Sprayer Management and Efficiency

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Why create a spray plan?
Applying herbicides (and other pesticides) has become a routine operation for most grain producers and often it occurs without planning. With the herbicide expenses costing grain businesses more than 10% of farm income the rewards from developing a 'spray plan' can be enormous. With proper planning you will generate time and machinery efficiencies, gain better weed control and make large financial savings.

Factors to consider and include in an effective spray plan are:

The people
A team approach is required to ensure the best possible result. The owners, manager, agronomist, chemical supplier, spray contractor, spray operator and spray manufacturer should all be involved in the planning process.

The target
The plan must address the target and the nature of the target. Is the target small or large, short or tall, fine or course, young or mature. Is the target stressed eg. heat, waterlogged, dry or frosted.

The product
What are the chemical manufacturers' recommendations on the label? Remember the chemical label is a legal document. Scan the label for recommended water rate per sprayed hectare, water quality, weather conditions (maximum temperature and minimum humidity), nozzle recommendations, droplet size and/or droplet quality (as per BCPC - British Crop Protection Council or ASAE - American Society of Agricultural Engineers), compatibility with other products and protective clothing to be worn.

The weather
What impact will the weather have on application success (will the chemical hit the target), will the weather influence herbicide efficacy, and will the weather cause off-target issues (drift, leaching). Critical weather factors to consider are wind speed, wind direction, temperature, delta T and the likelihood of rain/frost/dry event before and after application.

Delta T is a measure of the difference between the wet and dry bulb – this influences droplet survival.

The nozzles
When checking nozzle wear it is important to the check the pressure at the nozzle first. This can be done easily by using a nozzle cap with ¼" female thread and pressure gauge. Check the pressure at the nozzle right across the boom with all the booms turned on and the sprayer set to the average pressure it will operate at. Then check the flow rate and spray pattern of each nozzle. Checking the pressure at the nozzle will also check the pressure evenness across the boom sections.

The nozzle chart:
Nozzle manufacturers produce nozzle charts to allow easy nozzle size selection, operating pressures and travel speed. There is an ISO colour code for nozzles eg 02 are yellow and 03 are blue. This makes it easy to recognise the nozzle and its flow rate.

There is a lot of important information on a nozzle chart, but consider the following factors when interpreting the information contained within them:

- The pressure on the nozzle chart is the pressure at the nozzle, not the pressure at any other place on the sprayer.
- Litres per minute per nozzle is using water only, check the viscosity of spray mix it could change the flow rate.
- The nozzle chart is assuming that the nozzle spacing is 50 centimetres. If the nozzle spacing on the boom is something different to the 50 centimetres on the nozzle chart the litres per hectare will be incorrect.

The automatic rate controller
An automatic rate controller is only as good as the information programmed into it and the information it receives. If not set-up properly automatic rate controllers can give operators a warm fuzzy feeling and sub-standard application performance. Once a 'Spray Plan' has been completed all the information necessary to program the controller is available, including the information to perform a pre-field check. Most brands of automatic rate controllers have a test facility (eg. self test, simulated speed, test speed). This gives the spray operator the ability to set-up and test the sprayer at the pump shed before the chemical is added. There is no need to have any frustration out in the field.

The 'spray plan'
All the information collected and discussed when preparing a spray plan should be collated for ongoing reference and for troubleshooting throughout the season.

A copy of a suggested 'spray plan' is found below.

Further information to include in your 'Spray Plan' is the minimum, average and maximum speed for the nozzle being used at their optimum pressure range. Nozzle spacing (or band width), nozzle type, size and spray angle, optimum spray pressure and the litres per sprayed hectare for variable conditions is all important information. Nozzle height, droplet size and droplet quality is also critical.

Finally, when operating in the field average total litres per minute is a handy piece of information to have on the automatic rate controller display (particularly if spraying at night) as this will tell you if a boom valve hasn't come.

Boom "Spray Plan" Calibration Worksheet.

Customer Location /Date	Birchip Cropping Group					
Target to be Sprayed	Weeds			Weeds		
Comments on Application	**REFER TO LABEL FOR SPECIFIC APPLICATION DETAILS**					
Reference Number or Chemical to be Used						
Kilometres per Hour	Minimum	Average	Maximum	Minimum	Average	Maximum

Kilometres per Hour =

Litres per Minute (per nozzle) x 60,000 ÷ Litres per Sprayed Hectare ÷ Width (in centimetres)

Width Broadcast Spraying (nozzle spacing in cms)	0	50 centimetres	0	50 centimetres
Width Band Spraying (actual sprayed band in cms ÷ number of nozzles)	0	0 centimetres	0	0 centimetres
Width Row Crop Spraying (row width in cms ÷ number of nozzles)	0	0 centimetres	0	0 centimetres

Litres per Sprayed Hectare (litres chemical is added to)						
Litres per Paddock Hectare controller l/ha full boom width						
Litres per Minute per Nozzle at the Nozzle (theory)						
Pressure at Nozzle in (bar theory)						
V.M.D. approximately						
BCPC or ASAE						
Type of Nozzle	Standard Nozzles			Air Induction Nozzles		
Type of Nozzle on the Side	N/A			N/A		
Nozzle Height off Target	Depends on spray angle and spacing of the nozzles					
Total Boom Width Number of Rows being Sprayed	mtrs			mtrs		
Number of Nozzles (for total boom)						

Litres per Minute per Nozzle =

Kilometres per Hour x Width (in centimetres) x Litres per Sprayed Hectare ÷ 60,000.

Controller Settings	Minimum	Average	Maximum	Minimum	Average	Maximum
Total Litres per Minute (litres per minute per nozzle x number of nozzles)						
Kilometres per Hour						
Pressure in Bar						

Actual Litres per Sprayed Hectare =

Litres per Minute per Nozzle x 60,000 ÷ Width (in centimetres) ÷ Kilometres per Hour.