Agrowplow

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'Prosperity Through Soil Care'

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1.0 Safety

1.1 Safety is the Operators Responsibility

The Agrowplow presents an operator with hazards associated with setting up, on and off road transport, tillage 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 Agrowplow and demonstrate the safe operation of the Agrowplow according to Agrowplow 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 Agrowplow and attachments:

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

1.2 Safe Operation Needs a Qualified Operator

1.2.1 Understand the Instructions, Rules and Regulations

- The written instructions for the operation of the Agrowplow are included in the Agrowplow operator's manual and on the machine decals.
- Check the rules and regulations for your location. These rules may include any Federal and State safety requirements.

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 Agrowplow is delivered.
- New operators must start in an area without bystanders and use all the controls until they can operate the Agrowplow 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 maintaining or servicing the Agrowplow.
- 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 Safety Instructions

READ THESE SAFETY INSTRUCTIONS CAREFULLY BEFORE ALLOWING ANY PERSON TO OPERATE THE AGROWPLOW

1. Review this manual before each season of use.
2. Never allow anyone unfamiliar or untrained to operate the implement.
3. Operators must know and abide by any road transport regulations pertinent to the transit of your Agrowplow.
4. Never leave the Agrowplow in a raised position. Accidental release of control levers or hydraulic hose failure will result in the machine dropping. This can cause serious injury to someone near or under the implement.
5. 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.
6. Do not transport an Agrowplow in excess of 20 kph. Transporting at greater speeds will result in loss of implement control and cause serious damage or injury.
7. 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.
8. 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.
9. Extreme caution should be used when clearing coulters, tynes or soil openers. These may be very sharp and cause serious injury.
10. Do not ride on an Agrowplow at any time.
11. Use due care when adjusting or maintaining any aspect of the Agrowplow. Failure to do so may result in serious injury.

12. When undertaking maintenance on the Agrowplow the operator must ensure that the tractor is turned off and the hydraulics are fully lowered. Accidental release of control levers or hydraulic hose failure will cause the implement to drop down. This can cause serious injury to someone near or under the machine.
13. If the Agrowplow must be in a raised position for service or maintenance, ensure the unit is securely supported with proper support stands or the cylinder stoppers supplied with your Agrowplow. After the implement is secured release the hydraulics on to the supports and stop the tractor engine before starting work. If supports are not used accidental release of control levers or hydraulic hose failure will cause the implement to drop down. This can cause serious injury to someone near or under the machine.
14. Do not remove any safety instruction decals.
15. Ensure that any safety decals are clear and visible. Clean and replace as necessary.

2.0 Agrowplow Specifications

This section details the specifications for all standard models in the Agrowplow range.

2.1 Vineyard Plow Specifications

Range		**Vineyard Plow**			
Model		**2VP**	**2VP-D**	**3VP**	**3VP-D**
No of Tynes		2		3	
Number of Toolbars		1			
Shank Spacing*		1450mm		725mm	
Working Width		2.9m		2.2m	
Transport Width		2.15m			
Drawbar Power	**kW**	15-20		30-35	
	hp	25-30		40-50	
Linkage		Cat II			
Shank Protection		Rigid Shear Pin			

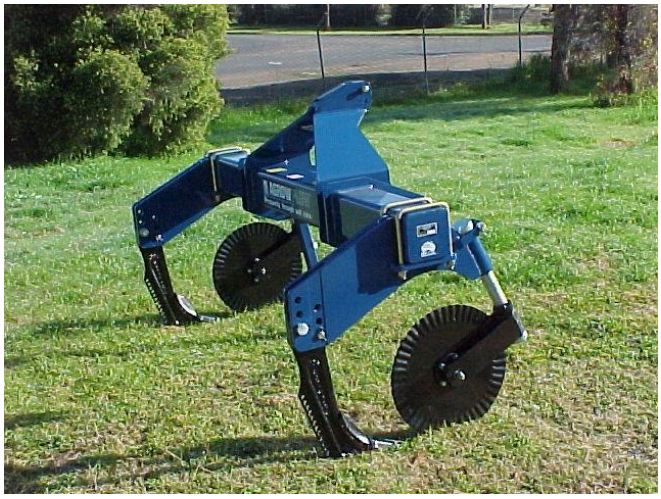
Frame	Fully Welded Frame 150 x 150 x 9mm RHS Toolbar

Rigid Shear Pin Shank Protection	24" Agrowplow Shanks 450mm Maximum Working Depth 1700lb Maximum Breakout At Blade Shear Pin Protected

Coulters	N / A	20" coulters Height Adjustable Plain or Fluted	N / A	20" coulters Height Adjustable Plain or Fluted

Optional Equipment	Mulch Blades Pitch Adjustable Furrowers

* Standard factory setting. Shank spacing can be variable along toolbar to suit requirements.



2.2 Econoplow Specifications

Range		Econo		
Model		**3S-Econo**	**5S-Econo**	**7S-Econo**
No of Shanks		3	5	7
Shank Spacing		305		
Number of Toolbars		2		
Working Width		0.9m	1.5m	2.1m
Transport Width		0.8m	1.6m	2.3m
Drawbar Power	**kW**	15-18	25-30	35-42
	hp	20-25	35-40	45-55
Linkage		Cat I	Cat II	
Depth Wheels		4.80/4.00-8.0	13 x 165 HT	

Frame	Fully Welded Frame 100 x 100 x 6mm RHS Toolbars 100 x 20mm FMS End Plates

Options	Bolt On Shank Assemblies Swivel Coulters - See Below Mulch Blades

Shanks	20" Agrowplow Shanks 350mm Maximum Working Depth 1200lb Breakout At Blade Shear Pin Protected

Optional Coulters	12" coulters Height Adjustable Plain or Fluted

2.3 Utility Plow Specifications

Range		Utility Plow			
Model		**3S-Utility**	**5S-Utility**	**7S-Utility**	**9S-Utility**
No of Shanks		3	5	7	9
Shank Spacing		305			
Number of Toolbars		2			
Working Width		0.9m	1.5m	2.1m	3m
Transport Width		0.8m	1.6m	2.3m	3.3m
Drawbar Power	**kW**	18 - 26	26 - 34	34 - 45	45 - 60
	hp	25 - 35	35 - 45	45 - 60	60 - 80
Linkage		Cat I	Cat II		
Depth Wheels		4.80/4.00-8.0	13 x 165 HT		

Frame	Fully Welded Frame 100 x 100 x 6mm RHS Toolbars 100 x 20mm FMS End Plates

Optional Equipment	Swivel Coulters - See Below Mulch Blades

Shanks	20" Agrowplow Shanks 350mm Maximum Working Depth 810lb Breakout At Blade 305mm Jump Height Spring Release Shank Protection

Optional Coulters	12" Coulters Height Adjustable Plain or Fluted

2.4 AP1 Agrowplow Specifications

Range		AP1			
Model		**3S-AP1**	**5S-AP1**	**7S-AP1**	**9S-AP1**
No of Shanks		3	5	7	9
Shank Spacing		330			
Number of Toolbars		2			
Shank Protection	**Standard**	Rigid Shear Pin			
	Optional	Heavy Duty Spring Jump			
Working Width		1m	1.5m	2.13m	2.97m
Transport Width		0.8m	1.95m	2.6m	3.26m
Drawbar Power	**kW**	20-35	30 - 40	65 - 75	90 – 100
	hp	30-45	40 - 55	85 - 100	120 – 135
Linkage		Category II Three Point Hitch			
Manual Depth Wheels		4.8 - 8	13 x 165 HT		

Frame	100 x 100 x 6mm RHS Toolbars Fully Welded Frame 100 x 50 x 6mm RHS Tower

Optional Equipment	Coulters - See Below Pitch Adjustable Furrowers Mulch Blades

Rigid Shear Pin Shank Protection	24" Agrowplow Shanks 450mm Maximum Working Depth 1700lb Breakout At Blade Shear Pin Protected

Heavy Duty Spring Release Shank Protection	24" Agrowplow Shanks 450mm Maximium Working Depth 810lb Breakout At Blade Spring Release Shank Protection

Coulters	14" coulters Height Adjustable Plain or Fluted Swivel or Rigid

2.5 AP2 Agrowplow Specifications

Range		AP2		
Model		**7S-AP2**	**9S-AP2**	**11S-AP2**
No of Shanks		7	9	11
Shank Spacing		330		
Working Width		2.3m	3m	3.6m
Transport Width		3.2m	3.7m	4.3m
Drawbar Power	**kW**	50-80	70-100	95-125
	hp	65-105	95-135	125-165
Shank Protection	**Standard**	Rigid Shear Pin		
	Optional	Heavy Duty Spring Release		
		Hydraulic Recoil		
Linkage		Cat II 3PL		
Depth Wheels		9.00 x 16		

Frame	Fully Welded RHS Frame 100 x 100 x 9mm RHS Toolbars 100 x 50 x 6mm RHS Spreader Bars

Optional Equipment	Trailing Kit Coulters - See Below Mulch Blades

Rigid Shear Pin Shank Protection	24" Agrowplow Shanks 450mm Maximum Working Depth 1700lb Maximum Breakout At Blade

Heavy Duty Spring Jump Shank Protection	24" Agrowplow Shanks 450mm Maximium Working Depth 810lb Maximum Breakout At Blade

Hydraulic Recoil Shank Protection	24" Agrowplow Shanks 450mm Maximum Working Depth 2000lb Maximum Breakout At Blade

Coulters*	14" Coulters Rigid Height Adjustable Plain or Fluted

*Not available with Hydraulic Recoil Shank Protection

2.6 AP2H Agrowplow Specifications

Range		AP2H				
Model		**11S-AP2H**	**13S-AP2H**	**15S-AP2H**	**17S-AP2H**	**19S-AP2H**
No of Shanks		11	13	15	17	19
Shank Spacing		330				
Working Width		3.6m	4.3m	5m	5.6m	6.3m
Transport Width		4.3m	5m	5.7m	6.3m	7m
Drawbar Power	**kW**	95-125	115-145	140-170	160-190	185-215
	hp	125-165	155-195	185-225	215-255	245-285
Shank Protection	**Standard**	Rigid Shear Pin				
	Optional	Hydraulic Recoil				
Linkage		Cat III & Cat III Quick Hitch				
Depth Wheels		11.00 x 16				

Frame	Fully Welded RHS Frame 150 x 150 x 9mm RHS Toolbars 150 x 100 x 9mm RHS Spreader Bars 25mm Plate Tow Lugs

Optional Equipment	Safety Stands Trailing Kit Pitch Adjustable Furrowers Mulch Blades

Rigid Shear Pin Shank Protection	24" Agrowplow Shanks 450mm Maximum Working Depth 1700lb Maximum Breakout At Blade

Hydraulic Recoil Shank Protection	24" Agrowplow Shanks 450mm Maximum Working Depth 2000lb Maximum Breakout At Blade

2.7 Cotton Bed Renovator Specifications

Range		Cotton Bed Renovator		
Model		**4m CBR**	**6m CBR**	**8m CBR**
Number of Shanks	**Side Bust**	13	19	25
	Centre Bust	9	13	17
Number of Furrowers		5	7	9
Working Width		4m	6m	8m
Number of Toolbars		3		
Wheels		9.00 x 16	11.00 x 16	
Transport Width		5.1m	6.7m	9.2m
Linkage		Cat III & Cat III Quick Hitch		

Features	Fully Welded 150 x 150 x 9mm Frame 24" Rigid Shanks Height & Pitch Adjustable Furrowers

Optional Equipment	Mulch Blades Safety Stands

2.8 AP3-95 Agrowplow Specifications

Range		AP3-95	
Model		**13S AP3-95**	**27S AP3-95**
No of Shanks		13	27
Shank Spacing		330mm	
Working Width		4.3m	8.9m
Transport Width		4.7m	6.1m
Number of Sections		1	3
Shank Protection	**Standard**	Rigid Shear Pin	
	Optional	Hydraulic Recoil	
Drawbar Power	**kW**	115-145	275-305
	hp	155-195	365-405
Linkage		Trailing	
Depth Wheels		14.9 x 28	

Frame	150 x 150 x 9mm RHS (Fully Welded) Heavy Duty Levelling Screw Category IV Drawbar Heavy Duty Wheel Arms & Carriers	Heavy Duty Wing Hinges 10º Wing Ground Following

Optional Equipment	Mulch Blades 4" Shank Extensions

Rigid Shanks	24" Agrowplow Shanks 500mm Maximum Working Depth 1700lb Maximum Breakout At Blade Shear Pin Protected

Hydraulic Recoil Shanks	24" Agrowplow Shanks 500mm Maximum Working Depth 2000lb Maximum Breakout At Blade Hydraulic Recoil Shank Protection

Hydraulic System	Self Phasing Hydraulic Lift	Hydraulic Wing Fold Two Independent Circuits

Safety	Ram Safety Stops 400mm Transport Clearance	Over Centre Wing Fold Wing Locking Pins

3.0 Principles of Agrowplowing

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

3.1 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 waterlogged 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 penetration, and reduce root growth and 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.

3.2 The Problem of Soil Compaction

Soil compaction is a form of soil degradation. It strangles the life out of soil. 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.

Normal farming activities using tractors, implements, headers, vehicles, cultivation, livestock and irrigation will cause soil compaction. 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 that reduces the porosity or bulk of your soil is causing soil compaction.

Compacted soil becomes denser and in turn, decreased porosity of the soil reduces:

