GRDC GROWNOTES

SPRAY APPLICATION MANUAL FOR GRAIN GROWERS

Module 19
Shielded sprayers
Practical issues and set-up considerations

Bill Gordon

Key points

- **Shielded sprayers are generally designed to prevent droplets from depositing onto a crop, and can reduce drift by more than 90 per cent compared to a conventional boom**
- **Products applied under shielded sprayers are applied as a banded application**
- **Banded applications require accuracy to uniformly deliver the product to the intended target area**
- **The choice of appropriate nozzle types for banded applications may be limited**
- **Using automatic rate controllers for banded and directed applications requires careful consideration of the plumbing set-up and the inputs into the rate controller**

1. Introduction

Shielded sprayers have traditionally been used for inter-row spraying in farming systems where wider row spacings are common, such as in the northern grains region where crop row spacing for summer cereals and some pulse crops can be one metre or more.

However, shielded sprayers are now being used in areas with much narrower crop row spacings, particularly in some of the higher-rainfall areas in the southern grains region. This use in narrower crop spacings has been in response to increased levels of resistance to selective herbicides, as well as the greater accuracy of GPS systems and the use of toolbars that can adjust the shield position in relation to the crop row.

There are a several things the spray operator must consider before purchasing or setting up a shielded sprayer for inter-row spraying including:

- **product labels, Australian Pesticides and Veterinary Medicines Authority -approved permits and other legal requirements;**
- **determining the applied rate and nozzle selection;**
- **obtaining a uniform deposit under the shield;**
- **maintaining the shield height close to the ground;**
- **keeping the shield in the inter-row; and**
- **Using manual pressure or rate controllers.**

This module outlines some of the practical considerations associated with using a shielded sprayer for inter-row spraying within a crop.

2. Label and legal requirements associated with shielded spraying

At the time this module was prepared the only registrations for shielded applications of non-selective herbicides for use in selected grain crops were for some glyphosate products. Other products registered for use in herbicide-tolerant crop varieties, which may be applied as an over-the-top application, could also be applied through shielded sprayers (according to their approved label).

There were no other current registrations or APVMA-approved permits for the use of shielded sprayers when applying non-selective herbicides into the inter-row of conventional (not herbicide-tolerant) varieties of grain crops.

Therefore, this module will not discuss the products that may be used, or cropping situations where shielded sprayers may be employed, it will only address the equipment itself and how it may be set up to achieve a uniform spray deposit.

Using shielded sprayers for any purpose not covered by a product label or an APVMA-approved permit cannot be supported by the authors of this manual or by the GRDC.

3. Determining the applied rate for banded applications

For all banded applications, including applications using shielded sprayers, the product needs to be applied within a discrete and uniform strip of a known width.

Once the required sprayed width is known (by using the flow rate and travel speed) the applied rate can be calculated using the same formula that is used for all sprayer calibrations:

Litres per sprayed hectare
= litres per minute per nozzle* x 600 ÷ speed (km/h) ÷ width^ (m)

where:
* per minute per nozzle (or average for more than one nozzle) applied to the band
^ the average sprayed width per nozzle to the band

3.1 Practical methods for determining the sprayed width for banded applications

The sprayed width can be determined in several ways. For a shielded sprayer this may simply be the internal width of the shield, provided the width of the spray pattern under the shield can match this width.

For individual nozzles this may be done by measuring the width of the wetted pattern on the soil or measuring the width of a single spray pattern at the target. Alternatively, the operator may use water-sensitive paper (WSP) to determine an effective sprayed width when the machine is operating in the field.

Looking at the actual spray deposits may provide a more accurate assessment of sprayed width than looking at the wetted pattern on the ground.

Source: Bill Gordon

Water-sensitive paper can can be used to determined sprayed width

When using a combination of different nozzles (e.g. fan angles or orifice sizes) directed at a single plant row or into a band under a shield, use the average sprayed width and average flow rate of the nozzles to calculate the applied rate.

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3.2 The most appropriate nozzle type for achieving a uniform band is an even flat fan

Applying a uniform band is critical to being able to achieve the same rate of product across the entire sprayed width. This is not possible when using tapered flat fan patterns (the type of nozzle spray pattern used on boom sprayers) or with solid cone nozzles (occasionally fitted to the WEEDit® target-selectable sprayer, which should only be used for spot spray rates).

Figures 1 and 2 show the difference in spray pattern and the distribution of the liquid output across the spray patterns of a tapered flat fan and an even flat fan.

Figure 1 Tapered flat fan pattern.

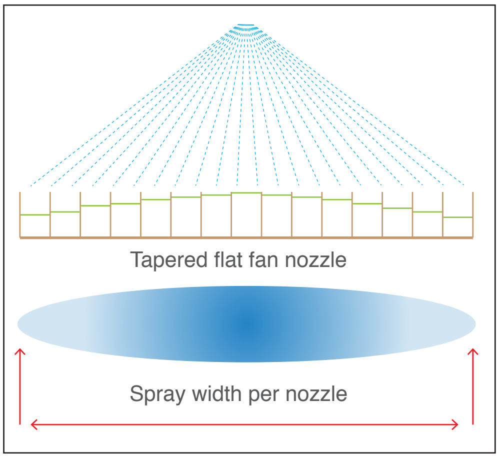
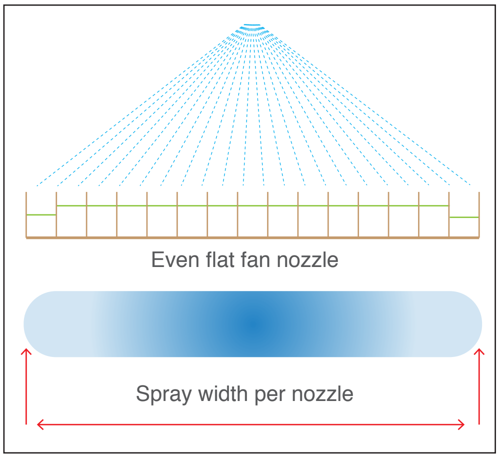


Figure 2 Even flat fan pattern.



4. Nozzle choice and spray quality for shielded sprayers and banded applications

There are relatively few nozzle types available that can produce an even flat fan pattern compared to the range of nozzles that produce tapered flat fans. If a product needs to be applied as a coarse spray quality the range of suitable even fans becomes even smaller.

4.1 Nozzle types and fan angles available as even fans

Even flat fans only produce a coarse spray quality in larger orifice sizes, or very narrow fan angles.

A TeeJet® TP 80 04 even flat fan nozzle

Source: TeeJet®

Even flat fans

Even flat fans may be available that produce patterns at a range of angles, including 40°, 65°, 80° and 95°. However, the wider-angled even flat fan nozzles with orifice sizes up to 03 or 04 may NOT be suitable for applying many bands under shields, as the 80° and 95° even flat fans generally do not produce a coarse spray quality.

Where a coarse spray quality is required on the product label, this narrows the choice of flat fan angle down to the 65° even flat fan in an 03 orifice or larger (typically used on the WeedSeeker®) or a 40° even flat fan in an 03 orifice or larger (generally the nozzle types used on WEEDit® target-selectable sprayers).

Even pre-orifice nozzles

Pre-orifice nozzles have a metering orifice to control the flow rate and an exit orifice to produce the spray pattern. Common flat fan angles available for even pre-orifice nozzles are 80° and 95°.

Careful attention needs to be paid to the spray quality produced at various pressures by the wider angled even nozzles as many of these begin to produce a medium spray quality as the pressure is increased for the orifice sizes commonly used by applicators (see Table 1)

Many pre-orifice nozzles will have a higher minimum operating pressure, typically 2.0 bar.

The even pre-orifice nozzles may be better suited to insecticide or fungicide applications over the plant row than herbicide applications.

The Drift Guard 95-degree even has a minimum operating pressure of 2.0 bar and a maximum of 4.0 bar.

Source: TeeJet® Image Library

A TeeJet® DG 95 04 even flat fan nozzle

Table 1 Spray quality data for the TeeJet DG 95° even flat fan nozzle.

	Spray quality produced at various pressures			
	Pressure (bar)			
Orifice size	2.0	2.5	3.0	4.0
DG95015EVS	M	M	F	F
DG9502EVS	M	M	M	M
DG9503EVS	C	M	M	M
DG9504EVS	C	C	M	M
DG9505EVS	C	C	C	M

Even air-induction nozzles

Depending on the operating pressure of the nozzle, 95-degree high-pressure air-induction nozzles that produce an even flat fan pattern are available to produce a coarse spray quality (or coarser) (see Table 2).

High-pressure air-induction nozzles typically need to be run at pressures above 4.0 bar to correctly produce the spray pattern. Some pumps and plumbing systems may not be able to operate these effectively.

The TeeJet® AI 95° even is a high-pressure air-induction nozzle, ideally operated at pressures above 4.0 bar to produce a coarse spray quality (or coarser) in a range of orifice sizes.

Source: TeeJet

A TeeJet® AI 95 04 even flat fan nozzle

Table 2 Spray quality data for the TeeJet® AI 95-degree even flat fan nozzle.

	Spray quality produced at various pressures						
	Pressure (bar)						
Orifice size	**2.0**	3.0	**4.0**	**5.0**	**6.0**	**7.0**	**8.0**
AI95015EVS	UC	XC	XC	VC	VC	C	C
AI9502EVS	UC	XC	XC	VC	VC	C	C
AI9503EVS	UC	XC	XC	VC	VC	C	C
AI9504EVS	UC	XC	XC	VC	VC	C	C
AI9505EVS	UC	XC	XC	VC	VC	C	C

Even twin jets

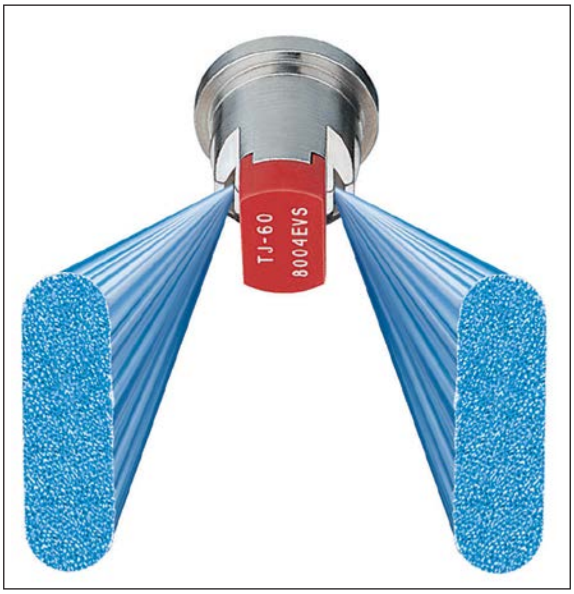
Typically, standard twin-jet nozzles produce a fine spray quality in orifice sizes smaller than an 04 or 06. These will not comply with most product labels.

One example of an even twin jet is the TeeJet® TTJ60 range of nozzles. The '60' refers to the angle between the two patterns, with one pattern facing 30° forwards and the other pattern facing 30° backwards. The TeeJet TTJ60 even nozzles are available that produce either a 40° pattern angle or an 80° pattern angle.

TTJ60 even twin-jet nozzles are available with an 80-degree or 40-degree pattern. They are only suitable for applications where a medium spray quality is required, with an 03 orifice or larger.

Source: TwinJet

A TeeJet® TTJ60 even twin-jet nozzle



The TeeJet TJ60-80-04EVS can produce a medium spray quality orifice at pressures between 2.0 and 2.5 bar, and the TeeJet TJ60-80-06EVS can produce a medium spray quality between 2.0 bar and 4.0 bar (refer to Table 3 for the complete spray quality data).

Table 3 Spray quality data for the TTJ60 40° and 80° even twin-jet nozzles.

	Spray quality produced at various pressures			
	Pressure (bar)			
Orifice size	2.0	2.5	3.0	4.0
TJ60-4002EVS TJ60-8002EVS	F	F	F	F
TJ60-4003EVS TJ60-8003EVS	F	F	F	F
TJ60-4004EVS TJ60-8004EVS	M	M	F	F
TJ60-4006EVS TJ60-8006EVS	M	M	M	M

Be aware that standard even twin jets have two orifices that each produce half of the total volume, hence the orifice size of each outlet for the patterns is half the size of that stated for the nozzle, and the smaller orifice sizes may be prone to blockages. The exit orifices of standard twin jets are different to the pre-orifice and air-inducted twin nozzles, where a metering orifice controls the total flow from the nozzle, and the exit orifices for the twin patterns are generally much larger than half the size of the metering orifice.

4.2 Nozzle height above the target to achieve the desired sprayed width

If the operator knows what the sprayed width per nozzle needs to be to match the band (shield width), they can use the information in Table 4 in two ways:

To determine the required distance from the target to achieve the required sprayed width (when the angle of the nozzle's spray pattern is known).

For example, when using a 95° nozzle and a sprayed width of 0.9 metres is required to match a wide shield, Table 4 (yellow highlight) can be used to determine that a sprayed width of 0.873 metres can be achieved when the 95° nozzle is 0.4 metres above the target.

To determine the required angle of the nozzle pattern to best match the required sprayed width (If the nozzle is at a fixed distance from the target).

For example, when using a shield that is 0.9 metres wide, and the nozzle height is fixed at 0.6 metres above the ground, using Table 4 (blue highlight) the closest match for this sprayed width would require selecting an 80° nozzle, which can spray a width of 0.888 metres wide at a height of 0.6 metres.

Table 4 The sprayed width of various nozzle angles at a range of heights above the target.

Nozzle spray angle	Nozzle distance from the target in metres							
	0.2m	0.3m	0.4m	0.5m	0.6m	0.7m	0.8m	0.9m
	Calculated spray width in metres (in theory) for the above nozzle heights							
40°	0.146m	0.218m	0.291m	0.364m	0.437m	0.510m	0.582m	0.655m
65°	0.255m	0.382m	0.510m	0.637m	0.765m	0.892m	1.020m	1.150m
80°	0.366m	0.444m	0.592m	0.740m	0.888m	1.040m	1.180m	1.330m
85°	0.367m	0.550m	0.733m	0.916m	1.100m	1.280m	1.470m	1.650m
95°	0.437m	0.655m	0.873m	1.090m	1.310m	1.530m	1.750m	1.960m
110°	0.571m	0.857m	1.140m	1.430m	1.710m	2.000m	2.290m	2.570m

4.3 Positioning nozzles under a shield

The position of the nozzles under the shield is important to achieve the sprayed width and for coverage of the target weeds under the shield.

It is very useful to have the nozzle mounted onto a structure that will allow the nozzle height to be adjusted when required.

Having the ability to adjust nozzle height and angle is essential for establishing the correct sprayed width under a shield, and for improving spray coverage.

Photo: Graham Betts

An adjustable bracket with T-piece for mounting nozzles under a shield

If a single nozzle is being used under a wider shield the nozzle may be adjusted to face at an angle so that the sprayed width of the pattern matches the width of the shield.

Where a T-bar or similar mounting structure is not fitted to the shield, a standard single nozzle swivel may be useful for angling the nozzle to adjust the sprayed width of the pattern.

Single nozzle swivels allow the orientation of the nozzle to be adjusted to match the width of the shield.

Source: TeeJet®

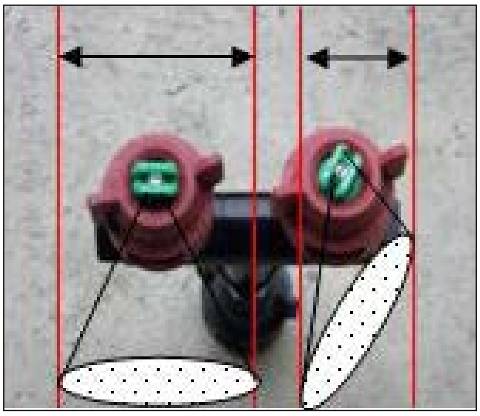
A single nozzle swivel for mounting nozzles

In situations where a narrow shield is being used, the angle of the even flat fan's pattern may be too wide to have the nozzle's pattern at a right angle to the travel direction for the shield. A solution is to have a nozzle cap with a round hole (normally used for cone nozzles), where the even flat fan nozzle can be turned within the cap to adjust the sprayed width.

Single nozzle swivels allow the orientation of the nozzle to be adjusted to match the width of the shield. The nozzle on the left will spray a wider band width. The nozzle on the right will spray a narrower band width, due to its angle in the cap.

Source: TeeJet

A single nozzle swivel for mounting nozzles



4.4 The impact of nozzle position under the shield on potential spray coverage

The location under the shield (in relation to the direction of travel) where the nozzle is mounted can have an impact on how much of the target weed may be covered, particularly when the weeds vary in size.

Where a range of weed sizes may be present, it is possible for larger weeds to be 'bent over' by the front edge of the advancing shield, which may lead to the 'shading' of smaller weeds. As a result, some weeds may receive less spray coverage.

The nozzle position (front, centre or rear of the shield) and the angle of the nozzle(s) under the shield can either increase or decrease the shading of smaller weeds.

4.4.1 Nozzle position and alignment for wider shields (more than 15 inches or 0.381 metres wide)

For wide shields fitted with a single nozzle, the ideal position is at the front of the shield, angled backwards. When two nozzles are able to be mounted into a wide shield, the first should be mounted at the front as described, and the other nozzle should be mounted at the rear of the shield, angled forwards, with the spray patterns of the two nozzles meeting at the ground in the centre of the shield.

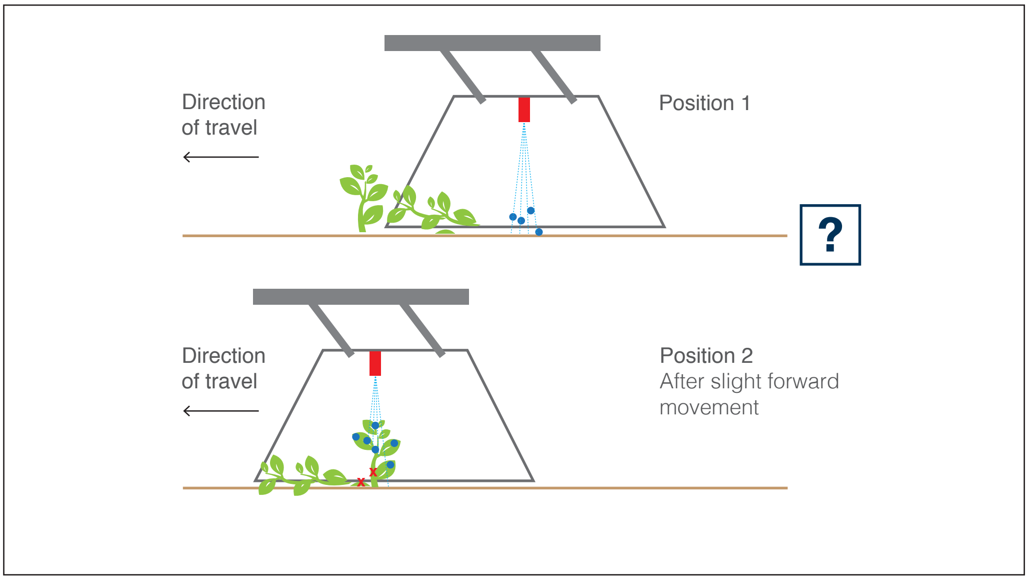
Wider shields were commonly used before the introduction of herbicide-tolerant crops.

Photo: Graham Betts

A Redball shield designed for use in wider row spacings

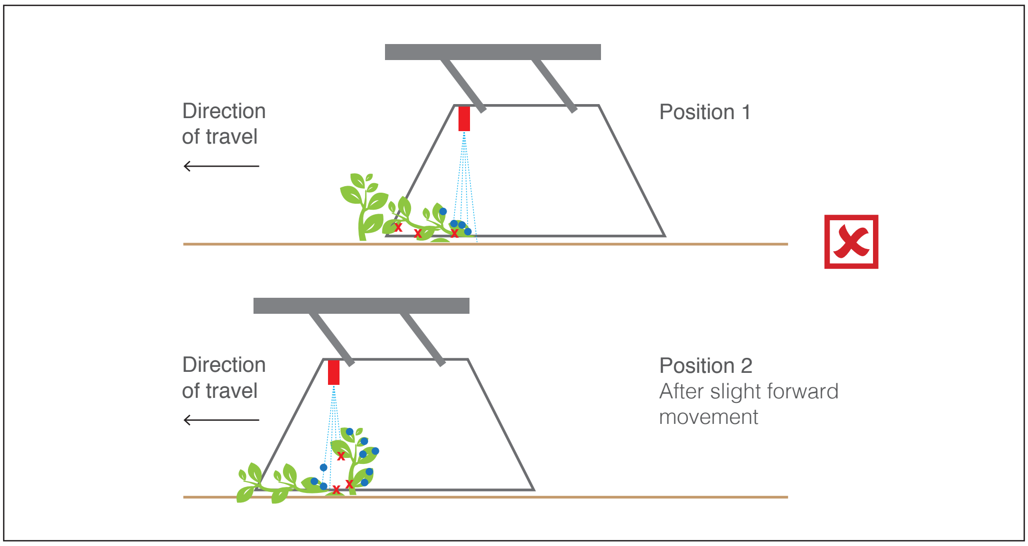
Figures 4 to 8 show the potential impact of nozzle position and angle on weed coverage. The red 'X' in each diagram (X) indicates areas on the weed that may receive reduced coverage when a mixture of weed sizes are present and where taller weeds may 'shade' the smaller weeds.

Figure 4 Nozzles mounted in the centre of the shield, facing downwards.



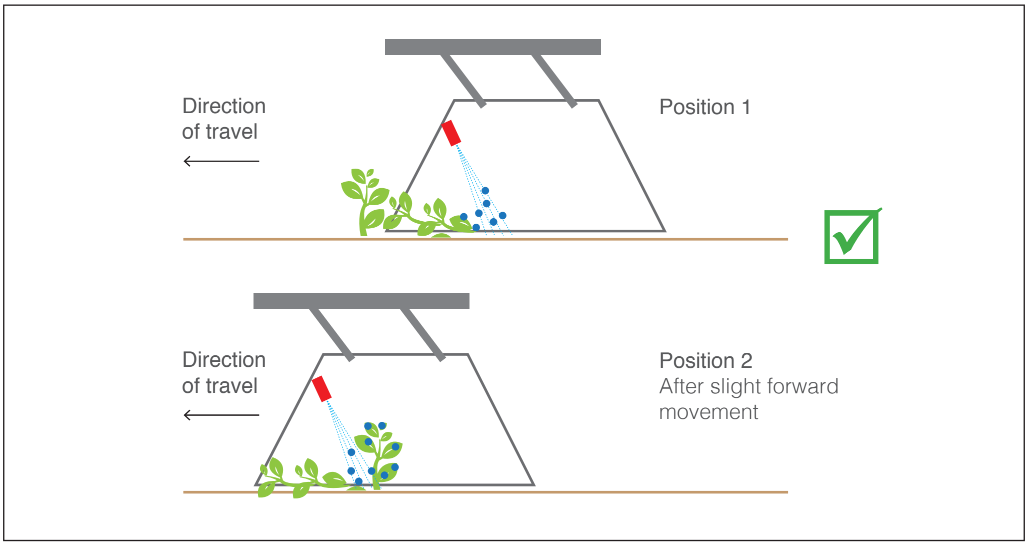
Nozzle placement in the centre of the shield is the most common set-up delivered by many shield manufacturers. In some instances this may lead to some shading in lower parts of larger weeds or shading of smaller weeds at ground level that may be directly below a larger weed.

Figure 5 Nozzles mounted at the front of the shield, facing downwards.



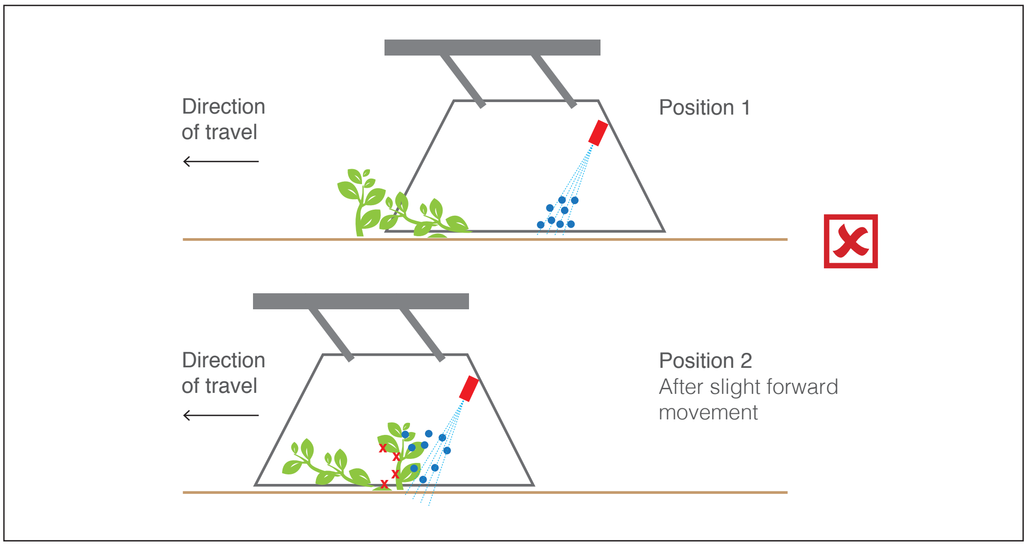
Nozzles mounted at the front of the shield, facing directly downwards will result in poor coverage of larger weeds that are bent over by the advancing shield.

Figure 6 A single nozzle mounted at the front of the shield, angled backwards.



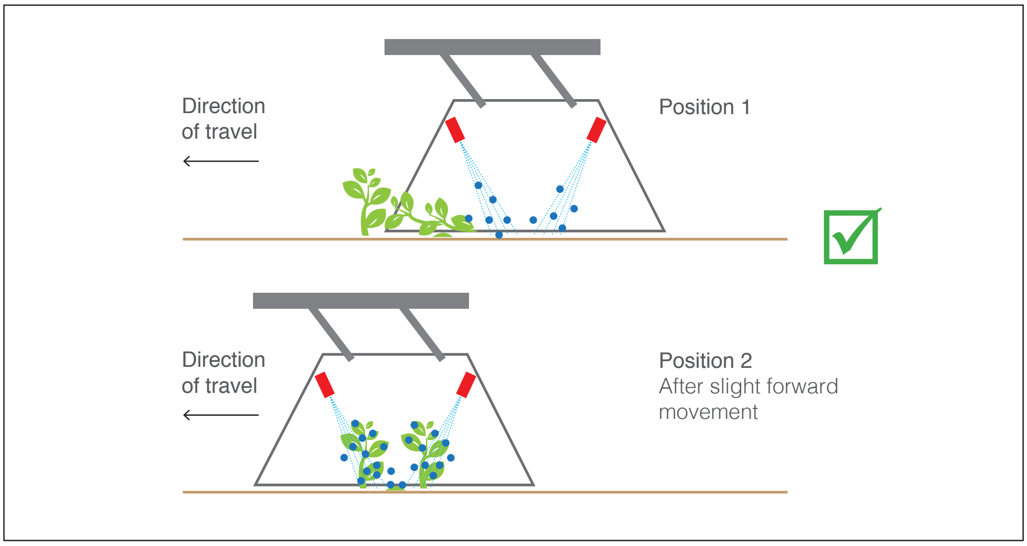
Where a single nozzle is mounted under a wide shield, it should be angled backwards, which will help to overcome shading created by larger weeds.

Figure 7 A single nozzle mounted at the rear of the shield, angled forwards.



A single nozzle mounted at the rear of the shield should not be angled forward. A single nozzle at the rear of a shield would be best directed straight down, which may still result in some shading, but would be better than having a nozzle facing straight down at the front of the shield.

Figure 8 Two nozzles, mounted front and rear, angled towards the centre



Where the required flow rate and spray quality can be achieved by using two nozzles, the ideal set-up would be to have them mounted at the front and rear of the shield, angled towards the ground in the centre.

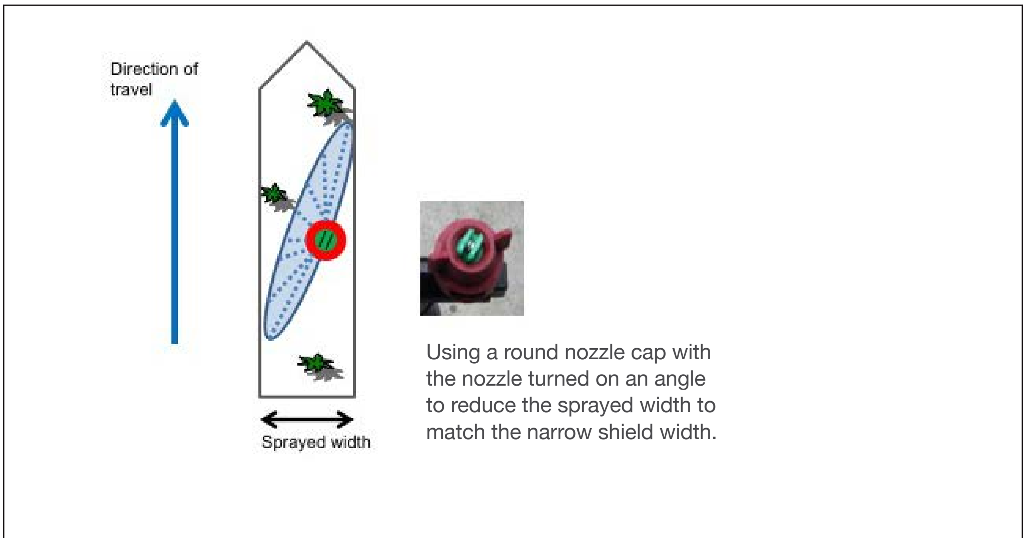
4.4.2 Position and alignment under a narrow shield

The use of shields for inter-row spraying must comply with the product label or be permitted by an APVMA approved permit.

Photo: Graham Betts

A narrow row shield being used in a trial to evaluate inter-row spraying

Figure 9 Nozzle orientation in a narrow shield.



Where a narrow shield (about 15 inches or 0.381 metres wide or less) is to be used, the nozzle may need to be turned within a round cap to allow the pattern and sprayed width from the even fan to match the width of the shield (Figure 9).

Under narrow shields, the applied rate (litres per sprayed hectare) is likely to be quite high, due to the sprayed width (the width of the shield) and the flow rate of the nozzle types and orifice sizes that are required to produce a coarse spray quality.

For narrow shields used in the inter-row of a dense crop canopy, it is important to use an efficient crop separator on the front of the shield to minimise the potential for crop foliage to pass under the shield.

The front of a Redball shield (for wider row use)

The shape of the front of the shield is important to minimise crop entering the shield.

Photo: Graham Betts

The front of a narrow row shield

The longer the crop separators at the front of a narrow shield are, the better they will be at minimising crop damage.

Photo: Graham Betts

5. Droplet escape (leakage) and drift potential from shields

Enclosing the spray pattern with a shield can reduce spray drift by more than 90 per cent than that of a standard boom sprayer, provided a nozzle producing a coarse spray quality or larger is used. This may provide the opportunity for greatly reduced downwind buffers (no-spray zones) for the application of some products, as drift-management strategies become recognised on product labels.

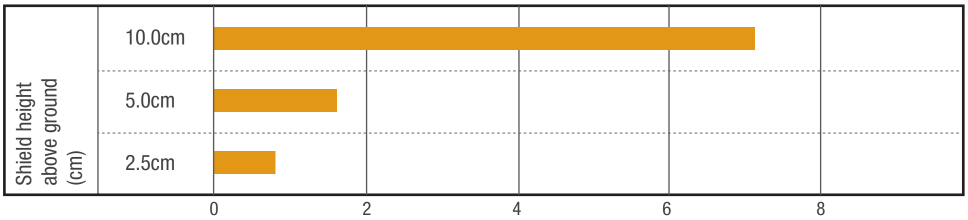
After spray quality, the most important factors for preventing droplet escape, or 'leakage', from a shielded sprayer are the gap between the base of the shield and the ground, the operating speed and the wind speed during spraying.

Figure 10 includes information obtained from field trials conducted by the Centre for Pesticide Application and Safety and Conservation Farmers Inc, published in *Shields ain't shields* in 2003.

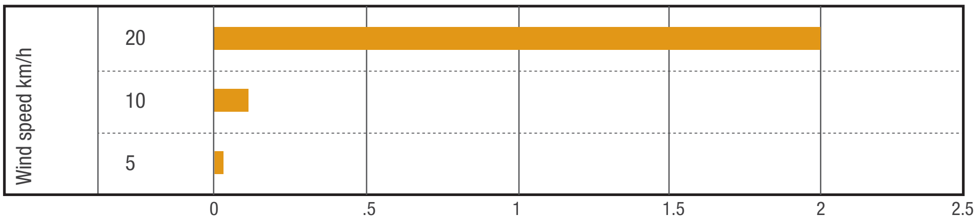
Figure 10 shows the effect of three parameters on leakage from the shield, which was measured as a relative index. The key points were:

- **increasing the shield height to increase the gap between the base of the shield and the ground from 2.5 centimetres to 10cm increased leakage by 50 times;**
- **an increase in wind speed increased leakage from the shield by 25 times; and**
- **moving from a medium spray quality to a very coarse spray quality reduced leakage by 10 times.**

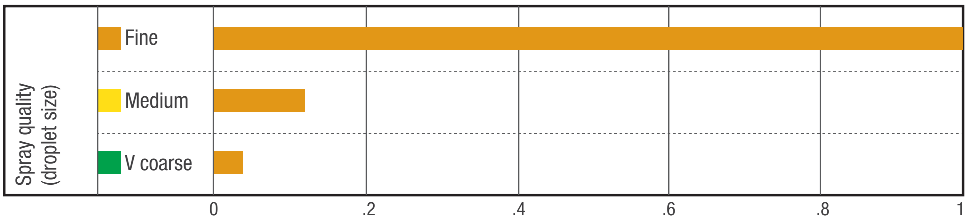
Figure 10 A summary of data from the 2003 publication *Shields ain't shields* produced by the Centre for Pesticide Application and Safety and Conservation Farmers Inc.



Leakage results from shield height study:
An increase in shield height from 2.5cm to 10cm increased leakage by 50 times.



Leakage results from shield height study:
An increase in the speed range from 5 to 10km/h showed minimal change in leakage.
An increase from 10 to 20km/h increased leakage by 2.5 times.



Leakage results from spray quality study:
Spray quality changes from **Fine** to **Medium** had a minimal effect on leakage.
Spray quality changed from **Medium** to **Very coarse** reduced leakage 10 times.

Maintaining shield height and minimising the gap between the base of the shield and the ground is important for reducing leakage which can lead to crop damage. Paddock selection for the use of shielded sprayers can be important, depending on how the height of each shield is maintained. Most shields will have a skid plate to assist with keeping the shield close to the ground, which may be less effective in 'rough' paddocks.

Minimising the gap between the base of the shield and the ground is critical for minimising crop damage due to 'leakage'.

Photo: Graham Betts

A skid plate at the base of a shield to maintain height above the ground

Generally, shielded sprayers should be maintained at spraying speeds of not more than 10 kilometres per hour.

Even at low spraying speeds, with fully enclosed shields, air will still enter the shield as it passes over the ground. Any air entering the shield will also leave the shield potentially carrying small droplets out of the shield. The combination of spraying speed and wind speed needs to be taken into consideration, particularly in headwind situations as this will have the greatest impact on 'leakage.'

Some shields have an open top, which should be fitted with an appropriate mesh or shade cloth to reduce droplet escape. This would require regular cleaning and decontamination to minimise the risk to the operator when changing or adjusting nozzles.

6. Control of the spray system for shielded sprayers

Ideally, the shielded sprayer will be set up on a tool bar that matches the width of the plant or seeder.

As with other sprayer set-ups, the operator needs to consider what the total volume will be that passes through the machine and associated individual components, in order to be able to select a suitable pump size and components to match this flow. The operator should also consider the agitation requirements of the tank mix.

Given the relatively low range of travel speeds for most shielded sprayers, many operators choose to set up the shielded sprayer with manual pressure control rather than attempting to use an automatic rate controller.

It is important to make certain that the hoses that supply the spray solution to each of the shields are the same diameter and the same length from the manifold, to ensure that the pressure at the nozzle is the same for each shield. If this is not practical, using proportional (adjustable three-way valves) will allow the flow to each shield to be adjusted.

For more information on plumbing and components for the spraying system, go to Module 11: Pumps, plumbing and components

6.1 Monitoring flow under shields (for manual pressure systems)

One of the challenges with operating nozzles under a shield is the difficulty in seeing how they are running. A useful addition to any shielded sprayer is a manual system for monitoring the flow to each shield.

A manual flow meter for monitoring three shields

Manual flow meters operate with 'balls' that float, where the level of the float indicates the flow rate through the shield.

Photo: Graham Betts

For more information about available height-control systems, visit the following web pages: [ravenprecision.com/products/boom-controls] and [www.norac.ca/products] and [www.deere.com.au/en_AU/products/equipment/sprayers/self_propelled_sprayers/self_propelled_sprayers.page]

6.2 Considerations for using automatic rate controllers for a shielded sprayer

There are several limitations if using a rate controller, particularly with a small number of nozzles, and the low travel speeds that most shields are operated at. The result could be a low total flow rate through the spraying system.

Two issues to consider are the minimum flow capacity required of the flow meter, and the set-up of the regulating valve. Regardless of the pump type that is selected, the regulating valve should be used in bypass mode when low flow rates are required.

Where a rate controller is to be used, it would be ideal to treat each shield as a section, with each section allocated a sprayed width to match the shield. This way the rate entered into the controller will match the applied rate.

Where it not possible to have a single section allocated to each shield, grouping shields together as a section may be a solution, provided the section width entered into the controller is the total of each of the sprayed widths of the shields within the group, and the plumbing can deliver even pressure and flow to each shield within the group.

6.3 Determining application and mixing rates (L/sprayed ha) for shields and bands

The following example is taken from the *Nozzle selection for booms, bands and shields: the back pocket guide*

Litres sprayed per hectare is the rate used to calculate how much chemical to put in the tank.

L/sprayed ha = litres per minute per nozzle x 600 ÷ speed (kilometres per hour) ÷ width (metres)

Sprayed *ha per tank* = tank size ÷ L/sprayed ha

Chemical per tank = chemical rate per ha x sprayed ha per tank

What to put in the rate controller (L/paddock ha) when using a shielded sprayer

- **L/paddock ha is the rate that should be entered into the automatic rate controller.**
- **L/paddock ha takes into account how much of the paddock is actually sprayed.**
- **When making calculations for banded or shielded applications, the L/paddock ha will always be less than the L/sprayed ha.**

L/paddock ha = L/sprayed ha x (total width of bands or shields ÷ sprayer width per pass)

Download the GRDC Back Pocket Guide 'Nozzle selection for booms, bands and shields'

Example: A 12-metre-wide shielded sprayer set up with 11 x 0.90m shields (with 2 x 015 nozzles per shield) and 2 x 0.45 metre guess row shields (with 1 x 015 nozzle per shield). It is operated at 10km/h and a pressure of 4 bar (an 015 @ 4 bar = 0.68 L/min/nozzle)

L/sprayed ha = 0.68L/min/nozzle x 600 ÷ 10 km/h ÷ 0.45 metres

= 90.7L/sprayed ha (mix to this rate)

L/paddock ha = 90.7L per sprayed ha x (11 x 0.9m + 2 x 0.45m) ÷ 12 metres

= 90.7L per sprayed ha x 10.8m ÷ 12m

= 81.6L per paddock ha (this rate goes into the controller)

7. Practical considerations for applying bands accurately

For more information on these topics, refer go to Module 12: GPS systems and Module 22: Integration of the sprayer with other farm equipment

As crop row spacing becomes narrower, and the crop canopy increases in size, the use of shielded sprayers in the inter-row space becomes more challenging. To apply products as an even band below the shield, the shield must be able to maintain its position relative to the plant row.

Factors that will influence the ability of the machine to maintain the position of the shield can include:

- **accuracy and repeatability of the guidance system and auto-steer functions;**
- **matching the widths of the wheel centres for all implements;**
- **the traffic system used on-farm and the condition of wheel tracks;**
- **the use of efficient crop separators; and**
- **the use of self-aligning tool bars (relative to the crop row).**

Play For an example of a Robocrop® bar, working with an in crop weeder, view the following YouTube clip: youtu.be/qaxwJQ0_FwM

7.1 Self aligning tool bars

The use of shielded sprayers in narrow crop row widths may require the ability to adjust the tool bar in relation to the crop row, particularly as the crop increases in size. There are toolbars, such as Robocrop®,which uses sensors to detect the crop row, and can adjust the position of the tool bar to keep implements in position in relation to the crop row.

7.2 Integrating target-selectable sprayers under shields

There are currently shielded sprayers that have integrated a WeedSeeker® system under the shields, for selectively targeting weeds in the inter-row.

The choice of target-selectable systems is limited by the required height of the sensor above the target. The WeedSeeker® sensors can operate at about 0.65 metres above the target, and have been fitted to commercially available shielded sprayers.

A Crop Stalker™ shielded sprayer, capable of being fitted with WeedSeeker® units under the shield

To accommodate WeedSeeker® units a shield needs to be relatively tall to allow the sensors to operate effectively.

Photo: Southern Precision

8. Summary

The use of shielded sprayers introduces an additional tool for the control of in-crop weeds, provided the products used are registered for the purpose. It is important for operators that are considering using a shielded sprayer to carefully assess the current registrations and APVMA-approved permits for specific situations.

Also refer to research into the efficacy, potential crop damage and yield implications before selecting a product for application through a shielded sprayer.

For more information about research conducted to investigate the potential for using shielded sprayers to control weeds in the inter row.

More information

'Physical and herbicide weed control in wide row lupins in Western Australia' Glen P. Riethmuller, Catherine P.D. Borger and Abul Hashem, Department of Agriculture and Food, Western Australia.

caws.org.au/awc/2014/awc201410791.pdf

'Weed control in lupins using a new spray shield and other row crop techniques' Mike Collins and Julie Roche, Department of Agriculture, PO Box 483, Northam, Western Australia 6401, Australia.

caws.org.au/awc/2002/awc200214841.pdf

For information about the various techniques that can be used for in-crop weed control, visit the following webpage:

grdc.com.au/Resources/IWMhub/Section-4-Managing-weed-seedlings#4.4

NEXT MODULE

SPRAY APPLICATION MANUAL FOR GRAIN GROWERS

Module 20 Target-selectable sprayers How they work and set up considerations

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