

# AGROWPLOW

## OPERATOR'S MANUAL

**Vineyard Plow**  
**AP10 Series**  
**AP30 Series**  
**AP70 Series**  
**AP70A Series**  
**Cotton Bed Renovator**  
**AP90 Series**



## Contact Details

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Local Agrowplow Dealer:

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‘Prosperity Through Soil Care’

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## Disclaimer

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Every effort has been made to ensure that the information in this manual was accurate and up to date at the time of printing. Agrowplow Pty Ltd reserves the right to make subsequent changes to the machine or this manual, where necessary, without notification.

Agrowplow Pty Ltd will not be responsible for any damage or consequential loss arising out of misinterpretation or failure to follow recommended procedures. Nor will it be liable for any damage caused by or arising out of modification or misuse of its product.

The owner has a responsibility to protect himself and others by observing all safety information and by ensuring all operators are well acquainted with the safety information, trained in the correct use of the machine and applying safe work practices.

# The Owner's Manual

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Your new Agrowplow will give long and efficient service if given normal care and operated properly.

This owner's manual is provided so that you can become thoroughly familiar with the design of the machine and to obtain information on correct operation, adjustment and maintenance. Only people well acquainted with these guidelines should be allowed to use this machine.

Right and left hand references in this manual are determined by standing behind the machine and facing in the direction of travel.

The manual is considered as part of your machine and must remain with the machine when it is sold.

## Delivery Inspection

On delivery of your new Agrowplow please check that the machine is not damaged. In cases of shipping damage, please ask your dealer to arrange for the appropriate claim to be lodged immediately.

Assemble any parts supplied loose and inspect your machine with the aid of this manual to familiarise yourself with its features. If you have any queries ask your dealer straight away.

The machine is covered by our 12 month warranty on faulty parts, subject to normal use. Record below the serial number of your machine and keep it in a secure place to help trace the machine and assist us when you order parts.

Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Authorised Agrowplow Dealer: \_\_\_\_\_

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# Agrowplow – Company Profile

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Agrowplow Pty Ltd is an innovative, soil conscious company committed to developing "Soil Care" products for improved, sustainable agriculture.

The founders of Agrowplow had the foresight to see that farmers needed to improve their practices - to improve soil structure, increase humus and allow more water to infiltrate and store in the soil - if farming was to be sustainable.

The first Agrowplow was designed and built in 1977 to improve soil structure, increase humus levels and increase water infiltration and storage deep into the soil.

Today the company's range of Agrowplows and Agrowdrills are widely accepted by farmers and agricultural researchers for their unique capabilities. The term "Agrowplow" has become a "farming concept" rather than just another implement.

The company's range of specialised Agrowplows, Agrowdrills and other products are designed and manufactured under strict code of sustainable agricultural mechanisation, and promoted under the slogan:

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"Prosperity Through Soil Care"

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The company's research and development division develops world leading technology for Agrowplow which has resulted in a well-earned reputation of turning market "Ideas" into reality.

Development is undertaken with the professional guidance of fully qualified design engineers with the use of 3D CAD/CAM that supports the complete design to manufacture process. All designs are manufactured to the highest standards of quality control.

Agrowplow has a large factory area (3500 square metres) with extensive fabrication equipment. Experienced and qualified personnel form an extensive resource in all areas.

Agrowplow - building soil care products for improved, sustainable agriculture.

# Warranty Policy

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Agrowplow warrants to its Dealer, who in turn warrants to the purchaser, that each new Product, part or accessory will be free from defects in material and workmanship for 12 months after delivery and installation by an Agrowplow Dealer, according to the conditions outlined.

This warranty is in lieu of all other warranties (except those of title), expressed or implied, and there are no warranties of fitness for the particular purpose. In no event shall Agrowplow be liable for downtime expenses, loss of machine use, loss of crops, loss of profits, injury or damage arising from accident, direct or indirect loss, or other incidental, consequential or special damages.

The Safe Use Inspection (SUI) and Pre Delivery Inspection (PDI) Forms must be filled in and returned to Agrowplow by the Dealer or Agrowplow representative within seven days of delivery and installation of the unit. By signing the SUI & PDI Forms, the owner acknowledges that he is responsible for the safe operation of the product, and that he undertakes to fully train any person that might operate the product. Only when the Warranty Registration is completed and returned can Agrowplow fulfil all warranty obligations.

## Conditions of Warranty

In the event of a defect which may result in a warranty claim:

- The Owner must provide the Authorised Dealer with written notice of the defect within 14 days of its occurrence, and allow reasonable time for replacement or repair.
- At Agrowplow's request the Dealer will ensure any failed parts are freighted to the Agrowplow factory. Freight costs will not be covered by Agrowplow. Transportation of the Agrowplow product to the Authorised Servicing Dealer for warranty work is the responsibility of the Owner.
- The Warranty is not transferable to any third party or subsequent purchaser.
- Components and conditions not covered by warranty include:

### Abuse

Failure resulting from neglect, improper operation, lack of required maintenance or continued use of machine after the discovery of a defect which results in greater damage to the unit.

### Environmental Conditions and Application

Deteriorated or failed components such as hydraulic hoses, seals, valves or connections damaged by corrosive materials, dirt, sand, excessive heat or moisture. Warranty determination for these types of failures will be made by Agrowplow only after inspection of failed components.

### Normal Wear

Normal wear and consumable items such as oils and lubricants, nuts, bolts, washers, grease caps, spanners, jacks, bearing housings, axles, poppet valves or seal kits for hydraulic cylinders, seals, points, discs, axles, tyres, machine adjustment and periodic service. These are considered to be normal wear items and are not warranted.

### Maintenance

Component failure caused by non-performance of scheduled maintenance such as correct lubrication and maintenance, tightening or replacement of bolts, nuts, fittings, shields and covers.

### Damage

Damage or machine failure caused by carelessness, accidents, improper operation, inappropriate transportation or storage of the machine, parts or attachments.



### **Alterations**

Any unauthorised alteration, modification, attachments or unauthorised repairs to the Agrowplow product, parts or attachments. Written approval must be obtained from Agrowplow for any such items to maintain warranty.

### **Replacement Parts & Service Work**

The Labour or expenses involved in any of the following replacements or service tasks is the responsibility of the owner:

- Replacement of faulty tyres
- Soil opener replacement
- Metering roller adjustment or replacement
- Any bearing replacement
- Adjustments (refer to manual)
- Drive shaft adjustment or replacement
- Periodic service work.

Agrowplow and its Dealers are not responsible or liable for any such expenses.

### **Clean-up Time**

Agrowplow does not pay for cleaning the products, parts, accessories or work area before or after the warranty repair. Clean-up time is affected primarily by the application or conditions in which the unit is operated and maintained. Since clean-up time can be so variable, cleaning time should be considered a customer expense.

### **Transportation & Insurance Costs**

Warranty does not cover transportation or insurance costs for its products or other equipment needing repair or replacement of warranted components. Nor does it cover any freight or insurance costs in obtaining new parts or returning old parts to Agrowplow for inspection purposes.

### **Travel Time**

Travel time required for warranty repairs is the responsibility of the Owner.

### **Diagnostic Time**

Warranty does not cover time required to diagnose a warranty problem. Diagnostic time is affected greatly by the training and expertise of the technician employed to do the job. With proper training of service personnel, diagnostic time should be at a minimum. Agrowplow expects that Dealers will assign a well trained and proficient technician to handle warranty repairs.

### **Non – Genuine Parts**

Use of parts other than Agrowplow parts for repair of warranted parts will automatically negate any warranty. Warranted components must be replaced with genuine Agrowplow repair parts.

### **Unauthorised Repairs**

Repairs by an unauthorised agent will automatically forfeit any warranty. Warranty repairs must be carried out by an Authorised Agrowplow Dealer only, and only after Agrowplow's authorisation has been obtained.

### **Special Warranty Considerations apply in respect to the following:**

Tyres, Hydraulics and Castings:

These items are covered by their respective manufacturer's warranty. Claims for faults relating to these components must follow Agrowplow's normal claim procedures.

## Completing Safe Use Instruction (SUI) & Pre Delivery Inspection (PDI) Reports

The use of the SUI and PDI Reports is mandatory. Each Report must be completed as part of the sales process of every machine and returned to Agrowplow for warranty registration. Each completed Report must detail:

1. The intended purpose of the machine;
2. The safety controls that have been used to reduce or eliminate identified hazards;
3. A warning of the existence of hazards remaining in the machine and an explanation as to why the hazard remains.
4. Limitations to the use and application of the machine or plant resulting from any remaining hazards as recorded on the SUI Report.
5. Further operator training that may be required.

### **Special Note:**

*Dealers are responsible by law to determine that machines are suitable and properly equipped for the application they know or should reasonably have known the machine will be used for. This implies that a supplier must enquire what the machine is to be used for, and a further review of safety controls must be carried out, in view of the specific application the machine to this intended purpose.*

At the time and point of delivery the salesperson must present the SUI & PDI Report to the purchaser as a record of the installation process. This should be the result of a face to face installation.

Once the intended purpose is confirmed, use each item of the SUI as the record of instruction given to the purchaser including:

- Safety controls that minimise the hazards present in the machine;
- Safe operating procedures for the proper use of the machine;
- Limitations to the use of the machine according to an intended application that prevents a safety hazard arising;
- Any additional training the operator may require to use the machine safely

The purchaser must sign the completed SUI as evidence that information and training has been provided and that the purchaser now has the responsibility to train all other operators. It is the responsibility of the purchaser to ensure all other operators are trained.

**The original SUI and PDI forms must be completed, signed and returned to Agrowplow for Warranty to be valid**

# 1. Safety

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Agricultural machinery presents an operator with hazards associated with setting up, on and off road transport, tillage and seeding applications, as well as machine service and maintenance. The operator must be aware of these hazards.

The dealer will explain the capabilities, safe application, service requirements and restrictions of the machine and demonstrate the safe operation of the machine according to Agrowplow's instructions. The dealer can also identify unsafe modifications or use of unapproved attachments.

The following publications provide information on the safe use and maintenance of the machine and attachments:

- The operator's manual delivered with the machine gives operating information as well as routine maintenance and service procedures. It is a part of the machine and must stay with the machine if it is sold. Replacement operator's manuals can be ordered from your Agrowplow Dealer.
- The machine has decals that instruct on safe operation and care.

## 1.1. Shared Responsibility for Safety

### *1.1.1. Why is farm safety important?*

Farming is dangerous. Farms have many conditions that create dangerous situations including increasing use of machines and chemicals, confined spaces, live animals, constantly changing weather conditions, very young and very old people and continual financial pressure to get crops in and harvest off on time. As any combination of these factors can become lethal, control of occupational health and safety risks has become an essential farm management competency.

Taking risks with the lives of family members or employees is not something that should ever be contemplated!

Farm accidents are often workplace accidents of a different kind. While any workplace accident is a tragedy, a farm accident is often a family disaster where a breadwinner, grandparent, child or other family member is injured or killed. At times the tragedy is made worse by the fact that another family member may have caused the accident and is charged with an offence under occupational health and safety legislation.

