Australian Herbicide Resistance Initiative (AHRI)

Think global

Herbicides are as important to global food production as antibiotics are to human health" – Professor Stephen Powles.

Humanity has faced some major challenges in the past and has always met these challenges through innovation. The extremely infectious and deadly smallpox virus plagued people for centuries and yet by 1980 we had eradicated it on a global scale. The innovation? A newly perfected vaccine, and a huge, worldwide collaborative effort.

But while smallpox is gone, herbicide resistance lives on and as AHRI Director Stephen Powles believes, it is posing a huge threat to global food security. Our population is exploding and with grains the only feasible way to feed the world, we can't afford a drop in grain production.

It will take new thinking to meet the challenge which is why Steve Powles and the AHRI team convened the Global Herbicide Resistance Challenge conference in Western Australia last year. Dr Ian Heap opened the conference with a global perspective.

Ian Heap is the Director of the International Survey of Herbicide Resistant Weeds. This international survey tells us:

- There are 220 weed species that have evolved resistance to one or more herbicides
- There are 404 unique cases (species x site of action) of herbicide resistant weeds globally
- ALS inhibitors (e.g. SU herbicides) account for about a third of all cases (133/404)
- There are 24 species with confirmed glyphosate resistance (and counting). 16 of these were found in Roundup Ready® cropping systems.

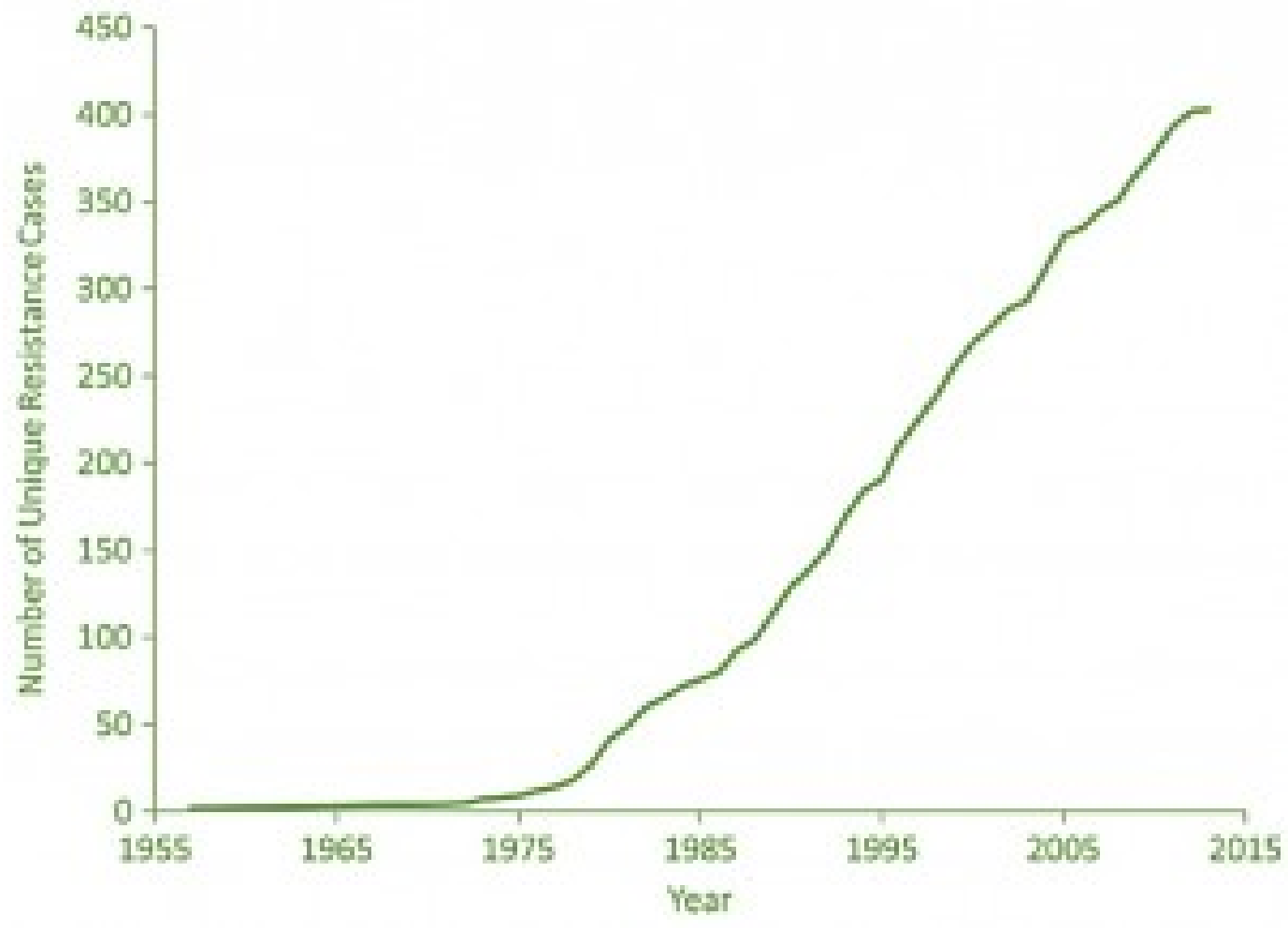

Figure 1. Chronological increase in the number of herbicide resistant weeds worldwide (source: weedscience.org).

Figure 1 is a very steep curve! Only a true optimist would suggest that it is flattening in any way.

The USA is leading the charge in developing herbicide resistant weeds with Canada, Australia, China, Brazil and Western Europe not too far behind. The map below really does show that herbicide resistance is a global challenge and is endemic in all cropping regions.

Annual Ryegrass – the world champion

Annual ryegrass *(Lolium rigidum)* is the world's worst herbicide resistant weed, having evolved resistance to 11 herbicide sites of action, in 12 countries, over millions of hectares. Annual ryegrass has a high degree of genetic variability and rapidly evolves resistance to almost any herbicide that it is exposed to. It is particularly troublesome because it often evolves cross-resistance (both target site and non-target site) and rapidly evolves multiple resistance to a wide array of herbicides through outcrossing.

No new herbicide sites of action in 30 years

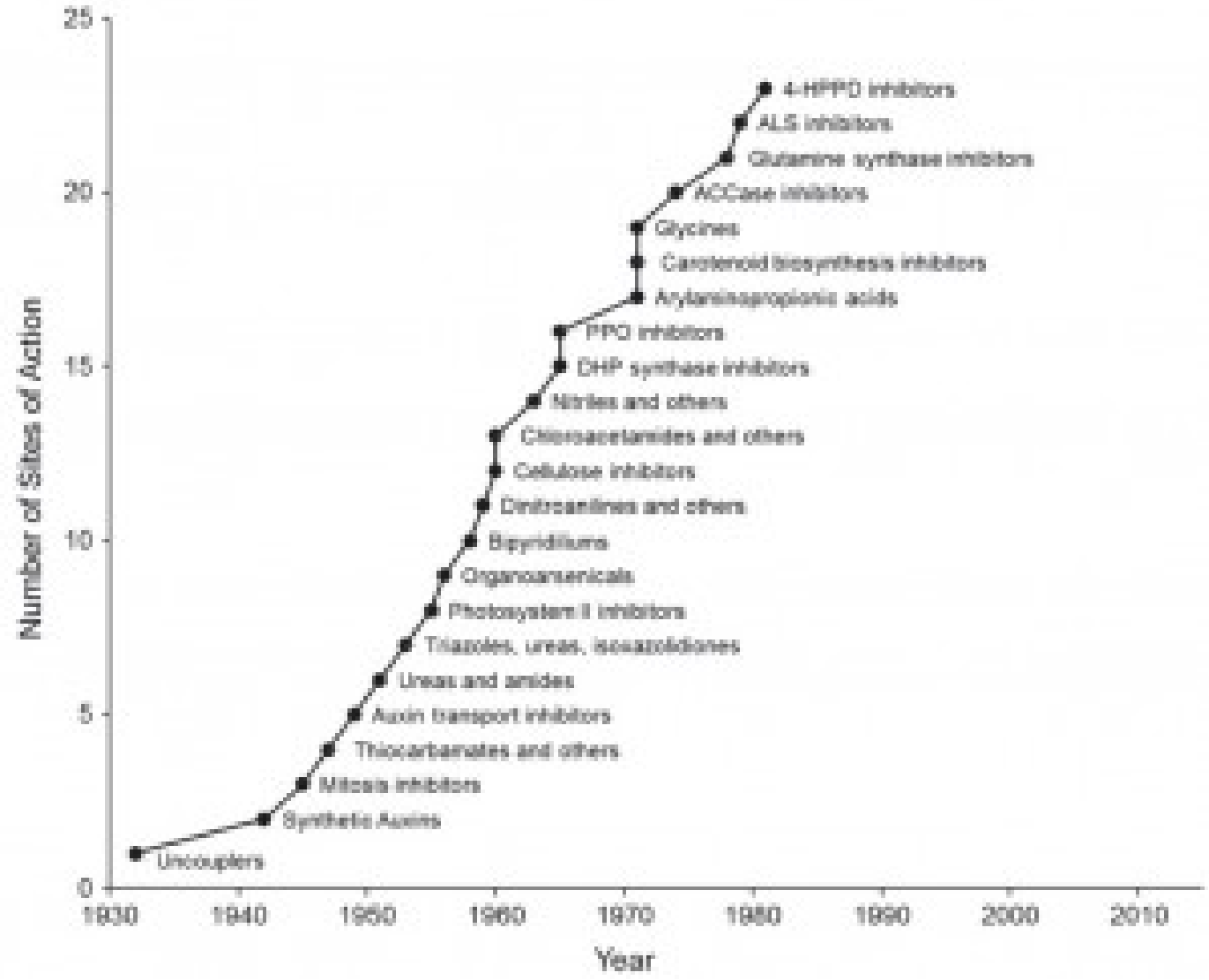

Figure 2. Chronological increase in the number of commercially available herbicide sites of action (source: weedscience.org)

For more than 40 years farmers have coped with herbicide resistant weeds because the industry provided them with a relatively steady stream of new herbicides with novel herbicide sites of action. This is no longer the case. Industry has not brought a novel herbicide to market in over 30 years.

Thinking Globally

“Agricultural productivity and sustainability, especially for the major field grain crops (wheat, rice, maize, soybean, canola) is essential to feed our exploding global human population. Only grains can be stored and globally transported at quantities that satisfy world food needs. Of the challenges to world food security, crop-infesting weeds are the biggest biotic threat. Crop weeds infest almost every crop field almost every year and they must be controlled to protect current and future harvests.”

“For the past 65 years, chemical herbicides have made a major contribution to world food supply by reliably and economically controlling weeds in global crops. However, the many advantages of herbicides have resulted in over-reliance on herbicide technology in field crops and many other crops and situations. Herbicide selection persistently applied to huge weed populations over vast areas without diversity has inevitably resulted in the evolution of herbicide-resistant weed populations.”

“Indeed, weed herbicide resistance evolution is a stark example of rapid evolution, with major negative consequences. Now, herbicide-resistant weeds, particularly in major field crops, are a widespread problem and a significant challenge to global food security.” – Professor Stephen Powles

Acting Locally

Grain growers worldwide must have profitable cropping as their number one priority. Our mantra at AHRI is ‘More crop, less weeds – sustainably’. We very deliberately put ‘more crop’ first. More crop means maintaining or increasing crop area (without clearing more land) while increasing yield / profit.

65 years of intensive herbicide use has created this global problem. While we believe that herbicides will continue to be a major form of weed control, it is quite clear that herbicides alone will fail.

Many grain growers are having a win in the battle against herbicide resistant weeds through using a diverse range of tools and never missing an opportunity to minimise the weed seed bank. We believe that the answer

to the global herbicide resistance challenge is to use a combination of new technology along with communicating grower success stories to continually achieve more crop, less weeds – sustainably.

It is not going to be easy, but in the interest of the global food supply, we have no other choice.

Follow the links below for further information: