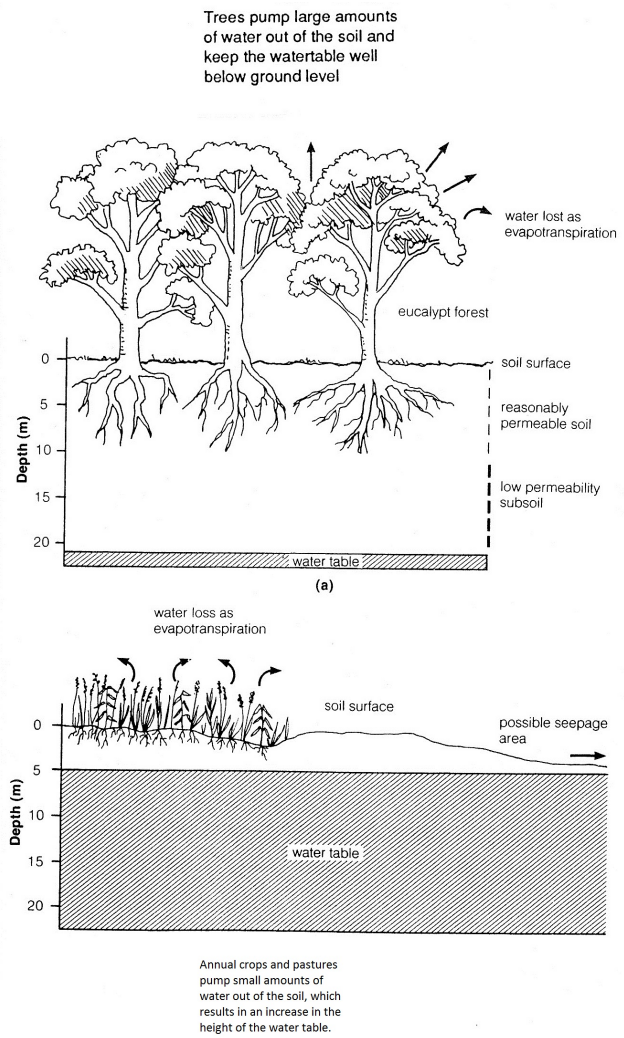


Figure 1.6: This diagram shows the size of the water table, as well as other benefits of having a deep root system.

1.10 How to plant trees

1. Spray area to kill grass
2. Deep rip well in advance for water penetration
3. Prepare suitable hole for the size of the seedling.
4. Place water absorbing substance in hole (eg. Alcosorb^{TM})
5. Place seedling at suitable depth and back fill hole.
6. Place sticks and carton around tree.
7. Construct water well around tree after backfilling and compacting soil.
8. Water thoroughly to consolidate the soil and remove air pockets from around the roots.

   Subsequent waterings will be made easier if you shake the soil around the tree into a saucer big enough to hold 20 litres of water.

   Don't plant on hot days or dry, windy days because the soil and plants will dry out very quickly, reducing your chances of getting the seedlings to establish successfully.

   Planting after rain is an advantage, but don't plant into waterlogged soil.

2 Fodder Oats and Filling the Winter Feed Gap

2.1 Locations of major oat growing areas and uses of oats

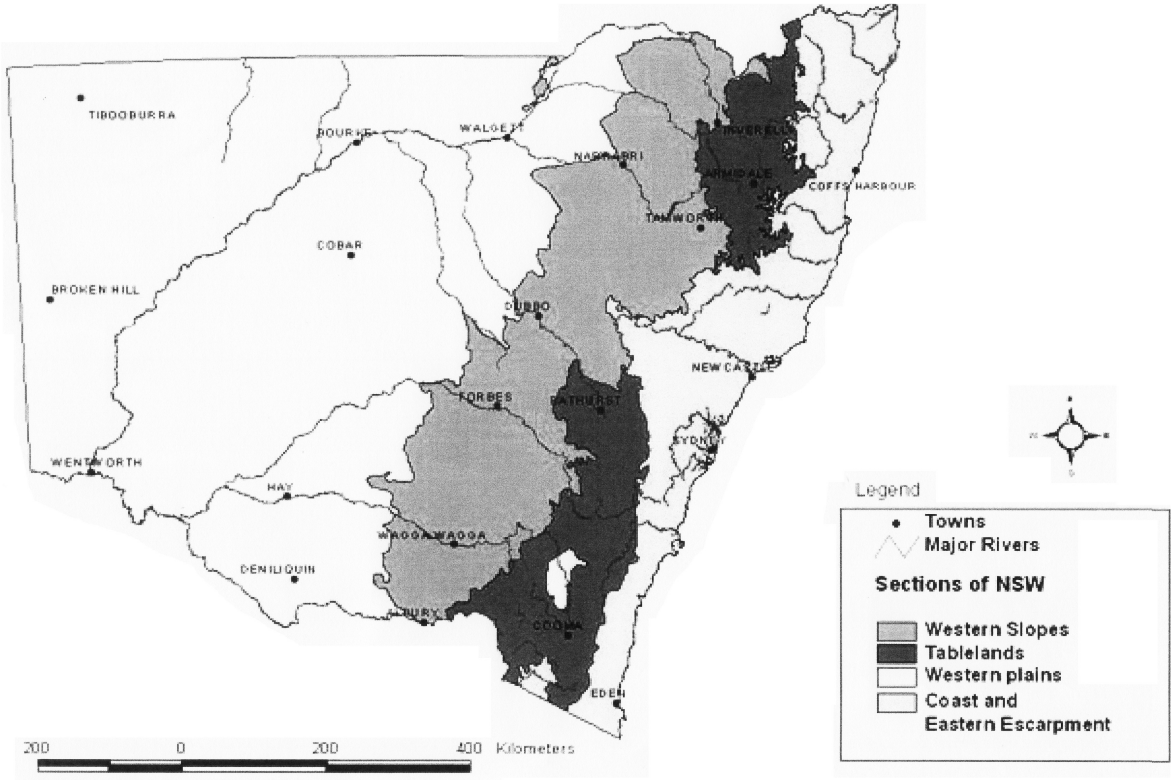


Figure 2.1: From left to right, the sections are western plains, western slopes, table lands and the east coast.

The table below shows the uses of the hay that is grown in different areas.

Coastal Plains	Grazing and hay production
Table lands	Grazing and hay production
NW slopes	Grazing and hay production
Central western slopes	Grazing, hay and grain
SW slopes	Grain production

2.2 Definitions

Fodder	Feed for cattle, sheep, horses and other livestock.
Conserved Fodder	Fodder (hay, silage, grain etc) that has been stored for use in times where there isn't enough feed (like the winter feed gap) e.g. Hay and silage
Fodder crop	Green plants that have to be eaten within 24 hours or they risk spoiling. It is grown to feed out straight away.
Conditioning	The crushing of the step so that the leaf and the stem dries at the same time.
Curing	Drying of the hay.

2.3 Why fodder is conserved

- Excess/abundant plant production
- Supplement to boost animal production.
- Dry spell reserves

2.4 How does Hurlstone use oats

Used to feed dairy cows because lack of heat and crops don't grow in winter.

2.5 Advantages and disadvantages

Hay can be stored for a long time, up to 15 years, as long as it is stored in a shed and made in the correct way.

Silage Advantages: It is made on your own farm and everyone can make it. It can be stored in a container or a pit. It is easy to be made - you just cut it up and store it.

Disadvantages: Molasses need to be added to make it smell nicer for the animals.
Grain is high in protein and can be stored for a long time.

2.6 Calendar of operations for oats

Date	Operation
Feb 15th	Sprayed paddock with roundup. 2 litres per hectare to kill all grass species.
March 2nd	Soil is aerated.
March 3rd	Paddocks are sown with oat seeds, Graze variety sown at 135 kg per hectare.
March 3rd	Paddocks are then harrowed, one pass.
May 20th	Paddock is grazed for the first time. Each paddock is grazed three times.
Late September	Stock are taken from the paddock and are fed else where. Paddock is allowed to grow.
Early October	Haymaking is done. All remnant growth is cut, dried and baled. It is then stored for next year.

2.7 Timing and purpose of the Oats calendar

Seedbed preparation

The winter oats crop is planted using a zero tillage technique. This negates the need for conventional seedbed preparation.
Existing summer pastures are either heavily grazes of slashed/mulched. This reduces the height of the pasture so that it does not shade the oats.
Following this, the existing pasture is sprayed with a non-selective herbicide eg. *Roundup* to prevent the existing pasture from competing with the emerging oats.
This would occur in Feb/Mar depending on the season.

Sowing

Oats seed is sown using zero tillage techniques.
The planting machines used is called an *Agrodrill*.
Sowing occurs in Mar/Apr.
Fertiliser is not applied at sowing. It is applied several weeks after germination.

Grazing

Timing largely depends on the time of planting and seasonal conditions. Varies from year to year.
It must not be grazed until it has firmly established roots, otherwise, the cattle will pull the plants out when grazing.
Often occurs between July and September.

Insecticide spraying

Usually not carried out.

Harvesting

The crop is cut for hay just as it is starting to brown off. Usually September to November. This process is part of hay making.
Machinery used are: mower-conditioner, tedder and hay baler.
If the oats crop is to be used for hay making, livestock must be excluded to allow the crop to form heads.

2.8 Parts of a mature oat plant

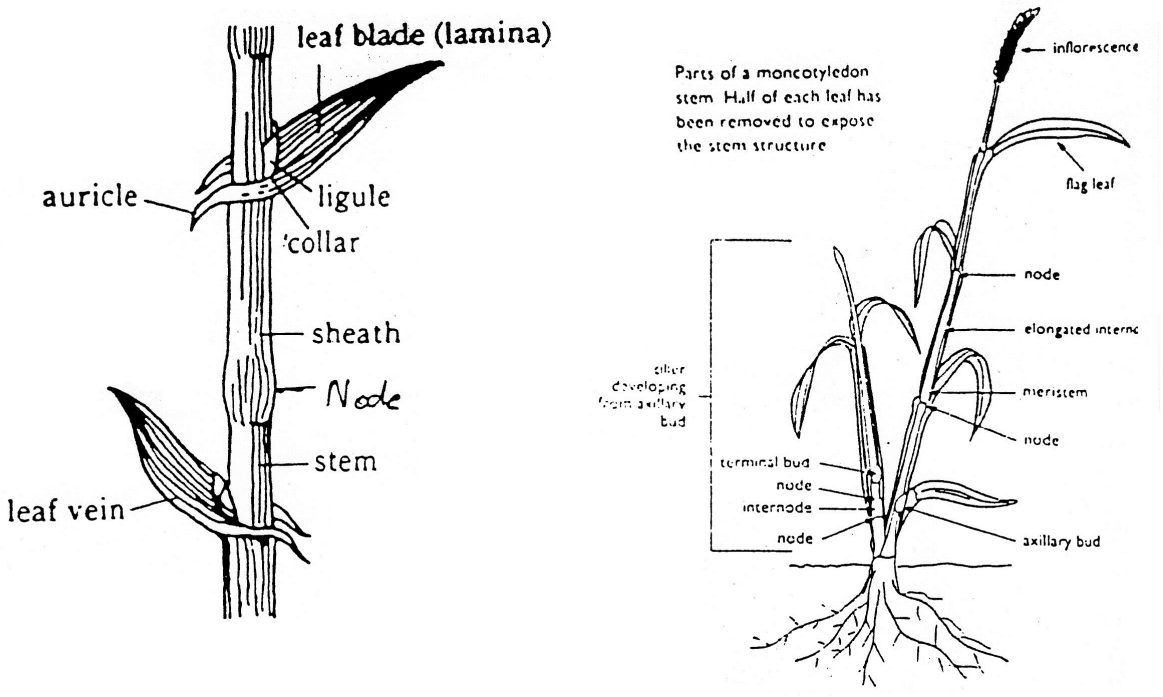


Figure 2.2: This diagram shows the parts of a mature oat plant.

2.9 Minimum/zero tillage implements vs conventional

A minimum/zero till means that you don't till the soil. That is, the machine doesn't rip apart the soil. Conventional tillage machines rip and destroy the plant structure. Using minimum/zero means that there won't be any erosion as the plant matter underneath the soil is still holding it together. However, birds can eat the seeds and the weeds might be still underneath. The seed doesn't go deep into the soil and get the required nutrients.

Minimum/zero till implements	Herbicide boom spray
	Agrow-plow
Conventional till implements	Disc plough
	Scarifier
	Harrows

2.10 Problems associated with cropping

The main problems associated with cropping are:

1. **Soil erosion** (Removal of top soil) - The cultivation of soil to produce a seed bed tilth, suitable for sewing the desired crop exposes the soil to the agents of erosion (ie. Wind and Water). Wind creates 'dust storms' which can in finely worked soils remove considerable amounts of valuable top soil. Water (particularly running water) can wash away the worked top soil, thereby reducing its productivity.

2. **Structural Decline** (breaking down of peds or aggregates) - The mechanical breakdown of soils to produce a seed bed reduces the size of the soil aggregates thereby reducing the benefits of a good structured soil (eg. Drainage, water infiltration, aeration, easy of root penetration by plants etc.) Structural decline is most rapid when soils are over cropped (the texture and organic matter content are 2 significant figures that determine a soils tolerance to structural decline). Structural decline also results in a lowering of the yield of the crops. Crusting of surface soil (when wet/dried) is an example of structural decline. This effect makes it more difficult for terminating seedlings to emerge.

3. **Algal Blooms** (growth of algae from increased nutrient levels from fertiliser applications, pesticide, nitrogen) - The run-off of nutrients into dams, rivers and water ways, product these "blooms", thereby producing 'irrigation' water which is 'toxic' to crops and pastures eg. blue, green algae. These 'blooms' are most likely to occur in the warmer periods of the year when irrigation if required to keep the plants growing.

2.11 Working parts of a tractor

The working parts of a tractor are the:

- 3-point linkage
- Power take off
- Drawbar
- Hydraulic hose linkages

2.12 Tractor implements

Appreciate that the tractor is a very versatile machine on the farm and state one piece of machinery on the Hurlstone farm that
- Is pulled by the drawbar: **Mouldboard plough**
- Is pulled by the drawbar, driven by the PTO and raised and lowered by hydraulics: **Posthole rammer**
- Is carried by the 3 point linkage and driven by the PTO: **Slasher**
- Is carried by the 3 point linkage: **Carryall**

2.13 Main controls of the tractor

- Clutch (Foot pedal on the left, 1 on diagram below)
- Gear stick (12)
- Foot throttle (11)
- PTO lever (5)
- Brake (10)
- Hand throttle(8)
- Steering wheel (If you don't know, you're stupid)
- 3-point linkage lever(14)

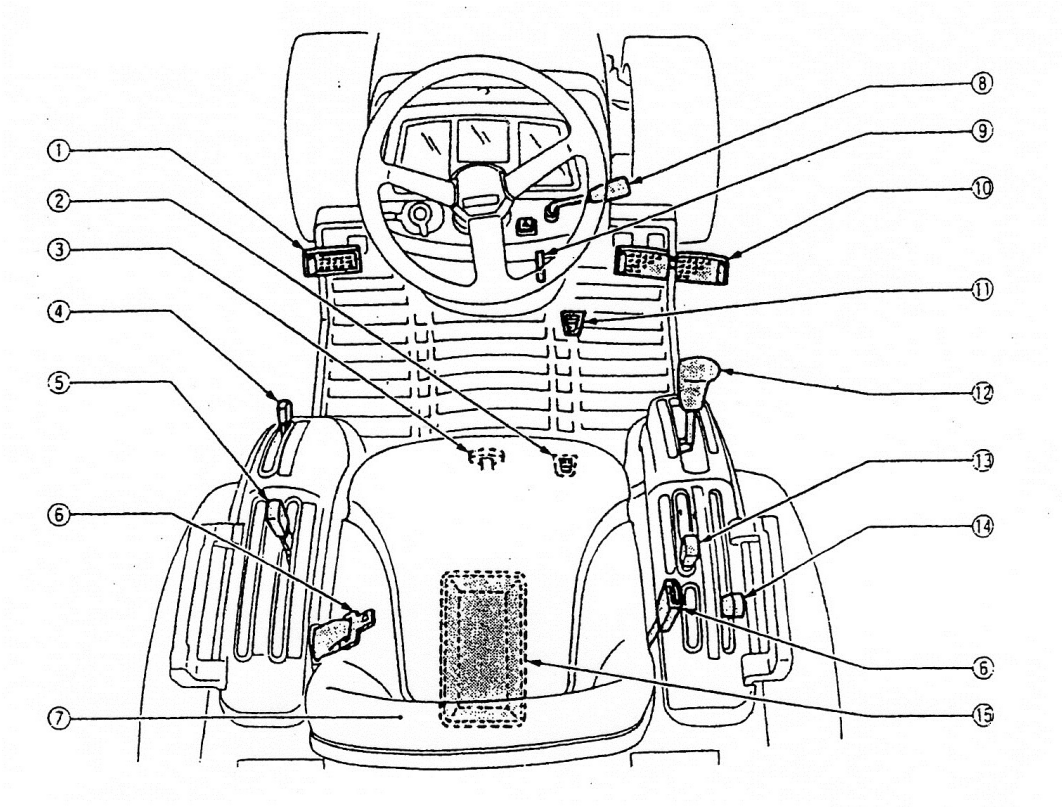


Figure 2.3: The top down view of the Kubota B7500.

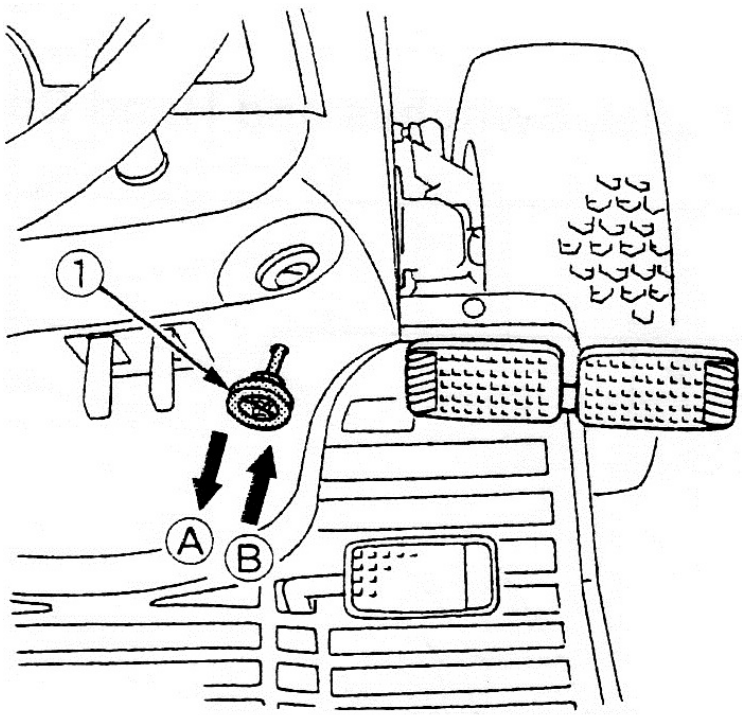


Figure 2.4: The brake pedals on the tractor are located on the right. You can also see the stop engine knob labelled. Pull to stop engine. You can also use it as an emergency stop button.

2.14 Tractor Safety

The Kubota B7500 safety mechanisms:
1) Roll over protection structure (ROPS) is compulsory on all tractors. Prevents driver from being crushed. This can be in the form of ROPS or cab.
2) Hazard lights: Warning to other people in the vicinity, especially at night.
3) Seat Belt: Driver does not get thrown off in the event of an over turn.

2.15 Starting and stopping a tractor safely

To start a tractor the following sequence must be adhered to, to protect little children or top schoolers from starting it and going for a joy ride:
1) Put the stop knob in.
2) Put the PTO and gear in neutral
3) Press foot handle to floor.
4) Set throttle at required speed.

Driving the tractor:
1) Turn throttle to appropriate for the use
2) Select appropriate gear (high 1)
3) Remove/lift clutch slowly until dulls in sound, or you see the wheels just start to move.
4) Hold or slightly release until tractor reaches top speed, or can go any faster.
5) Remove foot.

Stopping the tractor:

1) Depress clutch to floor
2) Return gear lever to neutral. If still moving may put foot on brake.
3) Remove foot from clutch. The tractor will remain stationary.
4) Safe to dismount.

All tractors are mounted from the left (like a horse). This is because there are more levers and controls on the right side since more people are right handed.
Unless working a paddock, the foot brakes should be fitted together.

2.16 Carrying out an experiment

Remember to keep all variables the same except for one.

Independent variable	Dependent variable	Control variable
Change	Measure	Same

The rest is year 7 and year 8 science.

2.17 Connections of the Tractor

The pin thing on the end called the drawbar is used for towing (moving the equipment) heavy equipment or equipment that needs to be dragged along (eg. The large fertilizer spreader or smaller equipment like trailers with nothing attached.). The second way that stuff can be attached is the three point linkage with the top arm (hooks and unlock the matching in place and 2 lower arms). They are good for lighter equipment. Three point linkage enables equipment to be carried or moved and raised or lowered by a hydraulic lever. The next piece is the power take off. The Spline locks it into place. Its function is to move parts.

2.18 Tractor terms

Hydraulics - Allows the tractor operator to raise implements (eg. slasher) attached to the tractor.
Throttle - the common name for the accelerator level.
Gears - Allows the operator to select a suitable engine transmission speed.
Clutch - Engages and disengages the engine from the transmission so that there is no power transmitted from the engine to the wheels.
Parking brake - Allows the driver to lock the brakes while they are off the tractor.
PTO - Power take off.
Accelerator - Controls engine speed.
ROPS - Roll over protection structure.
Brake - A device for arresting the motion of a wheel by friction or pressure.
Glow plug - Indicated that the engine is pre-heating.