Considering that the likelihood of an accident can be significantly reduced by people being more safety conscious, safety should be a topic of frequent discussion among family members and farm employees. Children also need to be trained to recognise hazards and to never use machinery as a plaything, as they too can play a role to remind others to never take safety risks. The loss of fun that kids might otherwise have on machinery is nothing compared to the grief of harm done to a child.

### *1.1.2. Four Big Reasons Why Safety Is Important*

- Accidents Hurt
- Accidents Cost
- Accidents Involve Others
- Accidents Can Be Avoided

### *1.1.3. How to Create Safety Awareness*

The Safety slogan – 'Think it, Talk it, Work it', summarises what we all must do to make workplaces that are without risk to the extent that is reasonably practicable. Assuming that the chain of responsibility is working as it should, machinery will be properly guarded, safety switches fitted and proper information given by way of Operator Handbooks, decals, verbal instruction and so on to all relevant personnel.

Risk awareness and proper use of a machine is the result of an employer having been given relevant information, taking safety seriously, and ensuring that each operator of a machine is properly trained and supervised.

#### *1.1.4. Consultation*

Providing information is a good beginning. Each employee must then be free to further discuss safety related matters and ask for further assistance from your employer, Health and Safety Representative, or workplace OH&S Authorities if required. Consultation is always best if it is done cooperatively, as part of the way business is normally done, at smoko discussions or at more formal meetings depending on the topic and your business situation.

Ultimately, we are only safe at work when everyone who is responsible for safety has played their part and the employer, supervisor and the person using a hazardous machine “thinks it, talks it and works it”. Safe working conditions are the result of a safety culture in which everyone participates, where it would be unacceptable to behave any other way.

#### *1.1.5. Hazard Identification*

A hazard is something that has the potential to cause harm to a person. Where you are now there may be hundreds of hazards. Some hazards have so little potential for harm, due to their likelihood, that we can disregard them. Other hazards, because of the real and likely potential for serious harm, must not only be identified, but also controlled so as to eliminate or reduce the potential for harm to a person.

## 1.2. Safe Operation

This section offers general guidelines for the safe operation of machinery. It does not replace local, state or federal safety regulations.

Agrowplow has made every effort to highlight all risks to personnel or property. Owners and operators have a responsibility to exercise care and safe work practices at all times in the vicinity of the machine. Owners are advised to keep up to date on safety issues and to communicate these to all users of the machine. If you have safety concerns specifically related to this machine, contact your dealer immediately.

#### *1.2.1. Operator Safety*

Read this manual carefully before operating new equipment. Learn how to use this machine safely. Be thoroughly familiar with the controls and the proper use of the equipment before using it.

Take careful note of all safety instructions both in this manual and on the machine itself. Failure to comply with instructions could result in personal injury and / or damage to the machine. Replace missing or damaged safety decals on the machine and ensure that these remain clearly visible.

It is the owner’s responsibility to ensure that anyone who operates, adjusts, lubricates, maintains, cleans or uses the machine in any way has had suitable instruction and is familiar with the information in this manual. Operators and other users of the machine should be aware of potential hazards and operating limitations.

#### *1.2.2. Have Training with Actual Operation*

- Operator training must consist of a demonstration and verbal instruction.
- This training is given by your dealer when the machine is delivered.
- New operators must start in an area without bystanders and use all the controls until they can operate the machine safely under all conditions of the work area.

### 1.2.3. Know the Work Conditions

- Operators must know any prohibited uses or work areas. They need to know about excessive slopes and rough terrain.
- Operators must know the local road transport regulations, and understand the dangers and requirements of transporting wide and heavy equipment.
- Always wear protective clothing when servicing the machine.
- For operators to be qualified, they must not use drugs or alcoholic drinks that impair their alertness or coordination while working. Operators who are taking prescription drugs must get medical advice to determine if they can safely operate a machine.

## 1.3. Warning Decals

Safety Warning Decals are a means of communication the presence of hazards and appropriate risk controls to machinery operators.

- Do not remove any safety instruction decals.
- Ensure that any safety decals are clear and visible. Clean and replace as necessary.

### 1.3.1. Hazardous Machinery

Misuse or incorrect operation on any machine could cause serious injury or death to either the operator or bystanders. It is important to always fully read the Operator's Manual and understand all operating and safety procedures before using the machine. If you have any queries relating to safety or the operation of any machine contact your Agrowplow dealer immediately.

All guards and safety devices must be kept on the machine and maintained in a functional condition. If necessary to remove guards or safety devices for maintenance they must be replaced before commencing operation.

Sound the horn before starting the machine and before moving off to alert bystanders of your intentions. Bystanders must also be well clear of the machine before operating.



Hazardous Machinery Decal

If the machine is to be left unattended the hydraulics must be lowered and the engine stopped. This will prevent accidental operation of the machine.

### 1.3.2. Bystanders



Do Not Operate Near Bystanders Decal

Do not operate any agricultural machinery near bystanders. Serious injury or death to bystanders could occur if they come in contact with projectiles, chemical spray, fertiliser and/or grain dust and moving machinery.

Sound the horn before starting the machine and before moving off to alert bystanders of your intentions. Make sure bystanders are well clear of the machine before operating.

### 1.3.3. Machinery Safety Guards



Rotating or Moving Machinery Decal

Safety hazards related to exposed drive belts, pulleys, chains, sprockets and other mechanisms must be clearly identified and properly guarded. Some hazardous mechanisms like tynes and coulter discs cannot carry out their intended function if they are guarded and must, therefore, be controlled by an alternative means. Guards must be fixed in place with bolts, locks or fasteners that require a tool or key to remove them.

Always wear Personal Protective Equipment (PPE) including overalls whilst operating the machine. Loose items of clothing, jewellery (including watches), or long hair could all become entangled in rotating or moving parts causing serious injury or death.

Keep clothing and body extremities well clear of pinch points while the machine is operating. Keep well clear of moving parts at all times. These include drive chains, sprockets, shafts, wheels, discs, pivot points, etc. Guards are provided with the machine for safety reasons where practical without compromising machine performance. Ensure these are always fitted during operation.

#### 1.3.4. Hydraulic Fluid Penetration

**A hydraulic fluid leak can, under high pressure, penetrate a human body**

Appropriate risk controls must be established to safe guard against hydraulic fluid penetration. All hydraulic machinery should be inspected regularly. Worn hoses and faulty connections, valves or cylinders, must be repaired or replaced.

Operators should be warned that, in some cases, residual pressure can remain in a hydraulic system after it is shut down. In these situations the cause of the residual pressure needs to be identified and controlled to avoid the possibility of a high pressure hydraulic fluid leak or the unintended operation or movement of the machine or attachment.



Hydraulic Fluid Penetration Decal

Relieve the pressure before disconnecting any hydraulic or other lines. Make all repairs and tighten all fittings before re-connection to pressurised fluid. Keep your hands and body away from any pinholes or high pressure jets. Search for leaks with a piece of cardboard instead of using your hand directly.

Avoid any contact with fluids leaking under pressure, because the fluids can penetrate the skin surface. Any fluid which penetrates the skin will need to be removed immediately by a medical expert. Seek specialist advice on this type of injury.

To eliminate the risk of serious injury or death:

- Repair or replace all possible causes of leaking hydraulic fluid, including:
  - Faulty valves, cylinders and components;
  - Worn hoses and fittings.
- Train operators to shut down pressure pumps or pressure sources before coupling or uncoupling hydraulic connectors
- Never use bare hands to check hoses for leaks. Use a piece of paper to detect a high pressure spray
- Use Personal Protective Equipment.

Instruct operators to wear protective equipment, including safety glasses, if there is a high likelihood of a high pressure hydraulic leak.

### 1.3.5. Hot Components

During operation hydraulic components such as motors, pumps and valve blocks can become quite warm. Do not touch these components until they have cooled down otherwise serious injury such as burns could result.



Heat Source Decal

### 1.3.6. Three Point Linkage



Three Point Linkage Decal

The three point linkage on a tractor creates numerous pinch and crush points that could cause serious injury or death. Keep well clear of this area when the engine is running.

Shut the engine off for all attachment, un-attachment and maintenance in this region.

### 1.3.7. Service Access

Using incorrect access points could result in serious injury or death as a result of slipping and / or falling. Agricultural machinery contains many sharp edges and points. Some of these can and should be guarded, whilst other sections cannot be guarded without compromising the working function of the machine.

Always use access platforms and access ladders to carry out maintenance or refilling. If maintenance is required on parts of the machine not serviced by an access platform always use a ladder or some other form of access device.





Do Not Climb On This Machine Decal

Do not ride on, or allow passengers on, the machine. Under no circumstances are passengers to be permitted on the machine while it is in operation or being transported. Any platforms and/or steps are provided solely for the purpose of preparing the machine for use.



Do Not Enter This Area Decal

Always shut the engine off before climbing into, onto or under machinery. If engines are operating power could accidentally be directed to components in these areas and cause serious injury or death.

Always keep clothing and hands clear of all engine driven components. Serious injury or death could result by contact with fast or powerful components.



Engine Driven Components Decal

### 1.3.8. Handle Agricultural Chemicals Safely



Chemical Hazard Decal

All farm chemicals including fertilisers should be stored, used, handled and disposed of safely and in accordance with the manufacturer's recommendations. Read the product label before using, noting any warnings or special cautions, including any protective clothing or equipment that may be required.

Do not eat or smoke while handling chemicals, fertilizers or coated seeds. Always wash your hands and face before you eat, drink or use the toilet.

Store chemicals, fertilizers and coated seeds out of reach of children and pets, and away from food and animal feeds. Any symptoms of illness during or after using chemicals should be treated according to the manufacturer's recommendations. If severe, call a physician or get the patient to hospital immediately. Keep the container and/or label for reference.

### 1.3.9. Controlling Noise



Noise Exposure Decal

Excessive noise levels can cause permanent hearing impairment. The incidence of hearing impairment increases as the exposure to noise increases. Noise levels are cumulative and increase with each extra noise.

Noise can be reduced by eliminating sounds. Isolate noisy operations by making sure that they are carried out away from other people.

Provide sound reducing equipment such as a cab on a tractor. Avoid using noisy equipment if possible.

Use warning signs to remind people to wear hearing protection and reduce noise. Have staff that work in noisy environments undergo an annual hearing check.

Always wear earplugs, or similar devices, when carrying out noisy activities.

### 1.3.10. *Battery Explosion*

Automotive lead/acid batteries may explode when improperly handled or used. Explosion may cause a person to be injured by the force of the explosion or a spray of sulphuric acid to their face or body.

Battery explosion may occur due to:

- Severe over heating due to overuse;
- A metal object being dropped on a battery causing a short circuit;
- A spark igniting hydrogen gas emitted when being charged;
- A spark igniting hydrogen gas when a battery is being installed or when jumper leads are applied.



Battery Explosion Decal

Operators must wear protective eye wear, gloves and clothing when handling or connecting batteries.

Batteries should always be covered when installed.

The final connection of a battery should always be the earth lead to the chassis or engine black, not to the battery.

### 1.3.11. *Tyre Inflation*

Tyres must not be inflated with unregulated air pressure where the pressure could exceed limits specified by a manufacturer.

Tyre inflation must always be observed by a competent operator to ensure the following is correct:

- Tyre to rim fitment
- Tyre / bead lubrication
- Bead seating
- Inflation pressure.



Tyre Inflation Decal

An operator must always face the tyre tread from the side and not from the face and no operator should stand in the blast trajectory of any tyre during inflation. The blast trajectory is the area in front of the wheel face.

Tyre explosion may be due to:

- Improper fitting of the tyre
- Improper fitting or damage to the rim or locking ring
- Excessive air pressure
- Inflation of damaged tyres or rims. Damaged tyres or rims must not be inflated until the damaged item is replaced or repaired to the satisfaction of a competent person Used tyres must be inspected inside and out prior to fitment. Rims must be clean, free of rust, not cracked, distorted or improperly repaired. Do not inflate over 35psi to seat beads
- Unknown damage to the tyre casing causing a zipper effect casing failure
- Tyre / wheel incompatibility. Tyres must only be fitted to rims for which they are verified as being compatible by a competent person
- No lubrication. Tyres must always be lubricated with a suitable lubricant that allows proper seating without damage to the tyre or the use of excessive pressure.

### 1.3.12. *Electrical Hazards*



Electrical Hazard Decal

Contact with overhead power lines or other electrical supplies or devices can cause serious injury or death. Avoid contact with these objects at all times.

**Look Up and Live!**

### 1.3.13. *Raised Wings*



Raised Wing Decal

A failure of the wings mechanical lock or a failure in the hydraulic circuit can cause the rapid collapse of the wing itself. Contact with a falling wing can cause serious injury or death by crushing, impalement or other forms of trauma.

## 1.4. Ergonomic Safety

### 1.4.1. *Personal Protective Equipment*

**Employers must provide a safe workplace for their employees.**

Employers are responsible to ensure that Personal Protective Equipment (PPE) is available for use in situations where it makes a practical contribution to controlling hazards and safety risks.

Employers must also ensure that PPE is in good condition and is properly used by employees.

### 1.4.2. *Working at Heights*

Where work is required at heights where a fall of more than two meters is possible, operators must be aware of hazards caused by:

- Unstable, sloping or slippery surfaces;
- Proximity to unguarded edges;
- Other non-fall hazards.

Risks must be controlled by the most practicable of the following means:

- Do the task at ground level
- Use suitable equipment that provides a solid elevated working surface
- Use fall prevention system (safety harness)

Ladders are the least preferred means of working at heights and should only be used when there is no viable alternative such as:

- Stairs
- Cherry picker
- Portable steps
- Forklift with appropriate platform
- Scaffold

Emergency procedures including first aid must be available.

A safety harness must also be used where required by the nature of the task.

Where employees must work at height in situations including servicing of machines proper equipment, such as a ladder and proper training in its use and emergency procedures must be provided.

In other situations where employees must often or always work at height a proper scaffold or mobile platform must be provided which provides a solid working surface. Other potential hazards that may cause falls, such as fatigue from using a spray gun and exposure to paint fumes must be minimised.

### *1.4.3. Manual Handling*

Manual handling injuries relate to a range of conditions including:

- Muscle sprains and strains
- Back injury
- Soft tissue injury
- Hernias
- Chronic pain

Some of these injuries are known as repetitive strain injury (RSI) or Occupational overuse Syndrome (OOS) but all are generally known as Musculoskeletal Disorder (MSD) resulting from manual handling.

All work activities must have manual handling hazards identified, risks assessed and controlled. Some tasks have a very high risk of MSD evident from an assessment of the task, or reports of previous injuries. Assessment should include a review of:

- Postures
- Movements / distances moved
- Forces and type of loads
- Duration and frequency of activity
- Environmental factors including vibration / heat / cold

A suitable checklist is available from WorkCover to ensure your assessment is systematic and facilitates consultation with employees.

Where practicable, tasks causing MSD must be eliminated, or the risk reduced by altering the machine or process to something less risky, according to the hierarchy of control such as:

- Eliminating the task
- Substituting the task with another less risky task
- Using mechanical aids
- Improved work layout / seating

- Improved work systems including job rotation or rest periods
- Providing training
- Using personal protective equipment

Implement and review controls to ensure they are properly used and effective.

As MSD is a complex subject with significant risks that are not immediately obvious, it is suggested a high degree of employee consultation is used and professional assistance is sought if you are unsure of the best approach.

Typical examples of MSD injuries in automotive workshops include:

- Bending over mudguards for long periods
- Working with your hands above your head for long periods
- Applying high force to levers, spanners, etc. for long periods
- Lifting heavy weights such as tyne assemblies

Use good mechanical handling equipment, such as hoists, jacks and wheel lifters as much as possible.

Review all tasks where employees work in unusual postures for long periods, or have to exert great effort, and develop improved job methods to reduce MSD injuries.

When MSD injuries are reported, risk assessments must be reviewed and all hazards identified and risks controlled.

## 1.5. Maintenance

### *1.5.1. Practice Safe Maintenance*

Keep the machine in safe working condition. Routine maintenance and regular servicing will help reduce risks and prolong the life of the machine. General Maintenance Accidents occur most frequently during servicing and repair. The following general rules must be followed when maintaining or working with machinery:

- All operating and maintenance manuals must be read before and referred to while using or servicing any piece of equipment.
- Turn off all machinery power sources and isolate the machine before making adjustments, doing lubrication, repairs or any other maintenance on the machine.
- Ensure that the machine hydraulics are disconnected from the power source.
- Wear gloves when handling components with cutting edges, such as any ground cutting components.
- Beware of hazards created by springs under tension or compression when dismantling or maintaining the machine.
- It is recommended that you clean the machine before commencing maintenance.
- When machinery is fitted with hydraulics, do not rely on the hydraulics to support the machine. During maintenance or while making adjustments under the machine, always lock the hydraulics and support the machine securely. Place blocks or other stable supports under elevated parts before working on these.
- Extreme caution should be used when clearing coulters, tynes or soil openers. These may be very sharp and cause serious injury.
- Use due care when adjusting or maintaining any aspect of the Agrowplow. Failure to do so may result in serious injury.

### 1.5.2. Electrical Maintenance

Disconnect the electrical supply from the tractor before doing any electrical maintenance. When welding with electronic equipment in modern tractors and on machinery it is advisable to disconnect the machine from the tractor or at least disconnect the alternator and battery before attempting any welding.

## 1.6. Transporting the Machine

Ensure that all linkage pins and security clips are fitted correctly. With trailing machines tow with the drawbar only as this is the only safe towing point on the machine. Always check that bystanders are clear before starting and moving the tractor and the machine. Plan safe routes of travel, and be aware of power lines and other roadside hazards. Take particular care when towing implements on hillsides.

**Do not pull trailed Agrowplows with any vehicle other than a tractor.**

In most instances the weight of the Agrowplow exceeds the unbraked towing capacity of the tow vehicle (except tractors). Not only is this unsafe it will also void the vehicle manufacturer's warranty.

Do not ride or allow passengers on the machine. This machine is not designed to carry passengers and therefore no riders are permitted at any time.

Please consult your local transport authority regarding the use of 'Oversize' signs, escort vehicles and lighting equipment when transporting agricultural machines on public roads.

When transporting the machine:

- A speed of 30 km/h must not be exceeded. Transporting at greater speeds will result in loss of implement control and cause serious damage or injury.
- Do not transport the Agrowplow without the tractor drawbar being in a locked position. Transporting without the drawbar locked will result in loss of implement control and serious damage or injury.
- Do not transport an Agrowplow with a vehicle of less gross mass than that of the Agrowplow being towed. Transporting with a smaller lead vehicle will result in loss of implement control and cause serious damage or injury.
- Make sure the Agrowplow does not exceed the unbraked towing capacity of the lead vehicle.
- Do not pull trailed Agrowplows from any point other than from the tractor drawbar. Pulling from a point other than the designated tractor drawbar can result in tractor instability and cause serious damage or injury.
- Do not operate when visibility is limited e.g. in foggy conditions. Do not operate outside daylight hours unless lights are fitted.
- Please consult your local road transport authority for road use eg. Oversize Transport.
- Avoid holes, ditches and obstructions which may cause the machine to tip over, especially on hillsides.
- Never drive near the edge of a gully or steep embankment as it might cave in.
- Slow down for hillsides, rough ground and sharp turns.

## 1.7. Un-Hitching the Machine

When unhitching the Agrowplow:

- Always unhitch on a solid, flat surface
- Always lower the hydraulics of the machine. The Agrowplow is more stable when the undercarriage is resting on the ground than if it is left in the raised position. Machines left in the raised position are susceptible to hydraulic failure causing the machine to crash to the ground and a rapid discharge of



pressurised hydraulic fluid. Lowering the Agrowplow to the ground will also relieve pressure from the hydraulic circuit making it safer and easier to connect and disconnect the hydraulic couplings.

- Always place chocks behind and in front of the wheels to prevent accidental movement on the machine.
- Always lower the jack stand to 'take the weight' of the A-frame. This will provide further stability to the parked Agrowplow.

## 1.8. Risk assessment

The table on the next page is a guide to assess the severity of hazards associated with the machines use. The columns listed include:

- Hazard Type – lists hazards for assessment and notes whether they are relevant to the machine
- Cause of Hazard – lists the area or application of the machine which applies to the hazard
- Risk Control – lists appropriate safety measures to protect personnel and equipment from damage or harm

The risk assessment rating is calculated from the following table by taking the value for 'Risk Severity' and adding it to the value for 'Likelihood of Occurrence'.

<b>RISK ASSESSMENT</b>	Rate the severity & likelihood of any hazards present within the machine			
<b>RISK SEVERITY</b>	4 = Possible fatality	3 = Major injury	2 = Minor injury	1 = Negligible injury
<b>LIKELIHOOD OF OCCURRENCE</b>	4 = Very likely	3 = Likely	2 = Unlikely	1 = Very unlikely
<b>FREQUENCY</b>	If the exposure to a hazard is very frequent eg continuous, compared to weekly, monthly etc, this should be reflected in increased likelihood of occurrence.			
Add the Risk Severity to the likelihood of Occurrence to calculate the Risk Assessment Rating				

The Risk Control measures listed should be in accordance with the following risk assessment ratings:

- Less than 3 – Low Risk, Acceptable Hazards  
Issues to be reviewed with regularity but no specific action is required. Machine usage with awareness.
- 3 to 4 – Medium Risk, Hazards to be managed  
Decals or warning signage should be fixed in reasonable locations. All personnel who interact with the machine should be warned of the hazard. Operators to be trained to never operate machine when safety measures are not being adhered to.
- 5 and higher – High Risk, Unacceptable Hazards  
Operators must be trained to check that no risk of this hazard is present before or while using machine and must never use the machine when any risk of this hazard is present.