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

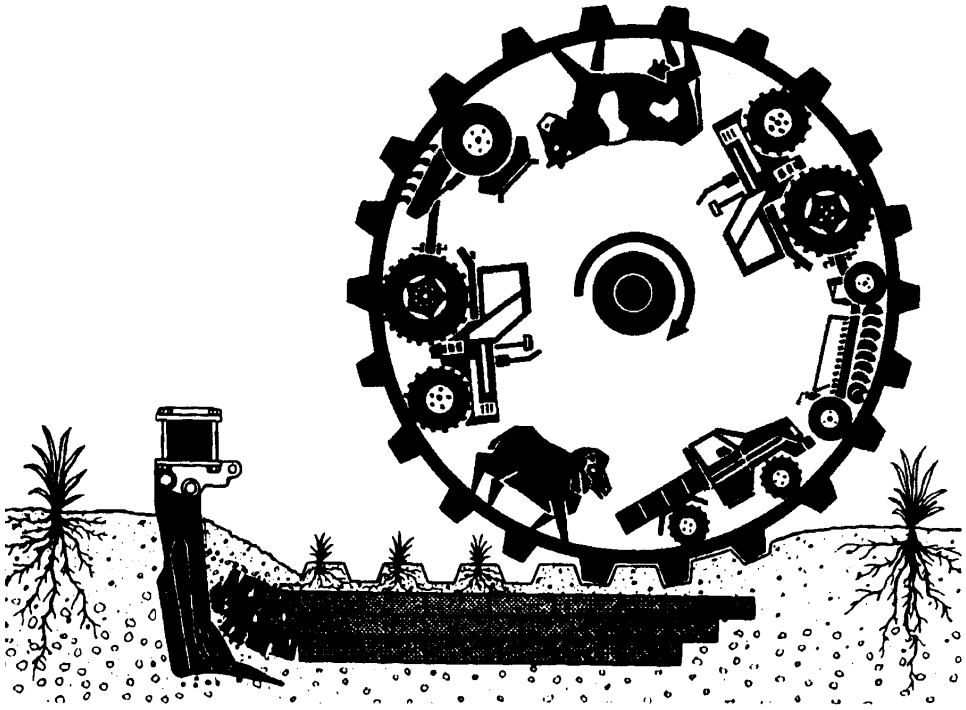


Figure 3.1: The effects of compaction

3.2.1 How Compaction Is Rectified

1. Break up compacted soils, hard pans, clay pans, tillage pans and impenetrable barriers with an Agrowplow.
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.
3. Use farming practices that minimise soil cultivation, soil inversion and traffic in wet soils.

3.3 The Advantages of Agrowplowing

Agrowplows are used for both primary and secondary tillage, without soil inversion and minimising moisture loss. The narrow edge-on tine 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 thus improving structure, adding humus, increasing 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 salination 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. Benefits include wheat roots being able to penetrate the ripped soil faster and deeper to absorb more soil moisture, capture more soil nutrients and improve yield.

Deep tillage has proved extremely beneficial mainly on light soils. On heavy soils, apparent responses from deep ripping were due to the following effect of the operation that can be obtained with shallower workings. Soil structure of heavy red clays has been shown to deteriorate with cultivation.

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 hardpan formation.

3.4 Unique Shank Design

Agrowplow's unique 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 penetration and infiltration into the 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 legumes also assist in developing and maintaining a healthy root bed.

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

Non-Inversion tillage allows the legume roots to develop deep in the soil profile where nitrogen-fixing bacteria produces nodules. This not only increases nitrogen in the root bed but also organic matter, which gives a fertile, friable soil structure.

Figure 3.2: 24” Agrowplow Shank

4.0 Operating Instructions

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 tractors 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.

   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.

4. Connect the levelling tube to the top lugs of the tower.

5. 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 AP2 or AP2H Agrowplows can be operated as either a trailed or three-point linkage machine. Both ranges are 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.
- 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 10 to 15 horsepower (7 – 12 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 spring release and 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 or 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.

5.0 Operating Tips

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 too will tractor fuel consumption.

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

Dig to the depth at which you wish to work with a shovel and remove a section of soil from this depth.
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.

Figure 5.1: Correct soil moisture content is important to achieve shattering.

6.0 Undercarriage Set Up

Depending on the model of Agrowplow there are different undercarriage options to suit. These include:

- Shank Length
- Shank Protection System
    - Rigid Shear Pin
    - Spring Release
    - Hydraulic Recoil
- Blade Mounting
    - Bolt On
    - Knock On
- Coulter Assemblies

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. They come in two lengths – 20” and 24”. The 20” shank is only available on the Econoplow Range. The 24” is available on all other models.

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 Pty Ltd will not be held responsible for any failure, injury or death resulting from the use of incorrect shear pins.

6.2 Spring Release Shanks

Spring Release shanks are available on the smaller models in the Agrowplow range. They come in two lengths – 20” and 24”. The 20” shank is only available on the Utility Plow Range. The 24” is available on the AP1 and AP2 models.

Shank protection is via a spring release system. These springs are designed to release at a set force allowing the tyne to clear the obstacle. Adjusting the pre-compression level of the spring itself sets the force at which the tynes release.

On all models the spring length is factory set with 50mm of the adjusting rod protruding from the top of the spring. To increase the breakout level of the spring simply tighten the spring retaining bolt to shorten the length of the spring.

Do not use fully tighten (totally compress) the spring as this prevents any breakout from occurring. Agrowplow Pty Ltd will not be held responsible for any failure, injury or death resulting from the full compression of the spring.

6.3 Hydraulic Recoil Shanks

Hydraulic Recoil shanks are available on the larger models in the Agrowplow range. Shank length is limited to 24” only. They are available on the AP2, AP2H and AP3-95 models.

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 Pty Ltd will not be held responsible for any failure, injury or death resulting from the operation outside of these parameters.

6.3.1 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 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.

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.

7.0 Maintenance

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 spacings 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).
- Correct Spring Tension (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.

There are two different methods for changing blades depending on the type of blade fitted to the shank.

7.4.1 Bolt – On Blades

The procedure for changing bolt-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. Remove retaining bolt that attaches the blade to the shank.
4. Remove worn blade and any damaged bolt.
5. Install new blade and any bolt and tighten bolt firmly.

7.4.2 Knock – On Blades

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 8.4.1 or 8.4.2 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 either 8.4.1 or 8.4.2 above.

7.6 Coulter Replacement

Coulter replacement procedure is as follows:

1. Place the Agrowplow on a hard surface. Lift to the highest position and secure using the ram safety stoppers.
2. Turn the tractor off.
3. Remove retaining bolts.
4. Replace worn coulters.
5. Replace and tighten retaining bolts.

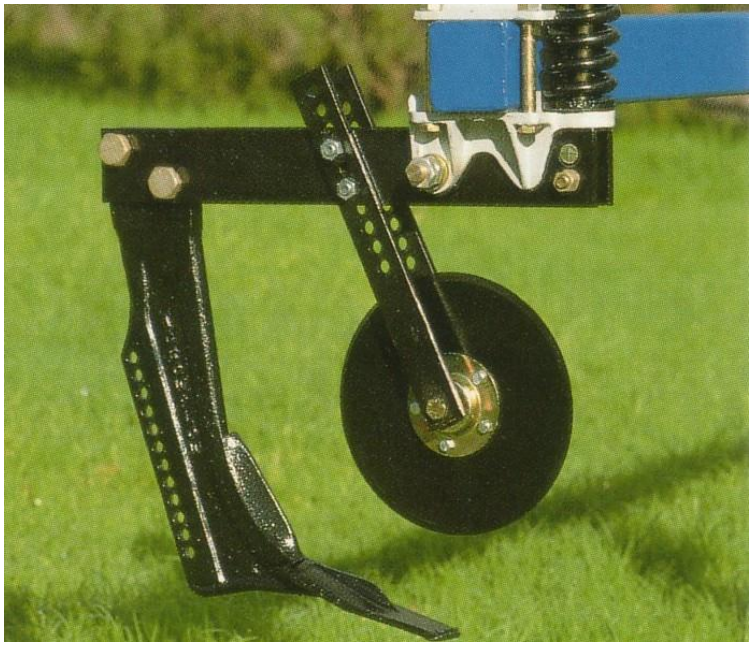


Figure 7.1: Spring Release Shank Assembly with Rigid Coulter Assembly

8.0 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 in troubleshooting please contact you nearest Agrowplow dealer.

8.1 Underframe

The Problem	Possible Cause	Possible Solution
Poor penetration	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
High blade wear	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
Uneven blade wear	Machine not level	• Level the Agrowplow
	Compaction behind tractor tyres	• Reduce load on rear tractor tyres
	Uneven spring adjustment	• Adjust all springs the same
Shanks 'laying back'	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

The Problem	Possible Cause	Possible Solution
Too much surface disturbance	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
Too deep on one side	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
Poor Shattering of soil	The soil is too wet	• Wait for soil to dry
	Not working below compacted layer	• Adjust deeper
	Working too slow	• Increase speed
Coulter 'bulldozing' soil	Coulter worn out	• Replace coulter
	Seized bearing	• Replace coulter bearing

8.2 Hydraulics

The Problem	Possible Cause	Possible Solution
Uneven lift	Hydraulics not primed	• Prime hydraulic system
Poor lift response	Air in hydraulic hose	• Bleed air from system
	Low oil level in tractor	• Add oil according to tractor operation manual
Failure of shank to return to working position	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

Notes: