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Understanding social attitudes related to the success of area-wide weed management

PRELIMINARY FINDINGS FROM THE RIVERINA

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Introduction

Weeds are one of Australia's most persistent agricultural and environmental challenges. The mobility of weeds, biological controls and herbicide resistance, means that weed management is a landscape-scale problem that requires community-wide solutions.

The need for weed management to work effectively across property and institutional boundaries, means that an in-depth understanding of the attitudes, practices and relationships of various actors involved in weed management is needed.

In mid-2020, over 80 growers, agronomists, consultants, contractors, extension officers, biosecurity officers and public land managers were interviewed as part of this social research project.

The aim of the interviews was to:

- learn about the diverse attitudes towards area-wide management of weeds across three case study regions: Darling Downs, Queensland; Riverina, NSW; and Sunraysia, Victoria.
- identify factors that explain participation in individual and area-wide management of weeds
- identify social costs and benefits of area-wide management of weeds and related practices

This report provides a summary of the preliminary results of the interviews in the Riverina. For more information about the project please contact: sgraham@uow.edu.au

Method

Thirty people from the Riverina participated in phone interviews between August and October 2020.

Fourteen of the interviewees are growers, six work for local or state governments, and ten are in information provision (including agronomy, industry extension and research).

The interviews involved open-ended questions about interviewees' experiences with and perceptions of: the most concerning weeds in the region; the key issues surrounding the management of weeds; perceptions regarding area-wide management of weeds; and the future of weed management.

This document presents the preliminary findings of the interviews. No detailed analysis of the data is presented nor conclusions drawn. That will be conducted in the next stage of the project.

Weeds of most concern

Interviewees were asked to identify the three weeds of most concern to them. In response to this question, interviewees identified 32 different weed species that they were concerned about.

The five weeds that were most commonly mentioned as being of concern were: ryegrass (19 interviewees), fleabane (18), silverleaf nightshade (9), feathertop Rhodes grass (7), and barnyard grass (3) (Figure 1).

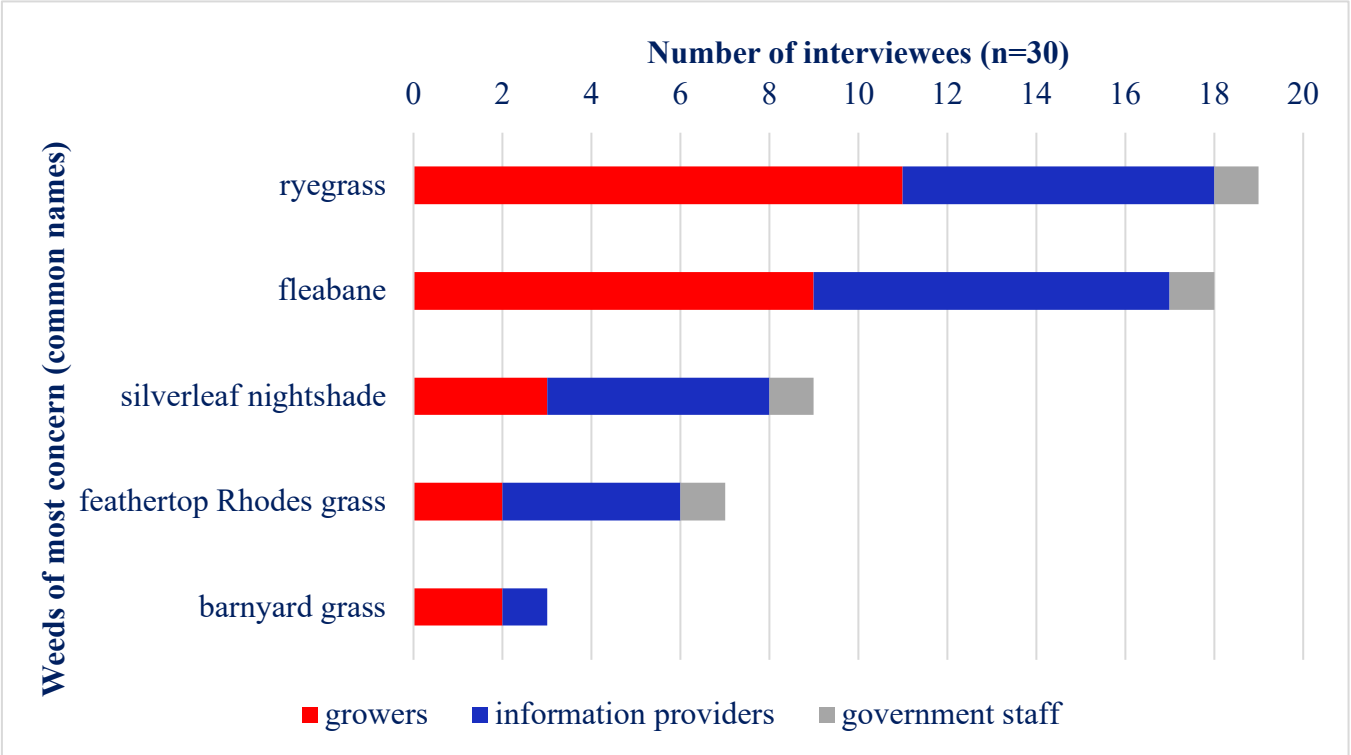

Figure 1. Number and occupation of interviewees who identified each weed as being in their top three weeds of most concern. Only weeds that were mentioned by at least three interviewees are included in this figure. The rest of the weeds were mentioned by one or two interviewees.

The reasons why the top five weeds were considered to be particularly concerning were:

1. RYEGRASS. Concerns were raised about glyphosate resistance in ryegrass (one interviewee mentioned that ryegrass, as well as fleabane and silverleaf nightshade "just love the Roundup" and another mentioned that "You rarely find ryegrass that isn't Roundup resistant"). Ryegrass is problematic for winter and summer crops.
2. FLEABANE. The most consistent concern was that fleabane is highly resistant to glyphosate (one interviewee suggested it was "almost 100% resistant/tolerant to glyphosate"), which makes it difficult to control. In addition, it is easily dispersed by weeds, because it is small-seeded, and is a surface-germinator. Interviewees mentioned that it is difficult to kill in summer fallow and that some growers are now chipping it out.
3. SILVERLEAF NIGHTSHADE. Is a prolific spreader, is spread easily by livestock and is transported onto properties from roadsides. It grows well over the summer and thrived during the drought. It contaminates wheat and rice, and there are limited control options when it is found in grapes.
4. FEATHERTOP RHODES GRASS. Is often glyphosate resistant and is often found along roadsides. It is labor-intensive to remove. Interviewees mentioned chipping it, burning it and putting it in plastic bags. There was concern about it on dryland farms with increasing presence on irrigation farms.

5. BARNYARD GRASS. Considered to be easier to control than the above-mentioned weeds, but challenging for rice growers as rice won't outcompete it and so it affects rice yields.

Twenty-seven other weeds were mentioned by either one or two people as being in their top three weeds of most concern (Table 1).

Table 1. Common names of weeds of most concern to interviewees, which were mentioned by two (**bold**) or one interviewee.

African boxthorn
African lovegrass
Australian bindweed
ball mustard
barley grass
Bathurst burr
blackberry
bridal creeper
caltrop
catheads
Chilean needle grass
coolatai grass
dirty dora
doc (organic rice weed)
grasses
johnson grass
khaki weed
marshmallow weed
mustard weed
parthenium
paspalum
prickly pear/tree pear
ribbon weed
roly poly weed
sow thistle
spiny bur grass
wireweed

In addition to the weeds mentioned above, interviewees identified a further 44 weeds that are of concern to them (Table 2).

Table 2. Additional weeds mentioned by interviewees that were not among the list of those of most concern. Weeds that were mentioned as new or emerging are in bold.

alisma
alligator weed
arrowhead
bone seed
boree tree
box thorn
bladder ketmia
burs
cabbage thistle
cane needle grass
castor oil
cat's eyes
cumbungi
datura (thorn apple)
fireweed
fruit trees
galvanised burr
grass Patagonia
horehound
kidney leaf mud plantain
lippia
mesquite
Mexican feathergrass
Noogoora burr
Paterson's curse
pepper trees
pig weed
prickly lettuce
scotch thistle
serrated tussock
silvertop grass
smart weed
spider grass
spiny emex
St John's wort
star fruit
sweet briar
thistles
tobacco weed
verbena
water hyacinth
white cedars
wild oats
wild radish

The most significant weed management issues

There were 9 significant issues that interviewees believe affect the management of weeds. Herbicide resistance was the most frequently mentioned, being mentioned by 12/30 interviewees. The next most frequently mentioned was funding (5 interviewees), spray drift (4 interviewees) and weeds spreading from roadsides and waterways (3 interviewees). The remaining issues were identified by one or two interviewees each.

- *Herbicide (glyphosate) resistance* – is problematic for a number of reasons, including changing the weed control chemicals and other control options applied and the timing of activities. It also affects all land managers, including those who use integrated weed management practices and have "good rotations". As one interviewee explained:

  > The main issue is resistance to chemicals. We're relying on chemicals more and more now, and if they become resistant… [it] makes everything harder than it should be… More expensive chemicals for one, because you're putting bigger rates, and you're putting more expensive chemicals to try and pull down the weeds. And also it takes more time, so that's at a cost. It takes – and if you cultivate, it's more time again, fuel, machinery, wear and tear, so it's just a flow-on effect.

- *Funding* – was a particular concern among government staff. Concerns were raised about not having sufficient funds to cover the area of land affected by weeds. This included insufficient funds to pay for staff and that too much money was spent on administration and overheads. Concern was mentioned about the nature of the funding model for research, and the need to shift from competition to coordination.

- *Spray drift* – was particularly a concern among cotton and organic growers. There were also concerns raised that people are not using the chemicals that they say they are using.

- *Roadsides and waterways* – are seen to be problematic because they represent common areas where weeds establish and then move onto neighbouring land. These areas are also of concern because organisations responsible for managing weeds on roadways and channels are limited in the chemicals they can use.

- *Lack of coordination* – among adjoining councils, between various government departments, among researchers, and with private land managers with respect to preventing the spread of weeds and managing weeds across boundaries.

- *Lack of understanding of integrated weed management* - because the focus is on using multiple chemical modes of action, rather than taking a more holistic perspective that involves cultivation or groundcover.
- *Timing of chemical application* – waiting too long to apply herbicides can give weeds an opportunity to become established. In addition, there are challenges with timing chemical applications around key growth and sensitivity windows for specific crops.
- *Use of dirty water* – was identified as an issue that can deactivate active ingredients in some herbicides.

- *Diverse weed priorities* – are a challenge in landscapes where different crop types adjoin one another. What is a priority for one person is not a priority for their neighbour. This poses challenges at the individual property and regional scale.

Area-wide management of weeds

There was little consensus about what area-wide management of weeds is, the size of the area it would cover and the activities it would include. One interviewee mentioned that they had not heard the term before and another suggested "regional weed management" would be a more commonly used term. There was more consensus around which weeds would be best suited to an area-wide approach and a handful of examples were provided of weed management programs that could be considered to be area-wide.

Overall, when interviewees were asked what the term "area-wide weed management" means to them, responses often included mention of a geographic area, who should participate and what sort of action is involved.

- GEOGRAPHIC AREA – the following terms were used to describe the area over which interviewees believed than an "area-wide" approach would cover.
    - Nearly state-wide
    - Region (e.g. with the same climatic conditions, Riverina region)
    - Valley/floodplain
    - Local government area
    - Irrigation area (irrigated farms)
    - Common areas, e.g. (a few) roadsides and channels
    - Group of farms
    - Whole farm
    - Large-scale area
    - Big area
    - Whole area
    - Broad location

With the exception of "region", "roadsides", "channels" and "irrigated area/farms", the remaining terms were mentioned by one interviewee each. "Region" was mentioned the most, being used by five interviewees.

Some interviewees referred to an industry-wide or cross-industry approach, rather than focusing on a particular geographic area. In doing so, interviewees recognised that different "crops have very different needs, even around the same weeds"

- WHO AND WHAT – the terms "everyone", "everybody", "all" and "working together" were the most commonly used to describe who should be involved in area-wide weed management

and what it involves. Other key terms included "collaboration", "cooperation" and "coordination".

- **As many people as possible** – some interviewees gave lists of different actors who they believe should be involved in area-wide management of weeds. These actors included: landholders, volunteer groups, (sub)urban residents, council, roads and transport authorities, state government, state water, etc.

- The following weed management activities were specifically mentioned by interviewees as potentially being part of area-wide weed management activities.

  - **Education** (for all)
  - Ongoing coordinated **communication** across communities
  - Developing a **plan** to control weeds across the whole area, including how to "help each other out"
  - **Early detection**, including baseline monitoring, "report[ing] anything new or different or strange" and "ongoing monitoring to understand emerging weed threats to the region"
  - Best (weed) management practice
    - Using all the weed control options available, not just herbicides
      - Maintaining groundcover
      - Cultivation
      - Crop rotation
    - Preventing weeds from going onto neighbouring properties
  - **Eradication** of individual or multiple (problem/priority/noxious) weeds
  - **Pooling funds** across individuals/organisations to pay someone to control weeds across multiple properties

- Two interviewees specified that they believe an area-wide weed management approach needs to have a leader. One mentioned that the program itself needs monitoring and evaluation.

- WHEN – three interviewees mentioned a temporal component to weed management. One mentioned the need to consider area-wide weed management across fallow, winter and summer crops. Another mentioned the need to do the "same thing at the same time". One interviewee mentioned the need for area-wide management to be a multi-year to multi-decadal program.

- WHICH WEEDS –interviewees were asked if there were any specific weeds that they thought would be well-suited to an area-wide weed management program. The following weeds were mentioned. Numbers in brackets indicate how many interviewees suggested each weed.

  - Ryegrass (7) – is seen to be a good contender for area-wide weed management because it "is a common problem on every farm", "is a problem on every field" and "everyone

seems to have [it]… all of them are looking at options to try and control that" because it is resistant to glyphosate.

- Silverleaf nightshade (7) – because it spreads so easily and is a local priority. An area-wide approach would be especially useful if they find a biocontrol.
- Fleabane (6) – is highly visible and "widespread throughout the district"
- Boxthorn (3)
- Alligator weed (1) – in irrigation areas
- Feathertop Rhodes grass (1)
- Horehound (1)
- Khaki weed (1) – drifts off roadsides
- Lippia (1) – spreading in some irrigation channels
- Spiny burr grass (1)

BENEFITS

When interviewees were asked what they perceive to be the benefits of area-wide management, or what would encourage people to participate in an area-wide program, the following enabling factors and benefits were identified. None of these ideas were mentioned by more than one interviewee.

- Greater awareness of the issue
  - Shows landholders what can be done, what is possible and what help is available
- Learn new techniques for using on-farm
  - Improvement in best practice
- Weed control will be more effective/rigorous
  - It will encourage more people to do weed control
  - Biocontrol – no point putting in weevils if no one else is doing it
  - Keeping the weed pressure down
  - Drive down the seedbank source
  - Fewer on-farm weed issues
- Better return on investment in weed control
  - Pooling resources means spending less on weed control over the long-term

COSTS

Many of the costs involved in area-wide management are similar to the costs that are often identified for weed management more generally. For example, a lack of time was the most commonly mentioned challenge associated with area-wide weed management.

- TIME – seven interviewees mentioned time as one of the social costs involved in area-wide weed management. This included the time required to attend meetings and undertake the weed control, which was placed in the context of existing commitments

and workloads. Mention was also made that area-wide weed management would require a long-term commitment.

- MONEY – five interviewees mentioned the financial cost associated with undertaking weed control, including the cost of chemicals, and the impact of such costs on gross margins. Mention was also made of the long time lag between investing money in weed control and seeing the benefits.

CHALLENGES

Beyond the costs and benefits of engaging in area-wide weed management, interviewees identified the following range of challenges that may undermine area-wide efforts.

- LEADERSHIP – who would lead and coordinate an area-wide weed management program? Some suggested that an organisation is required that goes beyond industry, such as Local Land Services, because "they'll be able to target everybody". However, it was also recognised that Local Land Services may not be suitable because "they're not putting a lot of resources into weeds". Similarly, others suggested that government organisations "are the weak link in all this".

- BRINGING PEOPLE TOGETHER – It was recognised that it is challenging to get everyone in a room to talk about weeds, as is evidenced by the challenge of getting everyone together for other common issues, such as water. There was recognition that some people don't want to be involved in area-wide programs because of the cost involved, or neighbourly disputes, or because they want to do their own thing. For example, one interviewee commented "I think you'd be very lucky to even get three or four farmers to do the same thing at the same time".

- DEMONSTRATING BENEFITS – aside from the long time it takes to demonstrate the benefits of an area-wide approach to managing weeds, interviewees identified that it is challenging to show individual benefits of participating. To overcome such a challenge would require formal monitoring and reporting back. In addition, there is the challenge that if benefits are demonstrated then it means that people may not feel the need to continue participating.

Other challenges identified included political will, communication among agencies and interagencies coordination, unequal resources available to contribute to weed control among participants, getting a common understanding of what needs to be done, what the options are, and what the best approach is.

EXAMPLES OF AREA-WIDE MANAGEMENT

Interviewees identified the following list of past and existing programs that they consider to be examples of area-wide weed management.

- Riverina Regional Weeds Committee
- Alligator Weed Taskforce
- Regional Blackberry Forum
- Silverleaf nightshade program

- Khaki weed – roadside vegetation area
- Boxthorns – taking a coordinated approach
- Kidney leaf mud plantain
- Spiny burr – As one interviewee explained: "a few year ago, we did have a pretty good combined approach with them in trying to control some spiny burr that had popped up in different spots, and that was basically, we basically identified all the areas using both their weeds officers and our blokes around on the ground, and we did – they did some – they might've done every second spraying, and we did the other spraying on those jobs on the way back and forth, which did work pretty well. And I think if you could come up with that same sort of arrangement across a number of weeds, I think you would actually get reasonable control options off it."

One interviewee provided the following rich description of an area-wide program that had been across a local government area. It clearly lays out the benefits of participation and how the program was organised.

> At a very small scale, this is just within my [local government area]. We had three areas that were under different organisation managements... One was a select group, which had control over a piece of land. Another one was a council asset, which had control over a piece of land and another one was an asset that council had absorbed, which was just an open piece of grazing land. Now, there was roughly in the neighbourhood of about $5,000 spent on each one of those pastorals by each one of the departments to manage the weeds on that particular land. Looking at it, it was the same problem across all three when I got it. I looked at it and I said, "Right, I want $2,000 from each of you. I will control it." So instead of $15,000 we used about $5,000 is what it worked out to and we managed to do the entire all three sections of land under one program.
>
> The next year it was four. The next year it was three. The next year it was two. Now, across each one of these groups it was a $1,000 a year to maintain the entirety of that area and it's an ongoing price. Now, when you think about that, that's the difference of every year spending $5,000 out of your budget or every year spending less than $1,000 out of your budget. Controlling a larger area.

Beyond weeds, interviewees identified the following as area-wide programs operating in and around the Riverina.

- Stop Off-target Spray drift (SOS) (4) – field days, spray application training
- Whitefly for cotton (3) – agronomists are managing it. It involves talking to neighbours, and coordinating spraying to knock down the whitefly population.
- Fruit fly control (3) – industry wide approach
- Stem rot– industry-wide response
- Fox control
- Come clean, go clean

Concluding remarks

These preliminary findings reveal that there are a wide range of weeds that are of concern to land managers across the Riverina. The weeds that are perceived to be most problematic are those that display herbicide resistance, which makes them challenging to control.

While Riverina interviewees had a broad understanding of what an area-wide weed management program might involve, there was little consensus about the scale of the region it could cover, and the types of activities it could involve. There were three key challenges—leadership, bringing people together, and demonstrating benefits—that would need to be addressed in the design of future area-wide weed management programs.

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