HAZARD TYPE		CAUSE OF HAZARD		RISK CONTROL
Is there a potential for injury or illness due to ...	YES or NO	What is the cause or source of the hazard ...	RISK ASSESS RATING	Determine and apply appropriate risk controls after considering Hierarchy of Risk Control
<b>CRUSHING</b> Crushing of operator or personnel during operation	YES	Attachment of machinery to tractor with 3pt link or hitch Folding Frame sections (folding ploughs only)	4 + 1 = 5	Do not operate with personnel on machine Clearly view crush area when reversing tractor toward machinery Fit transport lock for road or longer "on farm" travel (folding ploughs only) Apply safety stands before performing maintenance
<b>ENTANGLEMENT</b> Entanglement, drawing in, pinching or trapping	YES	Entanglement in wheel or shanks Rotating augers & similar mechanisms for moving seed/fertiliser (Ploughs with fertiliser box)	4 + 2 = 6	Do not operate with personnel on machine Do not operate with personnel in machine path
<b>STRIKING OR IMPACT</b> An object striking the operator or another person	YES	Material discharge from shank or striking rock	1 + 2 = 3	Do not operate with personnel in close proximity to plough
<b>CUTTING</b> A cutting, stabbing or shearing	YES	Shank point in operation, shearing against ground	4 + 2 = 6	Do not operate with personnel under plough or in its path
<b>SLIPPING - PERSONNEL</b> slipping, tripping or falling	YES	Moving over machine while removing trash, changing points or shin guards Walking over aerated and unstable ploughed ground	2 + 2 = 4	Apply 3 points of contact for access at all times Ensure no loose or hanging hoses or similar items that could cause a trip hazards Use caution and appropriate footwear when walking on unstable ground
<b>SLIPPING - MACHINERY</b> uncontrolled machine movement	YES	Travelling over slopes, slippery or sodden ground	3 + 2 = 5	Use tractor of equal or greater weight than towed weight See Tractor hazard control
<b>EXPOSURE</b> Exposure to vibration, heat, radiation, friction or abrasion	NO	Heat from tractor, see tractor hazard control		
<b>NOISE</b> Excessive noise	YES	Operation noise	1 + 1 = 2	Apply hearing protection if noise becomes hazardous
<b>HIGH PRESSURE FLUID PENITRATION</b> Hydraulic fluid leak	YES	Hydraulic tube or fitting leaking high pressure oil (ploughs with hydraulic system only)	3 + 1 = 4	Inspect hydraulic system for leaks using appropriate caution Use correct fittings & correct pressure rating for hoses in maintenance
<b>HAZARDOUS SUBSTANCES</b> Hazardous or dangerous substances or suffocation	NO	Exhaust from Tractor, see tractor hazard control		
<b>MANUAL HANDLING</b> Manual handling or ergonomic conditions	YES	Maintenance operations removing trash, changing shanks, adjusting shanks	2 + 2 = 4	Practice safe lifting of heavy objects Perform maintenance tasks in workshop with lift assistance
<b>EXPLOSION</b> Sudden release of pressure, chemical combustion	YES	Bursting tyre	3 + 1 = 4	Do not pressurise tyres beyond recommended pressure
<b>ELECTROCUTION</b> Electrocution, electrical burn	YES	Contact with underground electrical cables Contact with overhead cables	4 + 1 = 5	Practice electrical safety in the event unearthing underground cables (Folding ploughs only) Look up before folding plough wings into transport position.

## 2. Soil Care System of Farming

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The origins of Agrowplow began with observation and concern about devastating effects of conventional cultivation on Australian soils.

Today, Agrowplow remains focused and dedicated to the development of innovative farming practices and equipment to improve and protect our nation's greatest asset - the soil!

### 2.1. Soil Degradation

Traditional cultivation and sowing techniques, which require soil to be ploughed and cultivated before sowing, have caused erosion by wind and rain and severe break down of soil structure. Continual passes of the tractor and deterioration of soil structure have also formed compacted layers below the soil surface.

These soil damaging factors combine to seriously limit plant growth and yields, and erode our precious asset. In the case of compacted layers water absorption is prevented and root growth is restricted, prohibiting the plants access to nutrients.

Helpful soil microbes and earthworms are reduced or eliminated because poor soil structure causes pastures to become water-logged quicker, dry out faster, and often make tillage operations almost impossible.

Traditional cultivating practices are always aimed at controlling weed growth and preparing a fine "seedbed".

Unfortunately these practices destroy soil humus, expose soil particles to erosion, compact the soil, restrict moisture infiltration, reduce root growth and lower plant yields.

In order to maximize farming profits while still protecting the environment these problems must be overcome.

The "Soil Care System" approach to farming is different because it promotes the health of both "seed-bed" and "root bed" in a sustainable way - working with nature rather than against it.

New farming techniques are evolving together with new equipment to give simple, logical compatible answers.

### 2.2. The Solution

Agrowplowing, or non-inversion tillage, as well as direct drilling provide positive answers to sustaining soils for highly productive farming. The Agrowplow Soil Care System of Farming encompasses these techniques.

The Soil Care System of Farming has been developed to provide farmers with better returns from their crops and stock. It advocates no tillage or minimum tillage because of moisture losses and soil degradation brought about by each cultivation. These methods can be used in a variety of ways to suit each soil and seasonal condition for creating healthier, sustainable root bed and seed bed environments.

The unique range of specially developed Agrowplows and Agrowdrills are machines which will allow you to obtain the best advantages of non-inversion tillage, direct drilling and minimum tillage practices - for crop and pasture establishment in conservation farming systems.

#### *2.2.1. Agrowplowing or non-inversion tillage*

Non-inversion tillage is lifting and shattering hard soil pans without soil inversion. The task is accomplished with minimum soil surface disturbance ensuring that precious top soil is left on the surface and minimal moisture is lost to the atmosphere.

Top soil is not mixed with less fertile subsoils or less fertile subsoils mixed with fertile top soil. The topsoil remains virtually undisturbed and is less susceptible to wind and water erosion than conventionally cultivated soils.

The patented design of the Agrowplow shank prepares and renovates the root zone of the soil without inversion.

This unique ability of root bed renovation improves water infiltration, humus levels, soil structure and sustainable productivity. Root development is enhanced by an unrestrictive soil environment.

### *2.2.2. Direct Drilling*

No-Till or direct-drilling is the term given to establishing crops and pastures without any prior tillage. Control and reduction of vegetation and weeds is achieved by either chemicals or livestock or both.

Non-inversion tillage and direct drilling go hand-in-hand. Direct drilling promotes the benefits of Agrowplowing reducing risk of erosion and prolonging the effect of deep ripping through less soil traffic. This leads to reduced compaction and enhanced root growth encouraging healthier and deeper soils.

## 2.3. Soil Compaction

Soil compaction is a form of soil degradation. It strangles the life out of soil and severely impacts on yields. Yield losses of up to 40% are not uncommon. In extreme cases yields can be reduced by up to 80% and severe erosion can occur.

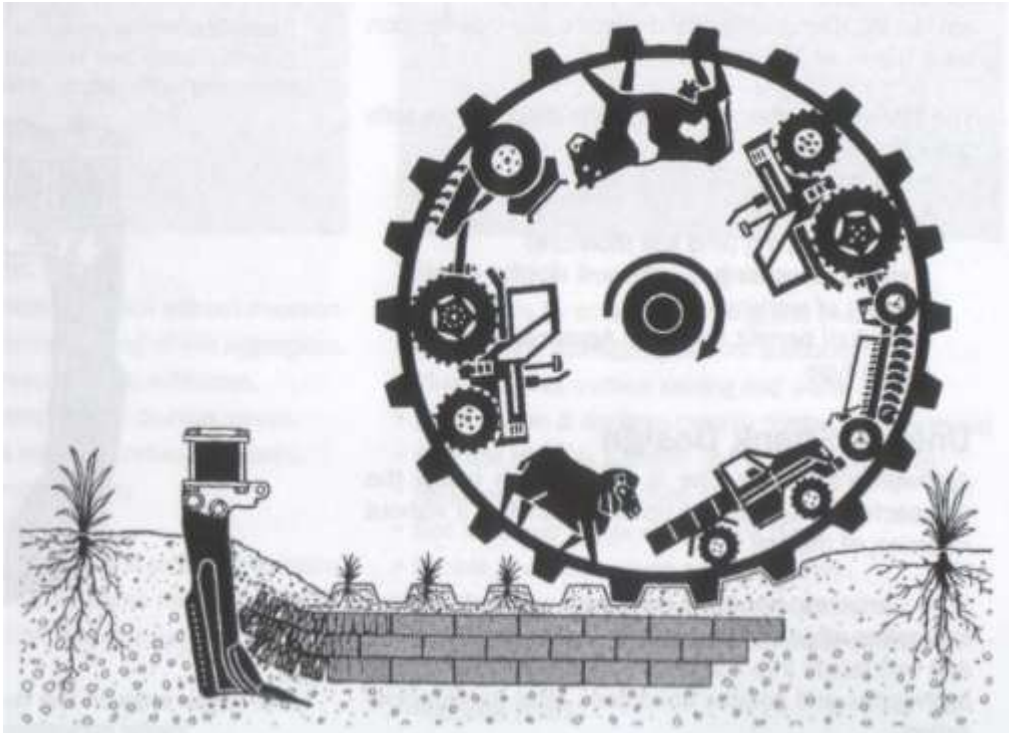
### *2.3.1. Causes of Soil Compaction*

Soil compaction is caused by normal farming activities including using tractors, implements, headers, vehicles, cultivation, livestock and irrigation.

The weight of vehicles and livestock compress the soil. Cultivation breaks down soil aggregates, soil structure, porosity and humus. The worst damage occurs in wet soils, with high stocking rates, frequent vehicle traffic and intensive cultivation. Any activity which reduces the porosity or bulk of your soil is causing soil compaction.

Compacted soil becomes denser leading to decreased porosity of the soil. This causes reduced:

- Water infiltration
- Humus levels
- Soil aeration
- Worm activity
- Microbe activity
- Water retention
- Root growth
- Crop yields



Everyday farming activities cause compaction

### *2.3.2. How is Soil Compaction Rectified?*

#### **Step 1**

Break up compacted soils, hard pans, clay pans, tillage pans and impenetrable barriers with an Agrowplow.

#### **Step 2**

Re-establish plants with strong, deep root systems to rebuild and hold the soil structure, bulk and porosity in a healthier state - preferably using direct drilling or minimum tillage techniques.

#### **Step 3**

Use farming practices which minimise soil cultivation, soil inversion and traffic in wet soils.

## 2.4. Advantages of Agrowplowing

Agrowplows are used for both primary and secondary tillage. They work without soil inversion and therefore minimise moisture loss. The narrow edge on tyne design substantially reduces tractor horsepower requirements.

The low angle digging tool and narrow shank of the Agrowplow ensures that the previous crops root systems are fully retained in the soil. This improves structure, adding humus, increasing water infiltration and holding moisture whilst allowing greater utilization of nitrogen created by legume Rhizobium bacteria.

The Agrowplow can be successfully applied in most situations. It has been used extensively in the farming of cereal, cotton, sugar, vegetables, vineyards and orchards under both dry land and irrigation farming methods.

Agrowplowing is particularly effective in pasture renovation and the control of water run-off, allowing infiltration and storage within the soil. Wind erosion is reduced and salinisation problems can be reduced.

Hardpans and barriers, created by fine particles moving downwards into the coarse soil structures creating an almost impenetrable layer, can be eliminated.

It should be noted that hard pans can be re-established quickly unless tractor traffic is reduced. Normal cultivation requires many more passes of a tractor than direct drilling.

Measurements from many soil types indicate that the depth of the traffic compaction layer varies according to soil type. Generally, the lower the clay content of the soil, the deeper the hard pan formation.

The following factors should be considered before soils are Agrowplowed:

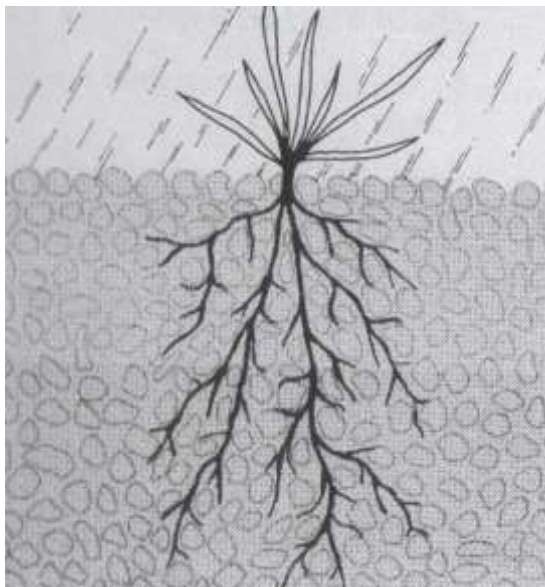
- Soil type
- Soil Moisture
- Shank spacing
- Time of working
- Speed of working
- Depth of working
- Crop type

#### *2.4.1. Unique Shank Design*

The unique Agrowplow shank is set to work below the compacted plough pan to uplift and shatter it without inversion of the soil. Soil particles become aerated without violent separation while allowing greater moisture infiltration into the seed bed. This minimizes fine soil aggregates and creates conditions ideal for microbial action. Crop roots are then free to pursue moisture and nutrients deep in the soil. Crop rotation and the planting of deep rooted species also assists in developing and maintaining a healthy root bed.

The Agrowplow has been engineered to operate in a wide range of soil conditions whether they be black, heavy soils or the light, sandy, abrasive types. Soil type does not affect successful Agrowplowing or non-inversion tillage.

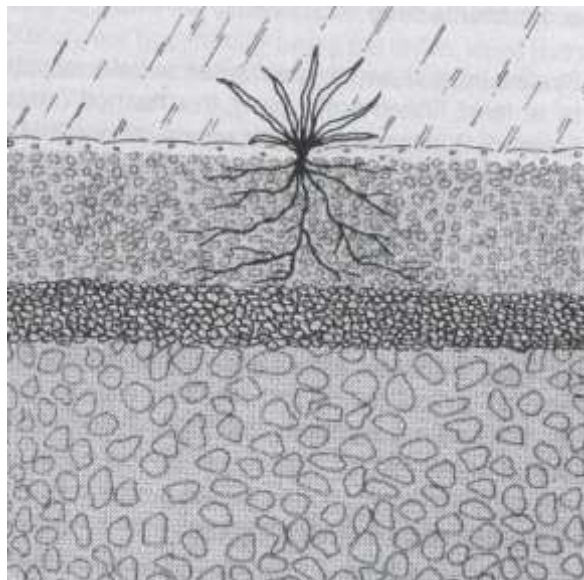
#### *2.4.2. Compare the Differences*



Root growth with non-inversion tillage

### Non Inversion Tillage:

- Kills weeds by lifting & separating soil without inversion
- Creates root bed with minimal fining of soil aggregates
- Soil decompaction increases water infiltration
- Retains and builds organic matter (humus levels)
- Aerates the soil (allows soil & microbes to breath)
- Increased worm & microbe activity
- Agrowplow eradicates hard pans
- Agrowplow decompacts vehicle and stock compaction
- Unrestricted root growth making nutrients more accessible
- Increased water infiltration and storage
- Erosion control
- Increased yields
- Sustainable Soil Care Farming



Root growth under conventional tillage practices

### Tillage which inverts and mixes soil:

- Kills weeds by smashing, mixing and inverting soil
- Creates fine soil aggregates for seedbed
- Fine soil gives surface sealing and water run-off
- Breaks down & depletes organic matter (humus levels)
- Fine soil reduces aeration (denser soil structure)
- Reduced worm & microbe activity
- Soil fines and tillage create hard pans
- Vehicle and stock cause soil compaction
- Restricted root growth & smaller root volume
- Restricted water penetration, less water stored
- Increased erosion

- Reduced yields
- More soil disturbance and degradation - unsustainable

## 2.5. Benefits of Direct Drilling

Direct drilling prevents the soil from being exposed to wind and water erosion and the effect of reduced traffic minimises soil compaction. Zero cultivation avoids degradation of soil structure.

The primary reason for cultivation is to kill vegetation that consumes moisture from the soil. This can now be achieved by alternative methods.

A big advantage of direct drilling is that it allows soils to improve and become more friable with time. As increased organic matter is retained and broken down, it is combined with the soil as humus. Soil structure is improved by this organic matter, making it more porous for better aeration and water infiltration.

The reduction of soil compaction (due to less traffic and soil degradation) allows full moisture retention to be achieved. The plant can then use the soils full potential of stored moisture, and can pursue water and nutrients deep into the soil.

Studies have shown that earthworm levels have increased by using this method. Soil microbes are also returned to the soil and these beneficial organisms aerate the soil. This further helps to break down organic matter and make nutrients available.

Utilising chemicals and livestock, modern farming is able to control weeds and maintain a good ground cover. Erosion is therefore reduced and evaporation is kept to a minimum.

As the cost of farming continues to rise over the next decade any increase in margins is an advantage to farmers. Compared to conventional cultivation, direct-drilling will save time and money, and also reduce replacement expenditure on plant and equipment.

Look at the advantages enjoyed by farmers who have adopted direct-drill and minimum-tillage techniques:

- Improved soils
- Reduction of capital costs by up to 40%
- Greater length of grazing time (between two and four months), allowing carrying capacity to be lifted in mixed enterprises
- Flexibility in cropping programs
- Yields superior to conventional cultivation
- Reduced labour requirements - less time is spent on the tractor
- More control over timing of sowing and related activities
- Reduced costs of production

## 2.6. Features of the Agrowdrill

The Agrowdrill is the most robust, versatile direct drill available in Australia. It maximises seeding versatility for pasture renovation, summer crops, cereals and legumes – from specialised direct drilling to traditional farming applications.

The Agrowdrill range is designed to meet a wide range of farmer and contractor needs in cropping and pasture applications. Each machine is capable of doing a number of jobs which enables the capital investment on machinery



to be minimized. Agrowdrills can be used in a range of one pass direct drilling and conventional cropping practices, and can handle most seed and fertiliser types.

There are a number of crucial features and options of the Agrowdrill which allow it to perform well in tough conditions. These include:

- Extremely rugged construction with plenty of frame weight to penetrate the soil
- Flexi Coil spring release tyne with a high breakaway force capabilities
- Two versions are available – 350lb and 550lb
- Very strong coil tynes with a high breakaway force which maintain the crucial digging angle and position of the soil opener
- The use of inverted “T” (Baker Boots) soil openers
- Strong coulter design
- Wide variety of soil openers to suit varying soil conditions

## 2.7. Advantages of the Baker Boot

The following outlines essential differences between the Baker Boot, disc seeder and conventional tynes and openers used for direct drilling.

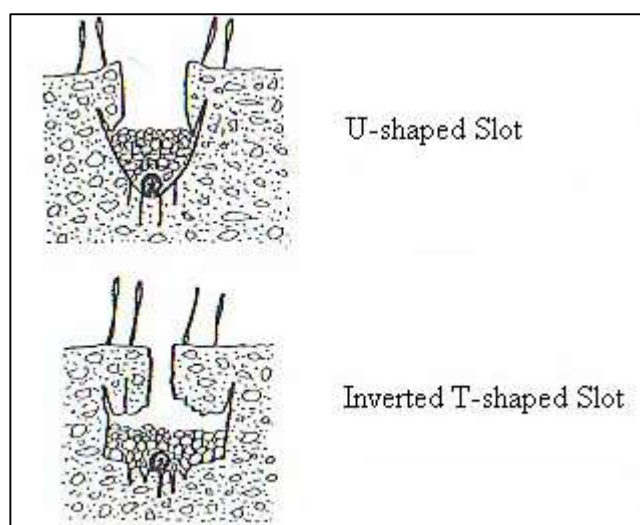
### 2.7.1. The Baker Boot

The action of the Baker Boot is quite different to the other openers used in direct drilling. The Baker Boot opener is capable of producing the most ideal environment for maximum seed germination and plant establishment, especially in drying soil conditions.

There is little smearing or compacting of the soil as the opener passes through the soil. Therefore the tiny roots of emerging young seedlings easily enter the soft earth and quickly support the plant. In drying conditions the germination and plant growth obtained from direct drilling with the Baker Boot is radically superior to other openers.

The Baker Boot has no moving parts and the very narrow profile gives lower draft requirements, easier penetration and less wear.

The use of coulters minimises soil disturbance and improves trash handling.



Seed placement in different furrow types

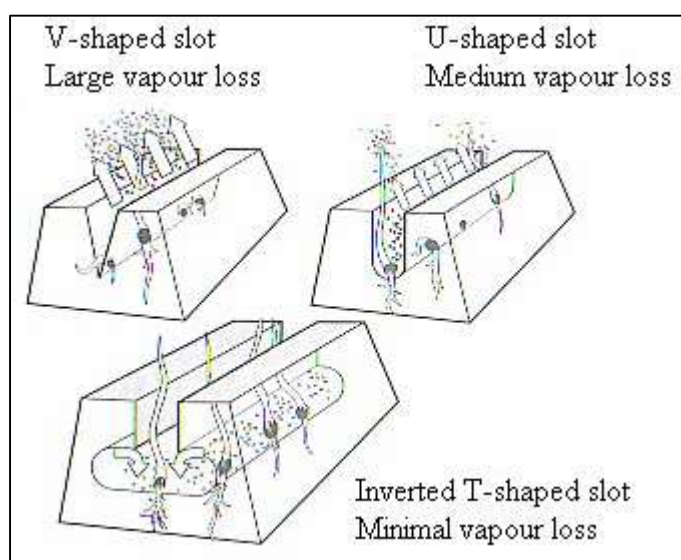
### 2.7.2. Conventional Tynes

Conventional tyne seeders mainly use a cultivating point which operates at a shallow angle to the soil. The action of the tyne and the digging tool tends to lift the soil and throw it to both sides leaving a U-shaped slot.

Few conventional seeders are fitted with coulters and consequently have difficulty handling the large amounts of surface trash often encountered when direct drilling. The action of the tyne tends to drag trash along with it.

The disadvantages of conventional tynes are as follows:

- Poor trash handling ability
- Dry the soil with a wide furrow, exposing moist soil
- Poor accuracy placing the seed and seed may end up near the surface, not in contact with moisture
- Have higher draft requirements due to the width of the digging point and the aggressive action of moving the soil up and to the side
- The digging tools often have a high wear rate
- The need for prior cultivation can damage soil structure



Moisture loss in different slot types

## 2.8. Planning to Direct Drill

Planning is the key to direct drilling and reduced tillage techniques. Planning must take into account gross margins, marketing (if applicable), paddock history, crop rotation, soil type, fertility (using soil tests), weed history and densities as well as long term development plans. Flexibility of operation is also essential.

### 2.8.1. Weed Control

Good weed control is essential for successful establishment of a new crop or pasture.

Weed control is one of the main reasons for traditional cultivation practices - the ground-engaging tool physically cuts and tears the roots of unwanted plants from the soil.

Direct drilling calls for a different approach. Some of the alternatives available for weed control include:

- Heavy grazing
- Spraying with herbicides

- Slashing
- A combination of the above

### 2.8.2. Timing

Timeliness of the seeding operation is critical for good germination, growth and best yield results.

There are two main aspects of timeliness you must consider:

- Always check the optimum seeding date for your district and seed on time
- Ensure the best use of available moisture after rain by seeding while the soil is moist

### 2.8.3. Seed

Use only good quality certified seed. Certified seed is guaranteed to meet a minimum standard germination percentage and to be free of weed seeds and impurities. Use the recommended seeding rate.

Your seed supplier or your local advisory officer can tell you how many kilograms per hectare (kg/Ha) you should sow. Adequate plant population will also help your establishing crop or pasture compete with weeds.

Be sure to inoculate legume seed with the correct strain of Rhizobia bacteria. Failure to inoculate could lead to a poor pasture stand. Talk to your seed supplier about inoculation and ask them to supply the inoculant.

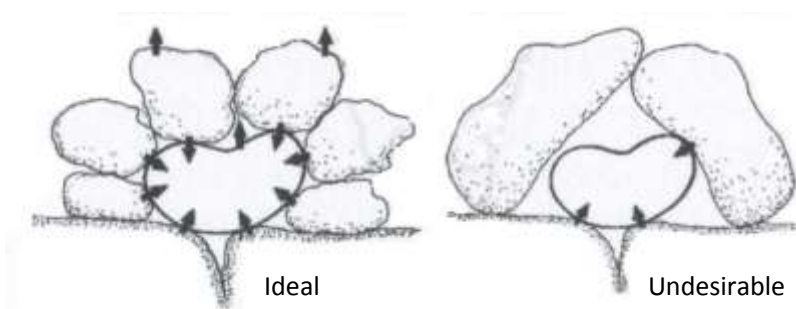
Your seed supplier will also be able to advise about chemical protection of your seed for insect attack and various soil borne diseases.

### 2.8.4. Seed Placement

Accurate seed placement is crucial for successful germination. Seed should always be covered and in contact with moist soil (see Figure 2.6). Seeding depth varies with species and is generally related to seed size.

Small seeds generally need to be placed shallow. The Agrowdrill is capable of placing seed accurately at any depth from a few millimetres down to 75mm (3"). Ask your seed supplier or advisory officer how deep you should be sowing and adjust the Agrowdrill accordingly.

The Agrowdrill can be set up to seed at various row spacing's. Sowing row spacing, if coulters are not fitted, can be virtually infinite.



Seed to soil contact

### 2.8.5. Ensure Adequate Plant Nutrition

Most soils are low in fertility and need to have nutrients added to boost pasture and crop growth. Young plants especially need good nutrition.

The need for fertiliser can be assessed in a number of ways:

- Paddock history
- The vigour of existing vegetation
- Chemical soil tests
- Trial plots

Advice on fertiliser requirements can be sought from government advisory officers, agricultural consultants or fertiliser companies.

Fertilisers are available in many different forms and can be applied in many different ways. The Agrowdrill can “band” artificial fertilisers close to the seed and provide nutrition where it is most need.

## 2.9. The Job’s not finished at seeding!

Careful preparation and seeding of a crop or pasture are only the first steps in the management process. There is a great deal of careful management practises needed after the Agrowdrill has given your seed the best chance of establishment.

### 2.9.1. Weed control

Effective weed control can be the difference between a profit and disaster. Good weed control before seeding will ensure emerging seedlings have a good start and an even better finish.

Certified seed, adequate fertility, correct seeding rates and placement of seed will put the odds in your favour for good germination and emergence.

The management practices after emergence however are just as important. Inspect your crop or pasture regularly for weed growth. If weeds become a problem you have a number of options open to you:

- Use a selective herbicide to kill weeds
- Strategic grazing or slashing can help reduce weed growth
- Applying fertiliser may help in some situations
- Cutting hay can remove weeds.

### 2.9.2. Insect Pest Control

Insect pests can seriously damage emerging or established crops and pastures. During your regular inspection you should also be on the lookout for insects. Consideration of the following points will help prevent or eliminate insects:

- Grow species or varieties that are resistant to the common pests in your area
- Use treated seed
- Spray only if absolutely necessary.

*Note: Information on chemical control of weeds and insects should be available from government advisory officers, agricultural consultants, chemical resellers or spraying contractors.*

### 2.9.3. Use of Fertiliser

Maintaining good nutrition is important for sustained production

All crops and pastures can benefit, in some situations, from additional fertiliser after seeding. Fertiliser can be added in many forms.

#### *2.9.4. Grazing Management*

New pastures can usually only stand light grazing in the first season. Perennial crops can also be grazed.

The following are some important points to remember:

- Graze only when plants cannot be pulled out
- Graze heavily for short periods to remove weeds.
- Some species need to set seed each year, so allow this to take place.
- Allow plenty of time for the pasture to recover after grazing.

### 3. Specifications

#### 3.1. Vineyard Plough Series Agrowplow

<b>Model</b>		<b>2VP</b>	<b>3VP</b>
<b>No of Tynes</b>		2	3
<b>Number of Toolbars</b>		1	
<b>Shank Spacing*</b>		1450mm	725mm
		4' 8"	2' 5"
<b>Transport Width</b>		2.15m	
		7' 1"	
<b>Drawbar Power</b>	<b>kW</b>	15-20	30-35
	<b>hp</b>	25-30	40-50
<b>Linkage</b>		Cat II	

<b>Frame</b>	Fully Welded Frame 150 x 150 x 9mm (6" x 6" x 3/8") RHS Toolbar
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<b>Rigid Shear Pin Shank Protection</b>	24" Agrowplow Shanks 450mm (18") Maximum Working Depth 1700lb Maximum Breakout At Blade Shear Pin Protected
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<b>Optional Equipment</b>	20" Coulters Mulch Blades Pitch Adjustable Furrowers
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\* Standard factory setting. Shank spacing can be variable along toolbar.



### 3.2. AP10 Series Agrowplow

<b>Model</b>		<b>AP10</b>	
<b>No of Shanks</b>		7	11
<b>Shank Spacing</b>		330mm (13")	
<b>Number of Toolbars</b>		2	
<b>Shank Protection</b>		24" Rigid Shear Pin	
<b>Working Width</b>		2.31m (7' 7")	3.63m (11'11")
<b>Transport Width</b>		2.5m (8' 3")	3.92m (12' 11")
<b>Drawbar Power</b>	<b>kW</b>	75 - 105	120 - 165
	<b>hp</b>	100 - 140	165 - 220
<b>Linkage</b>		Category II Three Point Hitch	
<b>Manual Depth Wheels</b>		13 x 165 HT	
<b>Frame</b>		100 x 100 x 6mm (4" x 4" x 1/4") RHS Toolbars Fully Welded Frame 100 x 50 x 6mm (4" x 2" X 1/4") RHS Tower	
<b>Shank Breakout</b>		Rigid (Shear Pin)	1700lb
<b>Optional Coulters</b>		14" Coulters - Plain or Fluted Height Adjustable	



### 3.3. AP30 Series Agrowplow

<b>Model</b>		<b>AP30</b>	
<b>No of Shanks</b>		7	11
<b>Shank Spacing</b>		330mm (13")	
<b>Number of Toolbars</b>		2	
<b>Shank Protection</b>	<b>Standard</b>	24" Rigid Shear Pin	
	<b>Optional</b>	24" Hydraulic Recoil	
<b>Working Width</b>		2.31m (7' 7")	3.63m (11' 11")
<b>Transport Width</b>		2.6m (8' 7")	3.92m (12' 11")
<b>Working Depth</b>		450mm (18") Maximum	
<b>Drawbar Power</b>	<b>kW</b>	75 – 105	120-165
	<b>hp</b>	100-140	165-220
<b>Linkage</b>		Category II Three Point Hitch	
<b>Manual Depth Wheels</b>		6.5 / 80 - 15	

<b>Frame</b>	100 x 100 x 9mm (4" x 4" x 3/8") RHS Toolbars 100 x 50 x 6mm (4" x 2" X 1/4") RHS Tower Fully Welded Frame Safety Stands
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<b>Rigid Shank Protection</b>	1700lb Maximum Breakout At Blade
<b>Hydraulic Recoil Shank Protection</b>	2000lb Maximum Breakout At Blade

<b>Optional Equipment</b>	<ul style="list-style-type: none"> <li>• 14" Coulters             <ul style="list-style-type: none"> <li>○ Plain or Fluted</li> <li>○ Height Adjustable</li> <li>○ No Breakout But Able to Swivel</li> </ul> </li> <li>• Mounted Flexi Roller</li> <li>• Furrower with Pitch Plate</li> <li>• Mulch Blades</li> </ul>
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### 3.4. AP70 Series Agrowplow

<b>Model</b>		<b>AP70</b>	
<b>No of Shanks</b>		13	17
<b>Shank Spacing</b>		380mm (15")	
<b>Number of Tool bars</b>		2	
<b>Shank Protection</b>	<b>Standard</b>	Rigid Shear Pin	
	<b>Optional</b>	Hydraulic Recoil	
<b>Working Width</b>		4.94m (16' 2")	6.46m (21' 2")
<b>Transport Width</b>		5.52m (18' 1")	7.04m (23' 1")
<b>Working Depth</b>		450mm (18") Maximum	
<b>Drawbar Power</b>	<b>kW</b>	145 - 195	190 - 250
	<b>hp</b>	195 - 260	250 - 340
<b>Linkage</b>	<b>Standard</b>	Cat III & Cat III Quick Hitch	
	<b>Optional</b>	Trailing	
<b>Depth Wheels</b>		10.5 x 20 Lugged Tyres	

<b>Frame</b>	Fully Welded RHS Frame 150 x 150 x 9mm (6" x 6" x 3/8") RHS Toolbars 150 x 100 x 9mm (6" x 4" x 3/8") RHS Spreader Bars 25mm (1") Plate Tow Lugs Safety Stands
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<b>Rigid Shank Protection</b>	1700lb Maximum Breakout At Blade
<b>Hydraulic Recoil Shank Protection</b>	2000lb Maximum Breakout At Blade

<b>Optional Equipment</b>	Mounted Flexi Roller Crumble Roller Pitch Adjustable Furrowers Mulch Blades
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### 3.5. Cotton Bed Renovator

Model		CBR					
Working Width		4m (13' 2")		6m (20')		8m (26' 3")	
Side or Centre Bust		Side	Centre	Side	Centre	Side	Centre
Number of Shanks		13	9	19	13	25	17
Number of Furrowers		5		7		9	
Number of tool bars		3					
Shank Protection		Rigid Shear Pin					
Transport Width		5.1m (16' 9")		6.7m (21' 11")		9.2m (30' 2")	
Drawbar Power	kW	145-195		190-250		250-300	
	hp	195-260		250-340		330-400	
Linkage		Cat III & Cat III Quick Hitch					
Depth Wheels		10.5 x 20					
Number of Sections		3					
Number of Wheels		2					

Features	Fully Welded 150 x 150 x 9mm (6" x 6" x 3/8") Frame Safety Stands Height & Pitch Adjustable Furrowers
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Rigid Shank Protection	1700lb Maximum Breakout At Blade
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Optional Equipment	Pitch Adjustable Furrowers Mulch Blades
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### 3.6. AP90 Series Agrowplow

Model		AP90 - 400		AP90 - 450		AP90 - 500	
No of Shanks		23	29	23	29	21	25
Shank Spacing		420mm (16")		450mm (18")		500mm (20")	
Number of tool bars		3					
Shank Protection	Standard	Rigid Shear Pin					
	Optional	Hydraulic Recoil					
Working Width		9.66m (31'8")	12.18m (39' 11")	10.35m (33' 11")	13.05m (42' 9")	10.5mm (34' 5")	12.5m (41')
Transport Width		6.5m (21' 4")		7m (22' 11")		6.5m (21' 4")	
Working Depth		450mm (18") Maximum					
Drawbar Power	kW	300+	375+	300+	375+	300+	375+
	hp	400+	500+	400+	500+	400+	500+
Linkage		Trailing					
Depth Wheels		14 x 24 Industrial Lug					
Number of Sections		3					
Wing Lock		Over Centre Wing Fold with Locking Pins					
Section Float		±10° Wing Ground Following					
Number of Wheels		4					

Frame	RHS 150 x 150 x 9mm (6" x 6" x 3/8") Toolbars
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Rigid Shank Protection	1700lb Maximum Breakout At Blade
Hydraulic Recoil Shank Protection	2000lb Maximum Breakout At Blade

Optional Equipment	Pitch Adjustable Furrowers Mulch Blades
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## 4. Operating Instructions

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### 4.1. Hitching and Levelling

The Agrowplow should be matched to the tractor size to maximise performance and efficiency. A mismatched tractor and implement will be inefficient and cost money, as well as being unsafe.

#### 4.1.1. Three Point Linkage Models

The three-point linkage lift capacity of the tractor will generally determine the required tractor size. Check the tractor's operator's manual for details.

It may be necessary for the tractor to be front weighted when using the Agrowplow. The larger Agrowplows are very heavy and will transfer weight off the front wheels. This can be very dangerous in hilly areas and when travelling at speed on the road. Consult the tractor's operator's manual for recommendations.

The Agrowplow must be level while operating. The hitching and levelling procedure is as follows:

1. Attach and level the Agrowplow laterally (side to side) using the screw adjustable linkage arm.
2. Set both depth wheels evenly at the desired working depth and tighten the locking collar or retaining bolt firmly.
3. Set the fore-aft level using the tractor's adjustable top link. The front and rear depth must be equal.
4. Start working at the desired depth and observe the level of the machine from both the side and the rear.
5. Readjust and repeat the above procedure if necessary.
6. Retighten the locking collar on the top link after completing adjustments.

It is very important that the Agrowplow be levelled correctly to achieve good results. Ensure that the front and rear shanks are working at the same depth.

Three point linkage stabiliser bars must be used at all times particularly if coulters are being used. Adjust the stabilisers to bring the Agrowplow directly behind the tractor, allowing only slight side-to-side movement.

The tractor's three-point linkage system should be operated in the 'float' mode allowing the Agrowplow to be supported by the depth wheels and to follow the ground contours. Consult the tractor operator's manual for details.

#### 4.1.2. Trailing Models

##### Hitching

The hitching procedure is as follows:

1. Pin the tractor drawbar into the central position.
2. Attach the Agrowplow to the drawbar and set the adjustable levelling tube so that the machine is approximately level.

**Warning:** *Ensure the drawbar pin is locked into position so that it cannot work itself out when the machine is in operation or transit. Failure to do this may result in serious injury or death.*

3. Attach the hydraulic coupling to your tractor remote outlet, taking care to clean away any dirt.
4. The working depth of a trailing Agrowplow is controlled by the hydraulic rams attached to the wheel assemblies. These are operated by the remote hydraulic system.
5. Connect the levelling tube to the top lugs of the tower.
6. Disengage the jack stand and adjust the hitch level to suit the drawbar height of the tractor. When level, ensure the levelling tube is locked using the locknut.

### Hydraulic Lift Circuit

The procedure to connect and prime the hydraulic lift circuit is as follows:

1. Ensure both the tractor remotes and the hose couplings are clean and then connect to the tractor.
2. Loosen the hydraulic connector on the input line (barrel end) of the right hand wheel lift cylinder. This should be done to allow air to escape while the hydraulics are being primed.
3. Slowly pressurise the hydraulics until oil appears at the loosened connection on the right hand cylinder.

**Note:** *Stand well clear of the loosened connection as oil under pressure can spray wildly outwards. It is a good idea to place a hessian bag or similar material over the connection to minimise oil movement.*

4. Retighten the connection as soon as oil appears.
5. Continue to prime the hydraulic lift circuit until the right hand cylinder is fully extended. Hold the hydraulics open for a further 15 to 20 seconds to allow air to clear from the circuit.
6. Fully raise and lower the machine several times to expel any residual air trapped in the circuit.

The lift circuit is now fully primed and the Agrowplow can now be moved.

### Levelling

The Agrowplow must be level while operating. The levelling procedure is as follows:

1. Start working at the desired depth and observe the machine from both the side and the rear.
2. Adjust the levelling tube so that the machine is level from front to rear.
3. Retighten the locking collar on the levelling tube when adjustments are completed.

It is very important that the Agrowplow be levelled correctly to achieve good results. Ensure that the front and rear shanks are working at the same depth.

#### 4.1.3. Hitching Conversion

The AP70 Agrowplows can be operated as either a trailed or three-point linkage machine. It is standard with Three Point Linkage however an optional Trailing Kit can be either factory or retro fitted.

A three-point linkage machine can be converted to a trailing machine by fitting:

- The trailing drawbar assembly  
and
- The trailing hydraulic kit including cylinders, hoses and couplings

## 4.2. Working Depth

Working depth will vary depending on the soil type and conditions and the objective of the Agrowplowing operation. The drawbar power of the tractor will also have an influence on working depth. As a guide Agrowplow recommends 15 to 20 horsepower (11 – 15 kW) per shank.

The following are important guidelines:

- Operating depth needs to be deeper than the hard pan or compacted layer being targeted.
- Working too shallow will have a minimal effect and will increase surface disturbance.
- Working too deep may cause shanks to 'lay back' particularly on hydraulic recoil models or will cause shear pin failure on rigid models.
- **Do not** work deeper than the shank pivot points. This will prevent the shank protection device from functioning correctly.

Consult an Advisory Officer for a recommendation regarding working depth if unsure.

### 4.3. Coulters

Optional coulters are available to suit both rigid and spring release shanks. Coulters are used to minimise surface disturbance and assist in residue handling. This is beneficial in pasture renovation applications.

Different shank styles and shank protection systems have different coulter arrangements available. Please consult your Agrowplow dealer to determine the right coulters to suit your application and machine.

Points to consider when using coulters:

- Coulters should be adjusted to approximately 50mm working depth when the shank is at the desired working depth.
- Do not turn sharp corners with rigid coulters fitted.
- Be aware of immovable objects, as some coulter assemblies are not fitted with a protection device.

The Agrowplow can be equipped with either plain or fluted coulters. Key factors to consider when choosing the type of coulter are:

- **Plain Coulters**
  - Used where best appearance of the finished job is required.
  - Used in harder soil where maximum penetration is required.
  - Lower wear rate than fluted coulters
- **Fluted Coulters**
  - Perform better in very heavy trash conditions.
  - Cause less smearing in clay type soils.
  - More aggressive soil surface disturbance.

### 4.4. Operating Speed

The Agrowplow will produce the best results if operated between 4 and 8 km/h. Optimum speed will vary with the soil type, vegetative cover and root matter present.

Operating at higher speeds will increase soil surface disturbance, reduce penetration and seriously reduce the shattering effect. High speeds will also increase wear on the blades.

### 4.5. Mulch Blades

The Agrowplow can be fitted with Mulch Blades to allow for deep ripping and a weed kill in one pass while still maintaining minimal surface disturbance. Mulch Blades should not be used too deep as the blades will not cut the root system. The shanks will 'lay back' as a result of increased load and hence increase surface disturbance. Draft load on the tractor will also be higher.

The blades are attached to the rear of the shank by bolting the blade clamps through the holes running down the rear spine of the shank.

The procedure for setting up Mulch Blades is as follows:

1. Attach the Mulch Blades to the shanks so they cut approximately 50mm below the surface.
2. Operate the Agrowplow and observe depth and weed kill.
3. Adjust the position of the Mulch Blades if necessary.
4. Retighten the retaining bolts after a few hectares of operation.

## 4.6. Furrowers

The 24" Agrowplow Shank can be fitted with Furrowers to allow for the creation of furrows or the reformation of bed walls. Furrowers will drastically increase the load on the shank and hence tractor draft force.

The furrowers are attached to the rear of the shank through the holes running down the rear spine of the shank. The procedure for setting up Furrowers is as follows:

1. Determine working depth of the shank.
2. Set the vertical position of the Furrowers at the approximate desired furrow height.
3. Operate the Agrowplow and furrow height and formation.
4. Adjust the position of the Furrowers up or down as necessary.
5. The pitch of the Furrowers can also be adjusted using the adjusting screw at the rear of the assembly.
6. Retighten the retaining bolts after a few hectares of operation.

## 5. Operating Tips

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The Agrowplow is part of a broader farming system – the 'Soil Care System of Farming'. This may include crop rotations with different varieties, cereals or legumes and even break crops.

This section outlines the ideal conditions for using an Agrowplow. These are recommendations only and ultimately the decision is yours. Your local Advisory Officer will be able to assist if necessary.

### 5.1. Surface Cover

Retaining crop residue such as stubble mulch both on the surface and in the root system below will protect the soil from both wind and water erosion. It will also improve moisture penetration and retention and retain heat. The root systems of previous crops and valuable organic matter to the soil and allow easier penetration of new root systems.

### 5.2. Weed Control

Weed control needs to be achieved via alternative methods to cultivation. While Mulch Blades can be fitted to the shanks they will increase soil disturbance and break down the root bed.

The soil will benefit from reduced cultivation passes and this will save both time and money. Alternative strategies to consider for weed control are:

- Strategic Grazing
- Chemical Spraying
- Break Crops
- Haying
- Slashing
- Combination of the above options.

### 5.3. Seed Bed

Do not aim for a nice clean, smooth seedbed. The even soil surface usually comes at the expense of compaction underneath. This leads to poor root growth and slow moisture penetration. Do not try and destroy large surface clods. This will break down naturally over time.

## 5.4. Soil Moisture

The Agrowplow will achieve the best results if operated at the correct soil moisture content. Due to the differing physical characteristics of different soil types it is impossible to recommend a strategy that will work in all situations.

If the soil is too wet the soil will be compacted further by the tractor tyres and the shanks will simply pass through the soil with minimal disturbance. This will not achieve the desired 'shattering effect' in either the sub soil or the compacted layer.

Dry conditions make it difficult for the Agrowdrill to sufficiently penetrate the sub soil. Furthermore, blade wear will be increased as will tractor fuel consumption.

As a guide to determine if the soil is ready to Agrowplow follow this procedure:

1. Dig to the depth at which you wish to work with a shovel and remove a section of soil from this depth.
2. Drop the section of soil on the ground from a height of approximately 450mm and observe how it breaks up.

If the soil breaks into a 'crumb' structure it is ready to work. If the pile appears dry, cloddy and dusty or if it doesn't break up and appears glazed on the surface then the soil is not ready for the Agrowplow and will need to dry out or get wetter accordingly.



Correct soil moisture content is important to achieve shattering.



## 6. Undercarriage Set Up

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This section outlines the different set up procedures for the different Shank Protection Systems.

### 6.1. Rigid Shear Pin Shanks

Rigid Shear Pin shanks are available on all models in the Agrowplow range. Shank protection is via a shear pin inserted in lieu of one of the mounting bolts at the top of the shank. These shear pins are designed to fail at a predetermined force. Once this force is exceeded the pin fails and the shank lays back.

Shear pin failure is finite and a 'failed' shear pin cannot be reused.

The procedure to replace a shear pin is as follows:

1. Lift the machine out of the ground.
2. Fit ram safety stops (if applicable)
3. Remove any remaining parts from the failed shear pin
4. Reposition shank back into working position
5. Insert new shear pin
6. Secure shear pin with locking clips

**Do not use a non-standard shear pin (such as a standard bolt) in place of the correct shear pin. Agrowplow will not be held responsible for any failure, injury or death resulting from the use of incorrect shear pins.**

### 6.2. Hydraulic Recoil Shanks

Hydraulic Recoil shanks are available on all models in the Agrowplow range except the Vineyard Plow and AP10.

Shank protection is via a hydraulic recoil system. The system is pressurised from oil in the tractors hydraulic system. As the shank encounters an obstacle the oil is forced out of the cylinder back into the circuit increasing the pressure in the accumulator. When the obstacle is cleared the accumulator forces the oil back into the cylinder returning the shank to its operating position.

The pressure in the operating system can be adjusted according to the operating conditions by increasing or decreasing the oil level in the circuit. A shut off valve is located near the base of the accumulator to either open or close the circuit from the tractors hydraulic system.

Agrowplow Pty Ltd recommends an operating pressure of 2000 PSI for the hydraulic circuit.

**Do not exceed 2400 PSI in the system as this is approaching the operational limits of the hoses, cylinders, accumulators and fittings. Conversely operating below 1500 PSI will damage the shanks as they will be allowed to 'lay back' causing their operating geometry to change. This will cause premature wear of the shank and blade failure. Agrowplow will not be held responsible for any failure, injury or death resulting from the operation outside of these parameters.**

#### 6.2.1. Priming the Hydraulic Recoil Circuit

Before commencing operation the hydraulic circuit of the Agrowplow must be primed. The procedure is as follows:

1. Fold the wings down (if applicable).
2. Open the shut off valve so oil can flow to and from the tractor.

3. Loosen the hydraulic hose connection at the base of each recoil cylinder (one per shank).
4. Lower the machine to the ground so the blades are just touching the surface.
5. Drive forward slowly and at the same time lower the machine to the ground until each shank is in the full recoil position. This removes any air from the system.
6. Slowly pressurise the hydraulics until oil appears at the loosened connection on the cylinders.

**Note:** *Stand well clear of the loosened connection as oil under pressure can spray wildly outwards. It is a good idea to place a hessian bag or similar material over the connection to minimise oil movement.*

7. Retighten all connections as soon as oil appears
8. Raise the machine to its full transport height
9. Continue increasing pressure until at the required working pressure.

The recoil circuit is now fully primed and the Agrowplow can now be used.



AP 70 Series Agrowplow Fitted with Hydraulic Recoil Shanks

## 7. Maintenance

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The Agrowplow is an extremely robust and durable machine and will give many years of service with simple routine maintenance.

### 7.1. Pre-Operation Check

Check the following points before operation:

- Check all nuts and bolts are tight.
- Check shank spacing's and alignment are correct.
- Check all grub screws are tight.

### 7.2. Daily Service

Before starting work each day the Agrowplow should be carefully checked for the following:

- Loose blade mounting bolts. Tighten as necessary.
- Correct fitting of Shin Guards.
- Correct fitting of Shear Pins (where fitted).
- Loose hydraulic fittings.
- Excessively worn soil openers (where fitted). Replace as necessary.
- Excessively worn coulters (where fitted). Replace as necessary.
- Quick visual check of entire machine.

### 7.3. Lubrication

The lubrication schedule for the Agrowplow is as follows:

Item	Action	Interval
Wheel Arm Pivots	Grease	100 Working Hours
Wheel Axle Bearings	Grease	Annually
Wing Fold Pivots	Grease	100 Working Hours
Coulter Pivots	Grease	20 Working Hours
Coulter Axles	Grease	Annually

*Note: Not all models have all the lubrication points mentioned above.*

### 7.4. Replacing Blades

You should replace blades when they wear past the tungsten tip or lose their point. Blunt tips or worn blades will reduce the digging efficiency of the Agrowplow and will substantially increase shank wear.

The procedure for changing knock-on blades is as follows:

1. Place the Agrowplow on a hard surface and lift to the highest position and secure using the ram safety stoppers.
2. Turn the tractor off.
3. Using a light hammer knock the blade off the end of the shank.
4. Install new blade and tap back on gently. Do not use a large hammer as this will damage the tungsten tips or hard facing of the blade.

### 7.5. Shin Guard Replacement

The Shin Guard is used to protect the front base of the shank from excessive wear.

The procedure for changing the Shin Guard is as follows:

1. Place the Agrowplow on a hard surface and lift to the highest position and secure using the ram safety stoppers.
2. Turn the tractor off.
3. Remove the blade according to the procedures outlined in either Section 7.4 above.
4. Remove worn Shin Guard. A slight tap with a hammer may be necessary.
5. Install new Shin Guard and if necessary tap back on gently. Do not use a large hammer as this will damage the Shin Guard
6. Reinstall blade according to the procedures outlined in Section 7.4 above.

## 7.6. Coulter Replacement

Coulter replacement procedure is as follows:

Place the Agrowplow on a hard surface. Lift to the highest position and secure using the ram safety stoppers.

1. Turn the tractor off.
2. Remove retaining bolts.
3. Replace worn coulters.
4. Replace and tighten retaining bolts.

## 8. Trouble Shooting Guide

This section aims to provide a guide to possible causes to problems that may arise. Not all causes and not all possible solutions are listed. For more information or assistance please contact your nearest Agrowplow dealer.

### 8.1. Underframe

The Problem	Possible Cause	Possible Solution
<b>Poor penetration</b>	Soil is too dry	Wait for rain or irrigate
	Worn blades	Replace blades
	Machine not level	Adjust levelling tube to suit
	Mulch Blades too deep	Set blades shallower
	Blunt Coulters	Sharpen or replace coulters
<b>High blade wear</b>	Soil is too dry	Wait for rain or irrigate
	Not working deep enough	Lower Agrowplow to work below the compacted layer
	Highly abrasive soil	Use tungsten tipped points
<b>Uneven blade wear</b>	Machine not level	Level the Agrowplow
	Compaction behind tractor tyres	Reduce load on rear tractor tyres
	Uneven spring adjustment	Adjust all springs the same
<b>Shanks 'laying back'</b>	The soil is too dry and hard	Wait for rain or commence irrigation
	Machine not level	Adjust levelling tube or top link to suit
	Working too fast	Slow to a suitable speed
	Insufficient spring pressure	Increase spring pressure
	Insufficient hydraulic pressure	Increase hydraulic pressure
<b>Too much surface disturbance</b>	Not working deep enough	Adjust deeper
	Working too fast	Slow to a suitable speed
	Coulters not cutting cleanly	Sharpen the existing coulters Fit new coulters
	Coulters not working deep enough	Adjust to approx 50mm
	Mulch Blades too shallow	Adjust Mulch Blades deeper
<b>Too deep on one side</b>	Incorrect depth setting	Adjust depth stoppers evenly
	Low depth wheel pressure on one side	Inflate to recommended pressures
	Low tractor tyre pressure	Inflate as recommended in tractor manual
<b>Poor Shattering of soil</b>	The soil is too wet	Wait for soil to dry
	Not working below compacted layer	Adjust deeper
	Working too slow	Increase speed
<b>Coulter 'bulldozing' soil</b>	Coulter worn out	Replace coulter
	Seized bearing	Replace coulter bearing

## 8.2. Hydraulics

<b>The Problem</b>	<b>Possible Cause</b>	<b>Possible Solution</b>
<b>Uneven lift</b>	Hydraulics not primed	Prime hydraulic system
<b>Poor lift response</b>	Air in hydraulic hose	Bleed air from system
	Low oil level in tractor	Add oil according to tractor operation manual
<b>Failure of shank to return to working position</b>	Air in circuit	Bleed air from system
	Loose hydraulic connections	Tighten hydraulic connections
	Insufficient hydraulic pressure	Increase hydraulic pressure
	Accumulator return valve failed	Incorrect valve Valve blocked