# El manejo de malezas en la Argentina: aprendizajes y reflexiones de estos últimos 40 años.

Eduardo S. Leguizamón




http://en.wikipedia.org/wiki/File:Ancient_Orient.png

# Domesticación y selección

- Trigo y Cebada : 8000 AC (Medio Oriente).
- Mijo y Arroz : 5500 AC (China & SE Asia).
- Legumbres : 6000 AC (Tesalonia & Macedonia).
- Lino textil : Neolítico temprano.

Transición gradual de caza y recolección a cultivos estables domesticados en un único sitio.

http://www.ars.usda.gov/is/graphics/photos/

Seminario ACSOJA 2016

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# Hammurabi

## (- , 1750 AC)

**Durante su reinado, Babilonia fue el centro principal del comercio del Asia occidental y continuó con su esplendor a lo largo de dos siglos más. Su código se cimentaba sobre tres bases indestructibles.**

- **Promulgar la justicia**
- **Poner en orden la tierra**
- **Procurar el bien**


全党动员 大办农业 为普及大寨县而奋斗

# Efectos de las malezas (Australia)
## Pérdidas directas: (Millones / año)

- ✓ US$1500 en costo de manejo.
- ✓ US$ 2500 pérdidas por fallas o ausencia de control

**Pérdidas indirectas:**

**ambiente, salud, calidad, diversidad de ecosistemas naturales:**

**Invasoras (15 % de las exóticas).**



http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/impact.html

# Volumen del Mercado Mundial de Agroquímicos

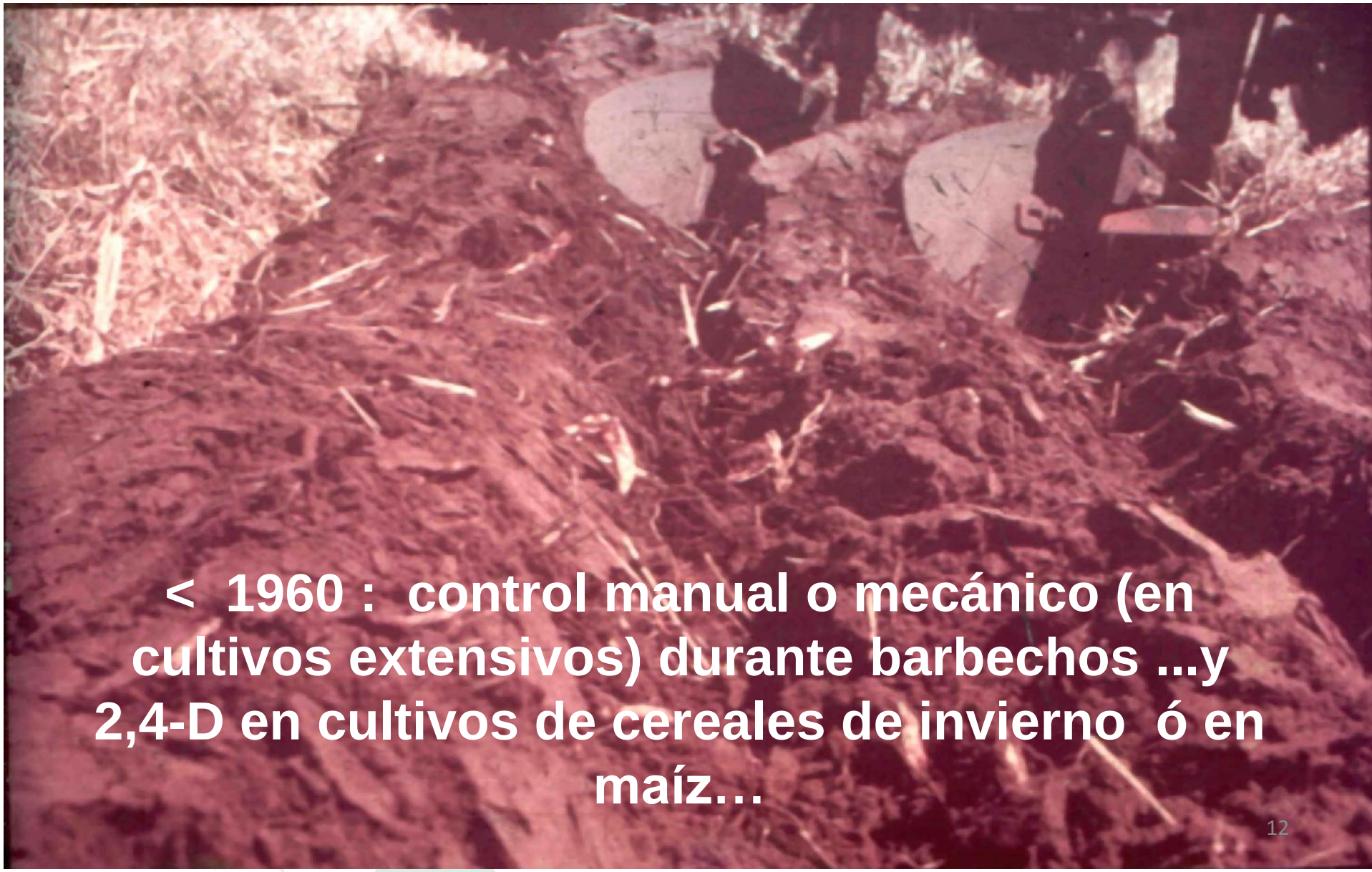
## Crop Protection Products

### 2014 Global Market Performance

In 2014, the global crop protection market grew by 3.6% as world population and demand for food continued to grow. For the second year running the most significant growth took place in Latin America, while weaker crop prices slowed growth in other markets.

CROP PROTECTION MARKET GROWTH (% Growth):
2013 SALES ($M) | **2014 SALES ($M)**


Source: Phillips McDougall
(Preliminary market data, 2014)



**< 1960 : control manual o mecánico (en cultivos extensivos) durante barbechos ...y 2,4-D en cultivos de cereales de invierno ó en maíz…**

**1960/70: control mecánico durante barbechos: diseño de herramientas específicas para el control de malezas perennes.**

# 1972 / 75 : Dinitroanilinas ( Soja )

1972 / 75 : Bentazón ( Soja )

- > 1980 : Residuales : IMI, Sulfonilureas, Triazolopimirimidinas…

- **1978/86 : FOP´s y DIM ´s (Soja)**

# Glifosato con equipo de sogas (“Wedge-wick”)

# >… 1990 barbecho quimico  y Soja RR...

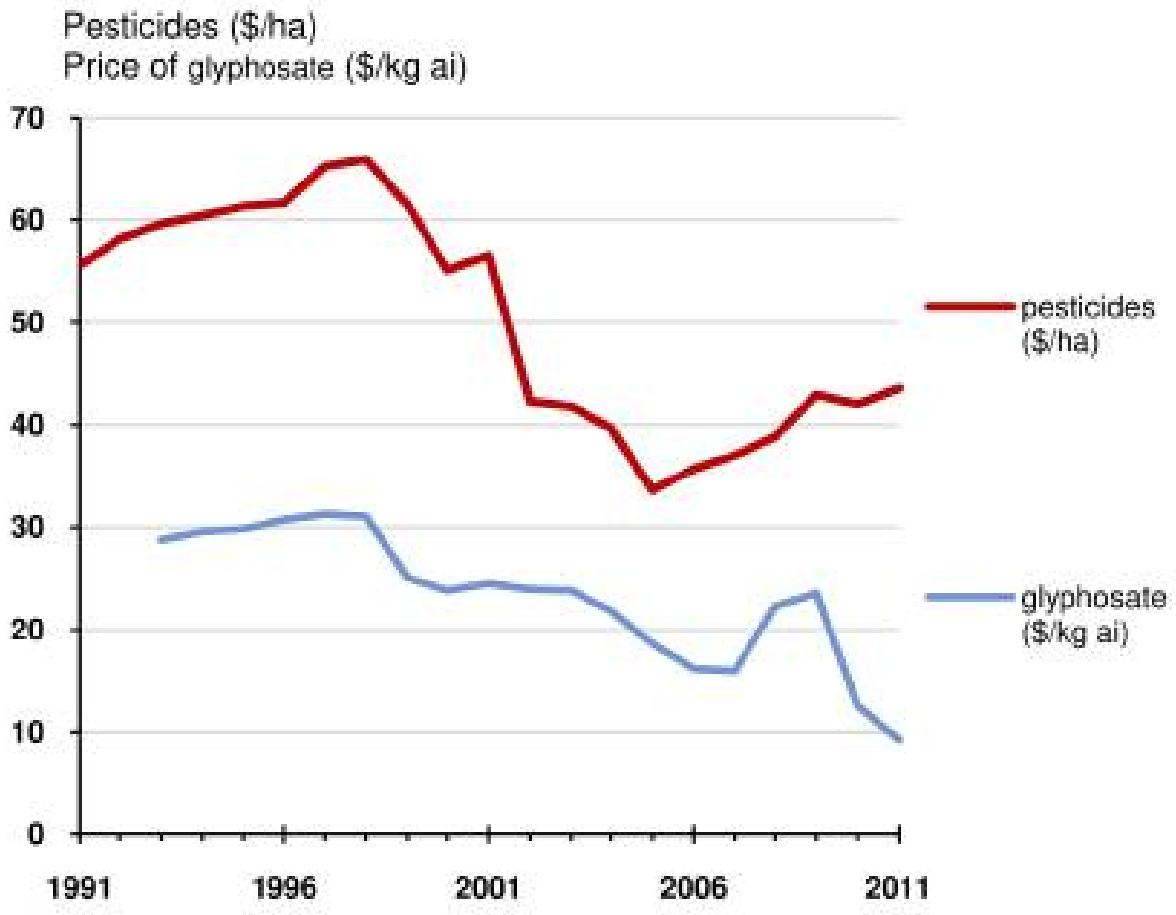





**Figure 4.** Price of glyphosate (USD per kg of active ingredient), and costs of all pesticides in soybean production costs, 1991–2011. Source: author's calculation from USDA-ERS [27], and USDA-NASS [28]. Note: 2011 data are provisional.

# Glifosato + 2,4-D + metsulfuron-metyl

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# GLYPHOSATE-TOLERANT SOYBEAN AND WEED MANAGEMENT IN ARGENTINA: PRESENT AND PROSPECTS

**Vitta, J; Faccini, D.; Nisensohn, L.; Puricelli, E.; Tuesca, E.; Leguizamón, E.**

**IWSC- Foz Do Iguassu- Brasil, 2000**

UNIVERSIDAD NACIONAL DE ROSARIO

CATEDRA DE MALEZAS
FACULTAD DE CIENCIAS AGRARIAS
UNIVERSIDAD NACIONAL DE ROSARIO

# a) Disminución generalizada de la abundancia

## b) nuevos “actores" y aumento de preexistentes, tolerantes = Desplazamiento de flora

***"Los futuros beneficios de la tecnologia basada exclusivamente en el uso de cultivares RR dependerá de su uso presente: en tanto sean utilizados masivamente, la presión de selección sera más intensa, lo cual a su vez creará la necesidad de reconsiderar el uso de esta tecnología en el largo plazo".***

*«En 1996, se ha informado que un biotipo de raigrás anual sobrevive a las dosis de marbete recomendadas para glifosato. Luego de examinar 500 muestras de poblaciones tomadas en otras tantas localidades,* ***sólo dos de ellas*** *exhiben resistencia, lo cual indica que que este fenómeno* ***no es extensivo ni está difundido****.*

*Las conclusiones preliminares que se han obtenido hasta el presente indican además que el biotipo resistente es fácilmente controlado por las tácticas convencionales (mecánica o con otros herbicidas) y que la resistencia está causada por* ***un patrón de herencia complejo, cuya ocurrencia es improbable en un amplio rango de especies»***

**Monsanto Australia, 1998.**

Fuente: Vila-Aiub UBA

PNAS

# Gene amplification confers glyphosate resistance in *Amaranthus palmeri*

Todd A. Gaines[a,1], Wenli Zhang[b], Dafu Wang[c], Bekir Bukun[a], Stephen T. Chisholm[a], Dale L. Shaner[d], Scott J. Nissen[a], William L. Patzoldt[e], Patrick J. Tranel[e], A. Stanley Culpepper[f], Timothy L. Grey[f], Theodore M. Webster[g], William K. Vencill[h], R. Douglas Sammons[c], Jiming Jiang[b], Christopher Preston[i], Jan E. Leach[a], and Philip Westra[a,2]

[a]Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, CO 80523; [b]Department of Horticulture, University of Wisconsin, Madison, WI 53706; [c]Monsanto Company, St. Louis, MO 63167; [d]Water Management Research Unit, US Department of Agriculture Agricultural Research Service (USDA-ARS), Fort Collins, CO 80526; [e]Department of Crop Sciences, University of Illinois, Urbana, IL 61801; [f]Crop and Soil Science Department, University of Georgia, Tifton, GA 31794; [g]Crop Protection and Management Research Unit, USDA-ARS, Tifton, GA 31794; [h]Crop and Soil Science Department, University of Georgia, Athens, GA 30602; and [i]School of Agriculture, Food and Wine, University of Adelaide, Glen Osmond, SA 5064, Australia

2007 collection
9
*EPSPS* copies

------- 2010 collection -------
12
*EPSPS* copies

2012 collection
16
*EPSPS* copies

217
g ae ha$^{-1}$

1736
g ae ha$^{-1}$

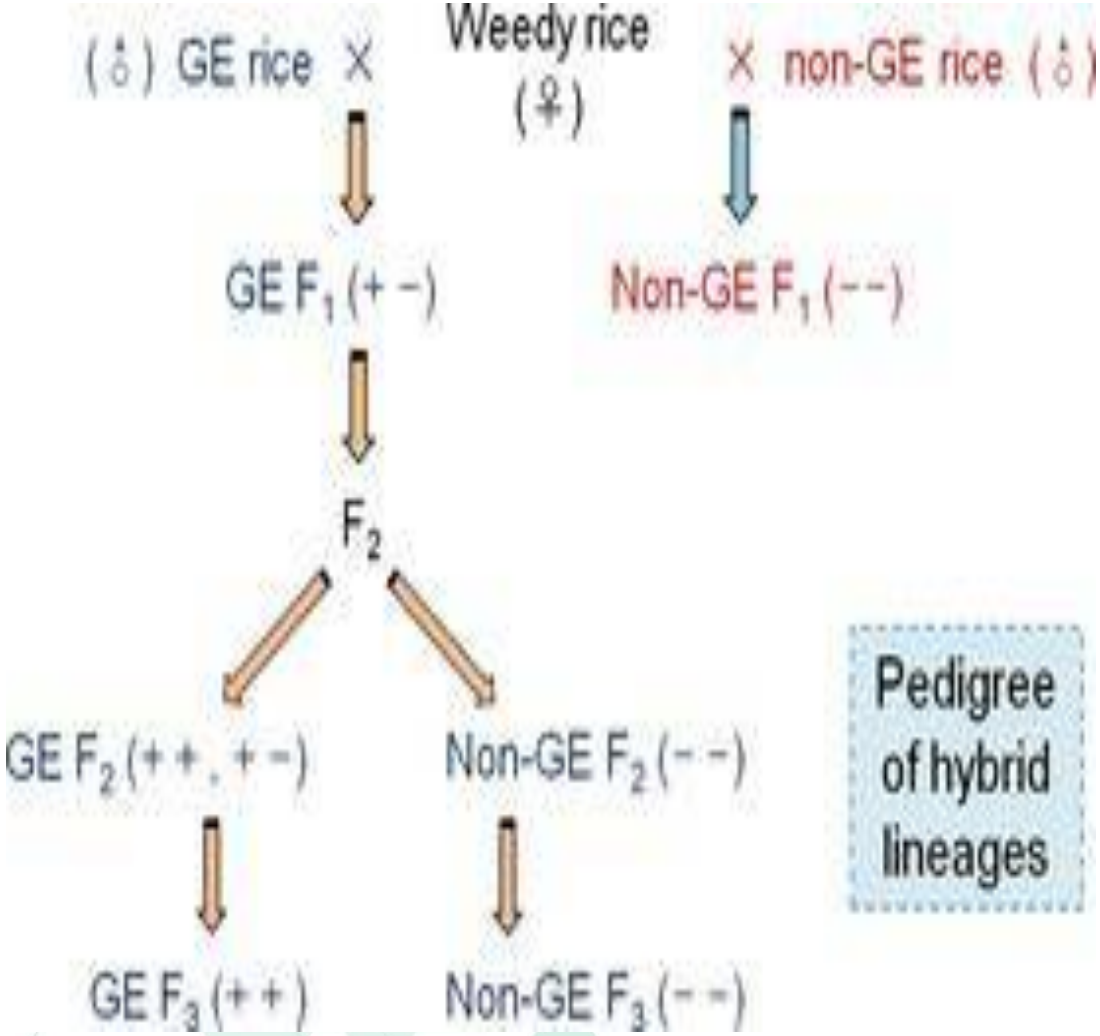
1736
g ae ha$^{-1}$

3472
g ae ha$^{-1}$

5208
g ae ha$^{-1}$

SUSCEPTIBLE ---------- RESISTANT ----------

# *Fitness* en híbridos de arroz silvestre x transgénico



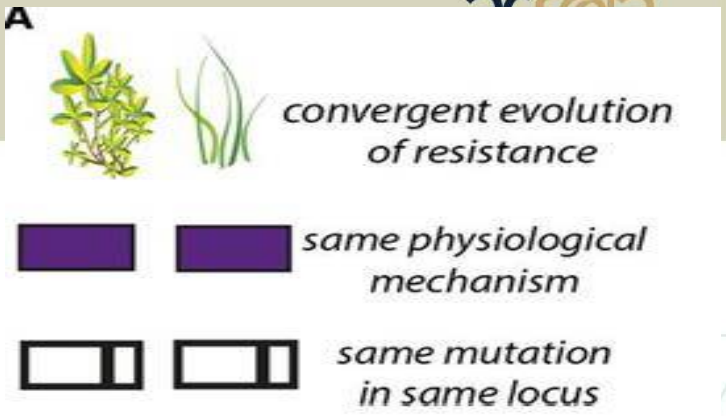

Los híbridos cultivo x maleza transgénicos F2 **produjeron más cantidad de semillas por planta, mayor cantidad de EPSPS y mas alta Tasa Fotosintética que los no transgénicos,**

**sin la aplicación de glifosato**.

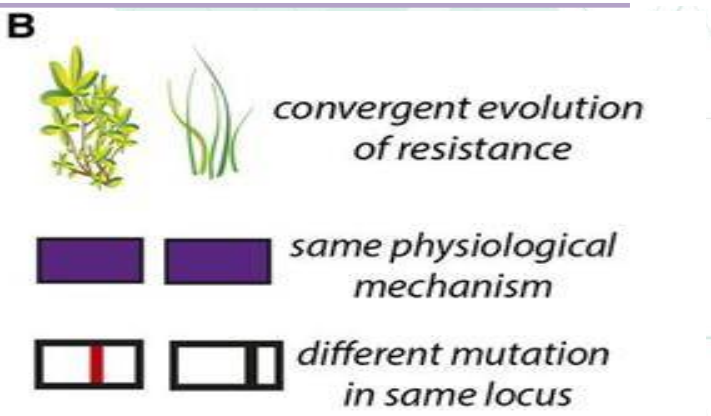
Wang et.al, 2014. A novel 5-enolpyruvoylshikimate-3-phosphate (EPSP) synthase transgene for glyphosate resistance stimulates **growth and** fecundity in weedy rice (*Oryza sativa*) without herbicide. New Phytologist 200:679-688

# Evolución convergente

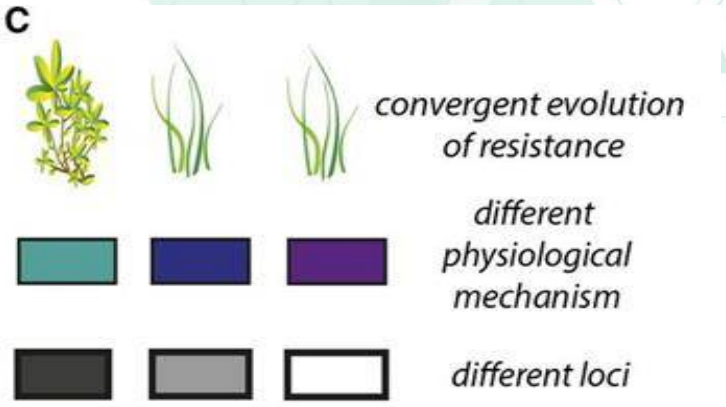
A: **la misma mutación** en el mismo locus de especies diferentes (TSR).




B: **diferentes mutaciones** en el mismo locus de especies diferentes (TSR).




C: diferentes **mecanismos genéticos y fisiológicos** (detoxificación, bloqueo de transporte) = amplia mezcla de NTSR y **TSR** entre especies o en una misma especie.






Baucom, R. American Jounal of Botany. 2016;103:181-183

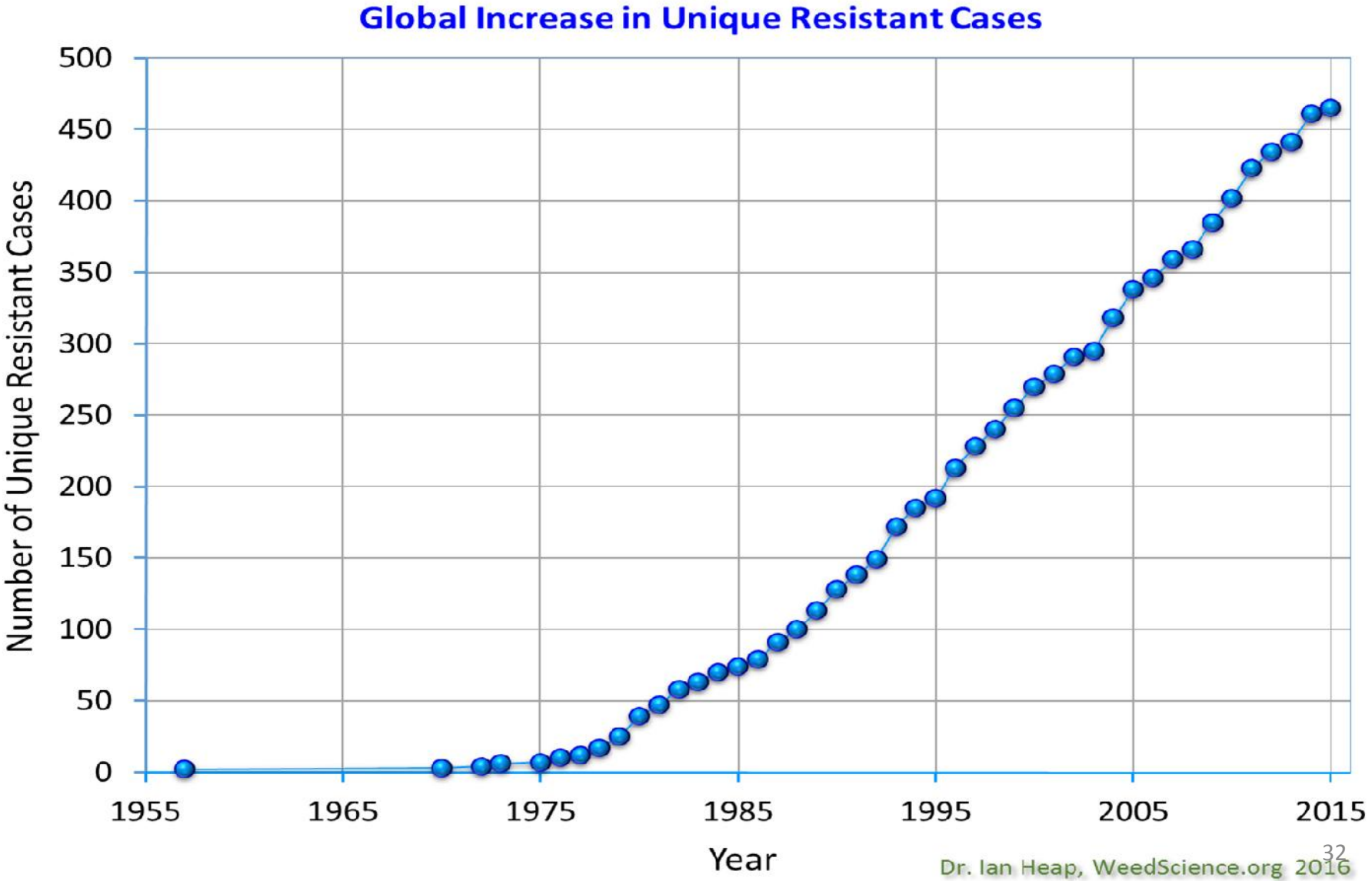
AHRI
AUSTRALIAN HERBICIDE RESISTANCE INITIATIVE
- a GRDC initiative -

HRAC
HERBICIDE RESISTANCE ACTION COMMITTEE

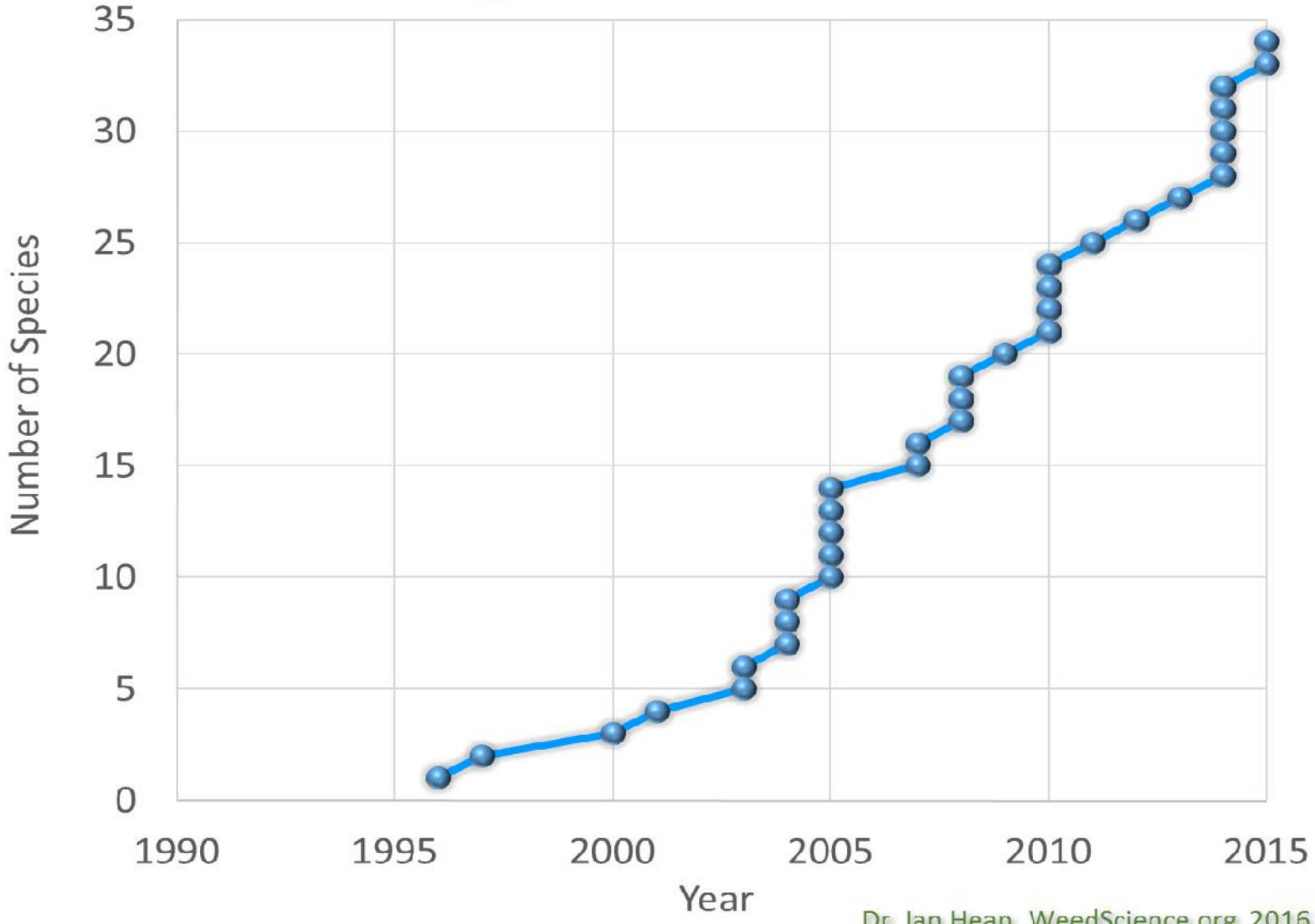
WSSA
WEED SCIENCE SOCIETY OF AMERICA

Rem
Red de conocimiento en malezas resistentes

ASACIM
Asociación Argentina de Ciencia de las Malezas


Global Increase in Unique Resistant Cases
Number of Unique Resistant Cases
500
450
400
350
300
250
200
150
100
50
0
1955
1965
1975
1985
1995
2005
2015
Year
Dr. Ian Heap, WeedScience.org 2016

## Increase in Glyphosate-Resistant Weeds Worldwide




Dr. Ian Heap, WeedScience.org 2016

# Herbicide resistance in waterhemp (*A. palmeri*) continues to grow.

Aaron Hager, Universidad de Illinois.

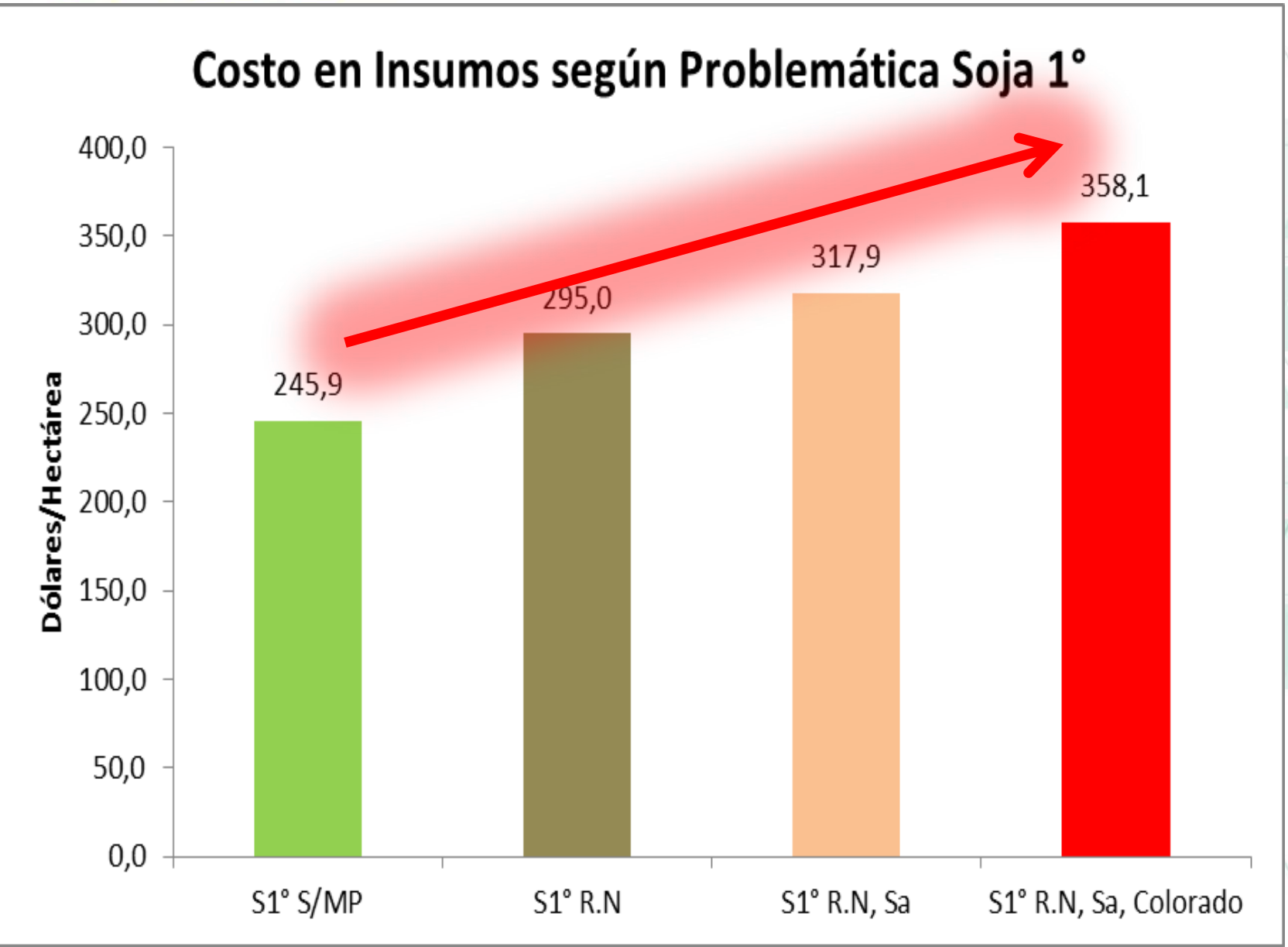
***"Tapiza campos de maíz y soja, causando pérdidas del 40-70 %".***

***"El daño de un herbicida HPPD en plantas > a 7 cm de altura no es aceptable: no es opción para enfrentar la resistencia".***

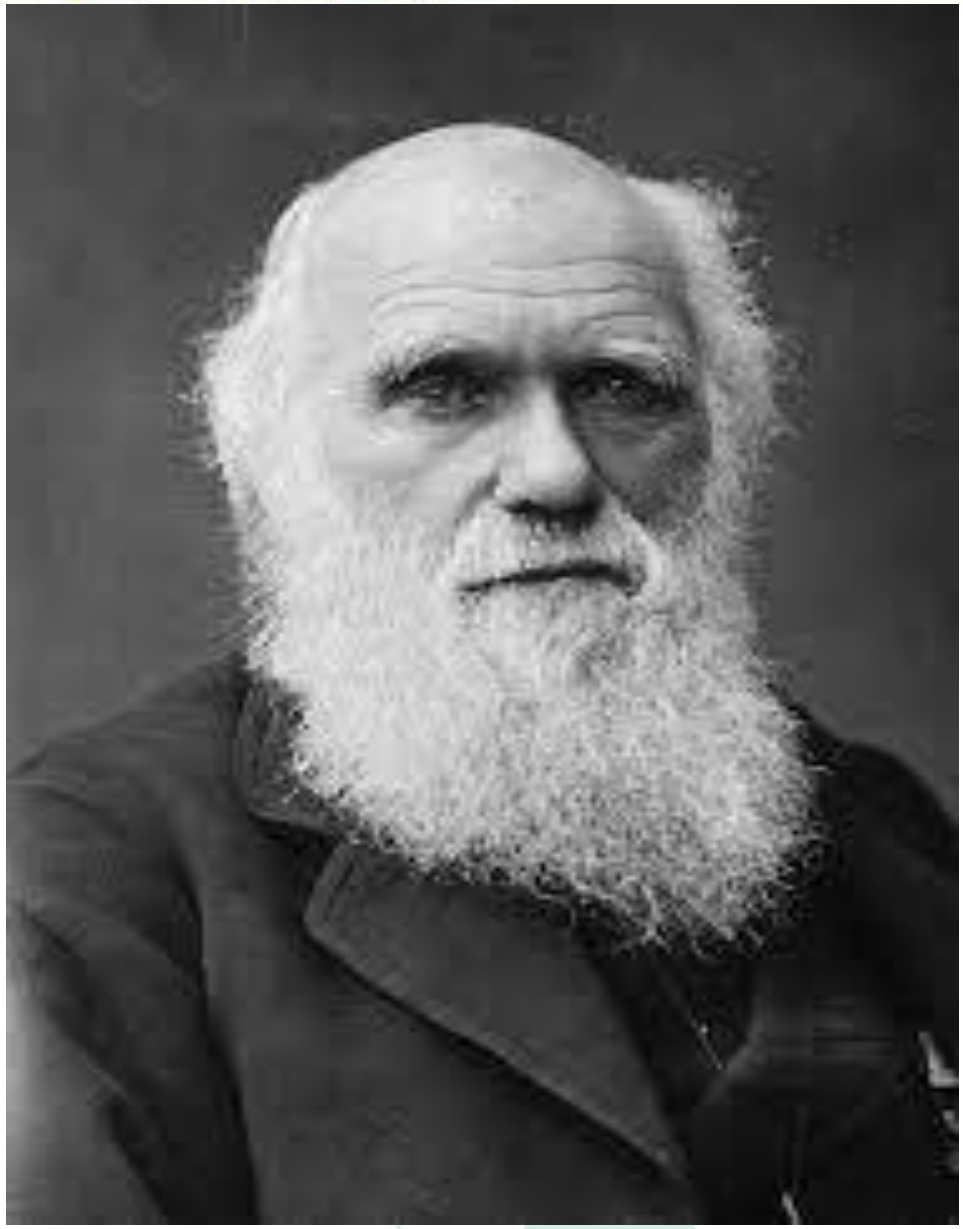
***"Esta maleza ya resiste a tres de tipos de herbicidas (Inhibidores de HPPD, ALS y PSII)… estas poblaciones utilizan mecanismos de resistencia que no habíamos visto nunca antes"***



http://phys.org/news/2016-04-herbicide-resistance-waterhemp.html


Costo en Insumos según Problemática Soja 1°
Dólares/Hectárea
400,0
350,0
300,0
250,0
200,0
150,0
100,0
50,0
0,0
245,9
295,0
317,9
358,1
S1° S/MP
S1° R.N
S1° R.N, Sa
S1° R.N, Sa, Colorado

Rovea, 2014



# Nos enfrentamos a un Gigante:

# … es un problema de Evolución !

**Charles R. Darwin (1809-1882)**

**La agricultura sustentable es un sistema integrado de prácticas de producción vegetal y animal que tienen un lugar específico de aplicación y que podrá satisfacer en el largo plazo las necesidades de alimentos y fibras, incrementar la calidad ambiental y la base de recursos naturales de los cuales la economía de la agricultura depende, haciendo un uso más eficiente de los recursos no renovables.**

**En el ámbito del establecimiento agropecuario integra, en el grado que sea apropiado, los ciclos y controles naturales, sostiene la viabilidad económica de las operaciones de manejo del establecimiento y promueve la calidad de vida de los productores agropecuarios y de la sociedad en su conjunto.**

**(Congreso de los EE.UU, 1990, pág. 3).**

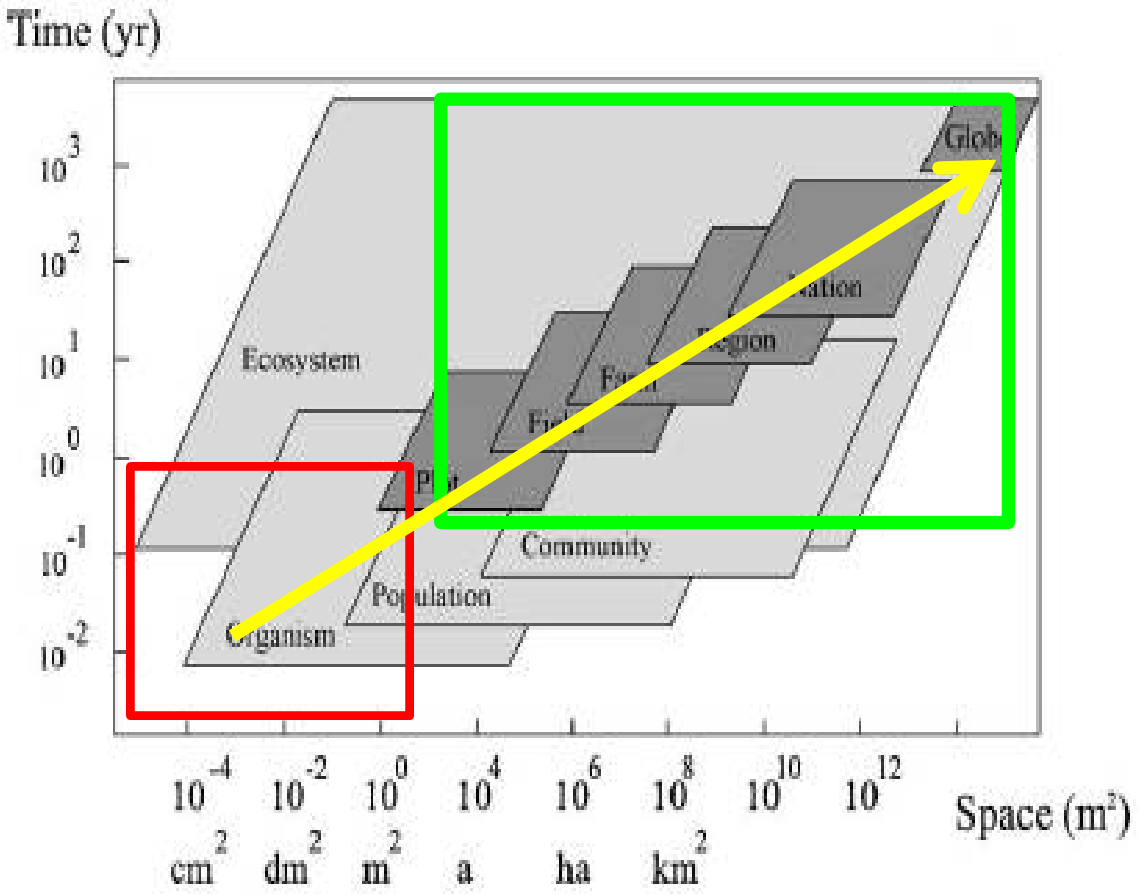



Fig. 3. Examples of the spatial and temporal scale for investigations of hierarchical levels within natural (light coloured), and agricultural systems (dark coloured) (after Rabbinge, 1997).



**Dif: 446 Kg**

Cultivo Cobertura: Trigo siembra de junio sin fertilización. Solo semilla.

Fuente: Fabio Noca


ZANELLO

Biomedicine

# The Next Great GMO Debate

Deep inside its labs, Monsanto is learning how to modify crops by spraying them with RNA rather than tinkering with their genes.

by Antonio Regalado August 11, 2015

# WSSA Survey Ranks Palmer Amaranth as the Most Troublesome Weed in the U.S., Galium as the Most Troublesome in Canada

Posted on April 5, 2016

**LAWRENCE, Kansas** – April 5, 2016 – It's now official. A survey conducted by the Weed Science Society of America (WSSA) has ranked Palmer amaranth, also known as Palmer pigweed, as the most troublesome weed in the U.S. Weeds in the *Galium* genus (cleavers, catchweed bedstraw and false cleavers) ranked as the most troublesome in Canada.

| Most Troublesome Weeds, U.S. |
|---|
| 1. Palmer amaranth |
| 2. morningglory (ivyleaf, pitted, tall, sharppod) |
| 3. common lambsquarters |
| 4. waterhemp (common, tall) |
| 5. horseweed (marestail) |

# Monitoreo de malezas e Invasoras en cultivos de cereales, oleaginosos y forrajeros de la Argentina.

**Noviembre 2010 - Febrero 2011**
**5000 censos**

SENASA

PAFIS
Programa de Apoyo al Fortalecimiento Institucional del SENASA-CE

EuropeAid/123383/C/SER/AR

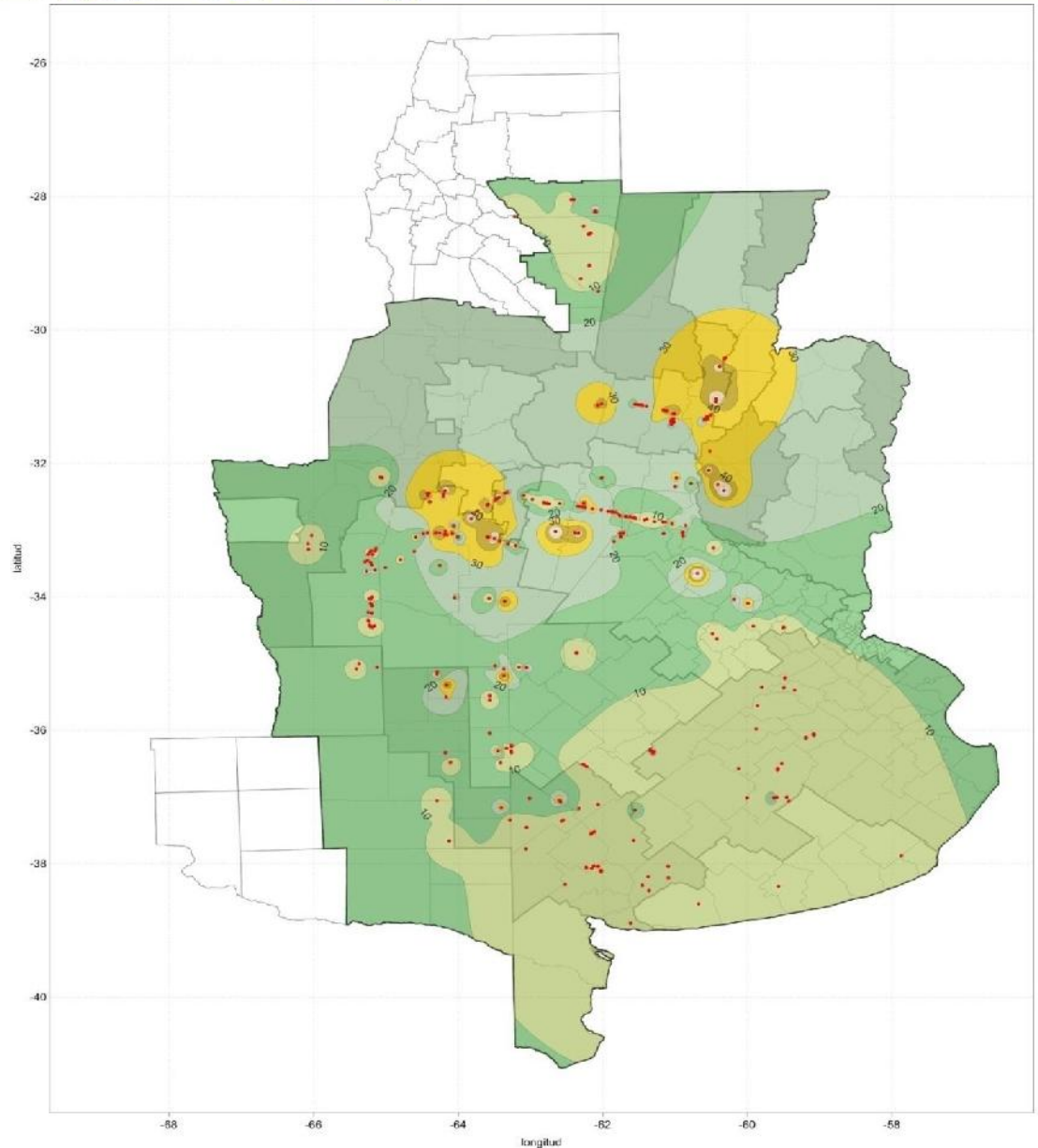
ECA

COPCA
Generalitat de Cataluña

AGRICONSULTING EUROPE

INGAL


173 especies

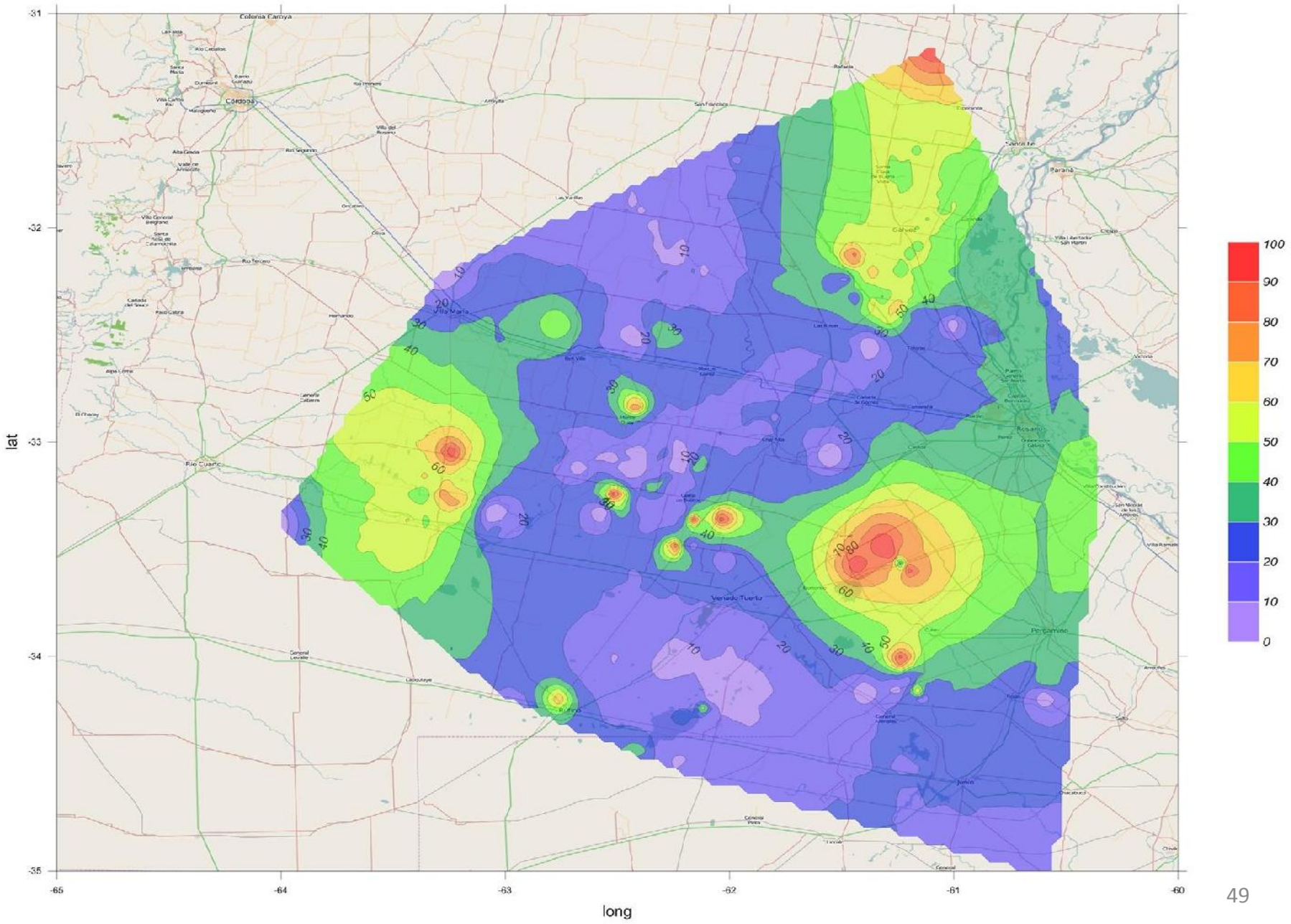



***Sorghum halepense***

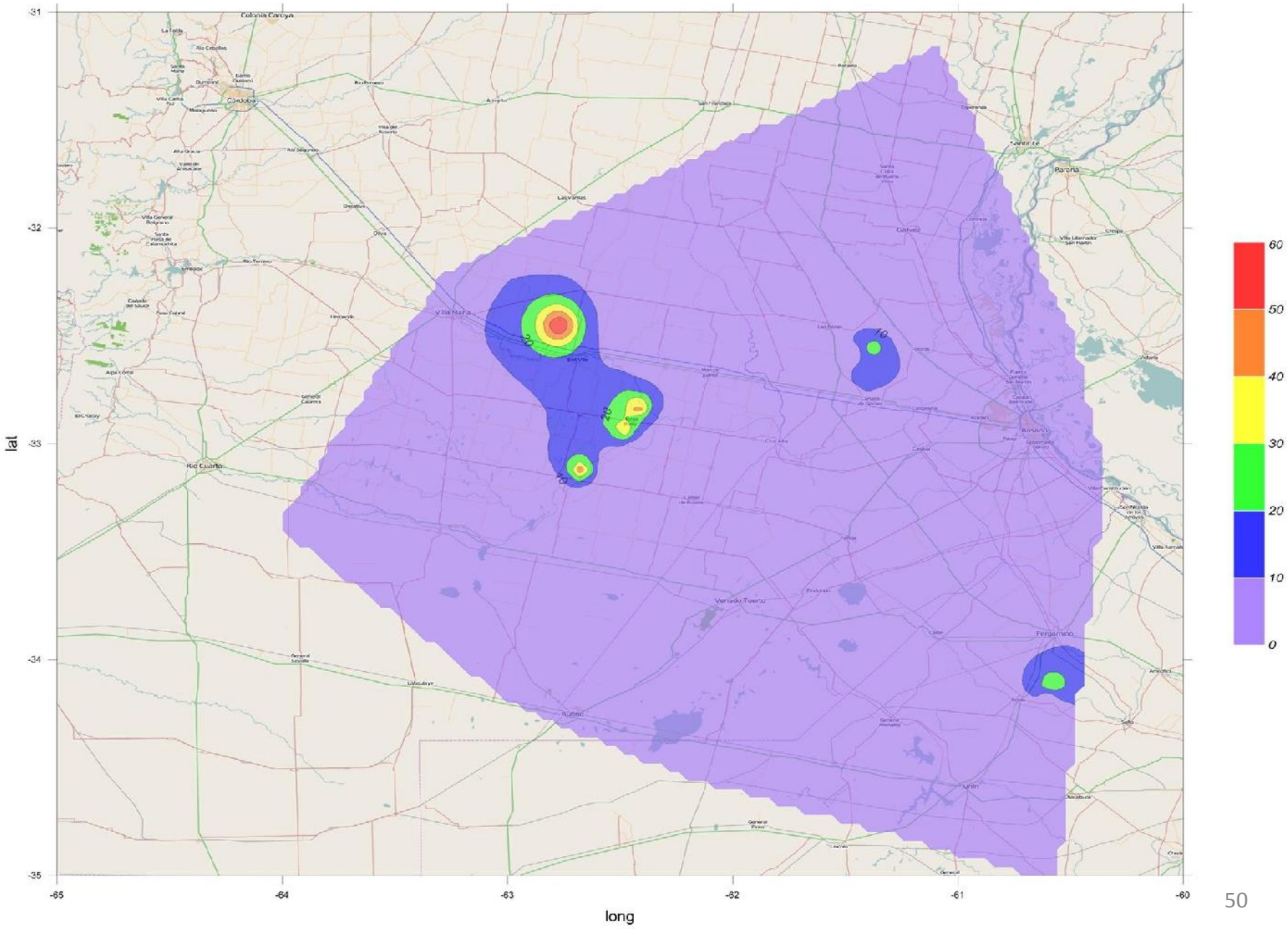
# Programa de Manejo sustentable de Malezas en la región de influencia del CREA Sur de Santa Fe

**Marzo-Abril 2013**
**2300 censos**

# ERIBO


lat
long
-31
-32
-33
-34
-35
-65
-64
-63
-62
-61
-60
100
90
80
70
60
50
40
30
20
10
0

# ECHCO




CASE IH
CASE IH

# weed seed WIZARD

## Helping manage your weeds

The Weed Seed Wizard – a weed management simulation tool.

GRDC
Grains Research & Development Corporation
Your GRDC working with you

THE UNIVERSITY OF WESTERN AUSTRALIA
Achieve International Excellence

THE UNIVERSITY of ADELAIDE

Queensland Government

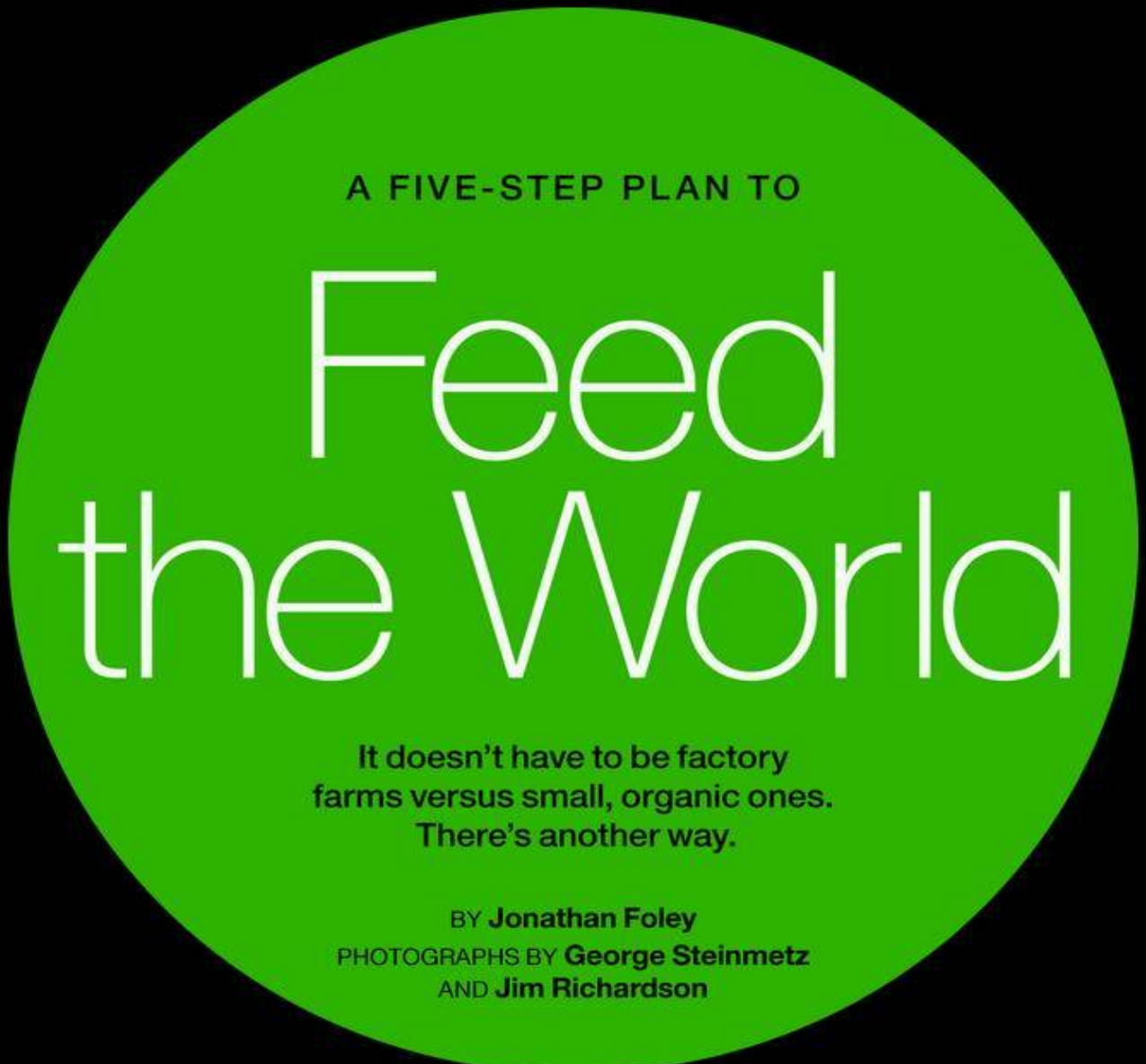
NSW GOVERNMENT Department of Primary Industries

**Hacia 2050, la agricultura tendrá el desafío de alimentar a 2000 millones de personas adicionales…**

**…en la actualidad, la agricultura ya ocupa el 40 % de la superficie de la tierra, produce el 30 % del total de gases de efecto invernadero, consume el 50 % del agua dulce disponible y modifica la biodiversidad…**



NATIONAL GEOGRAPHIC MAGAZINE


A FIVE-STEP PLAN TO
Feed the World
It doesn't have to be factory farms versus small, organic ones. There's another way.
BY Jonathan Foley
PHOTOGRAPHS BY George Steinmetz AND Jim Richardson

Resources

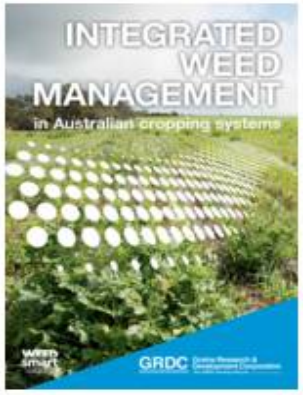
- ▸ GrowNotes
- ▾ Integrated Weed Management Hub
  - Integrated Weed Management Manual
  - ▸ Section 1: Herbicide resistance
  - ▸ Section 2: Agronomy to enhance weed management
  - ▸ Section 3: Managing the weed seedbank
  - ▸ Section 5: Stopping weed seed set
  - ▸ Section 6: Managing weeds at harvest

# Integrated Weed Management Hub

## Using this resource

Rapid expansion of herbicide resistance and the lack of new modes of action (MOA), require that non-herbicide tactics must be a significant component of any farming system and weed management strategy. Inclusion of non-herbicide tactics is critical to prolong the effective life of remaining herbicides, as well as for new products and modes of action that have not yet been released or indeed invented. Effective herbicides are key components of profitable cropping systems. Protecting their efficacy directly contributes to the future sustainability and profitability of cropping systems.

*We need to look after what we have.* It is a shock to some that the last significant new herbicide mode of action released in Australia was Group H chemistry, first launched in Australia in 2001. Prior to that, the most recent other new mode of action was Group B chemistry, when chlorsulfuron was commercialised in Australia in 1982.

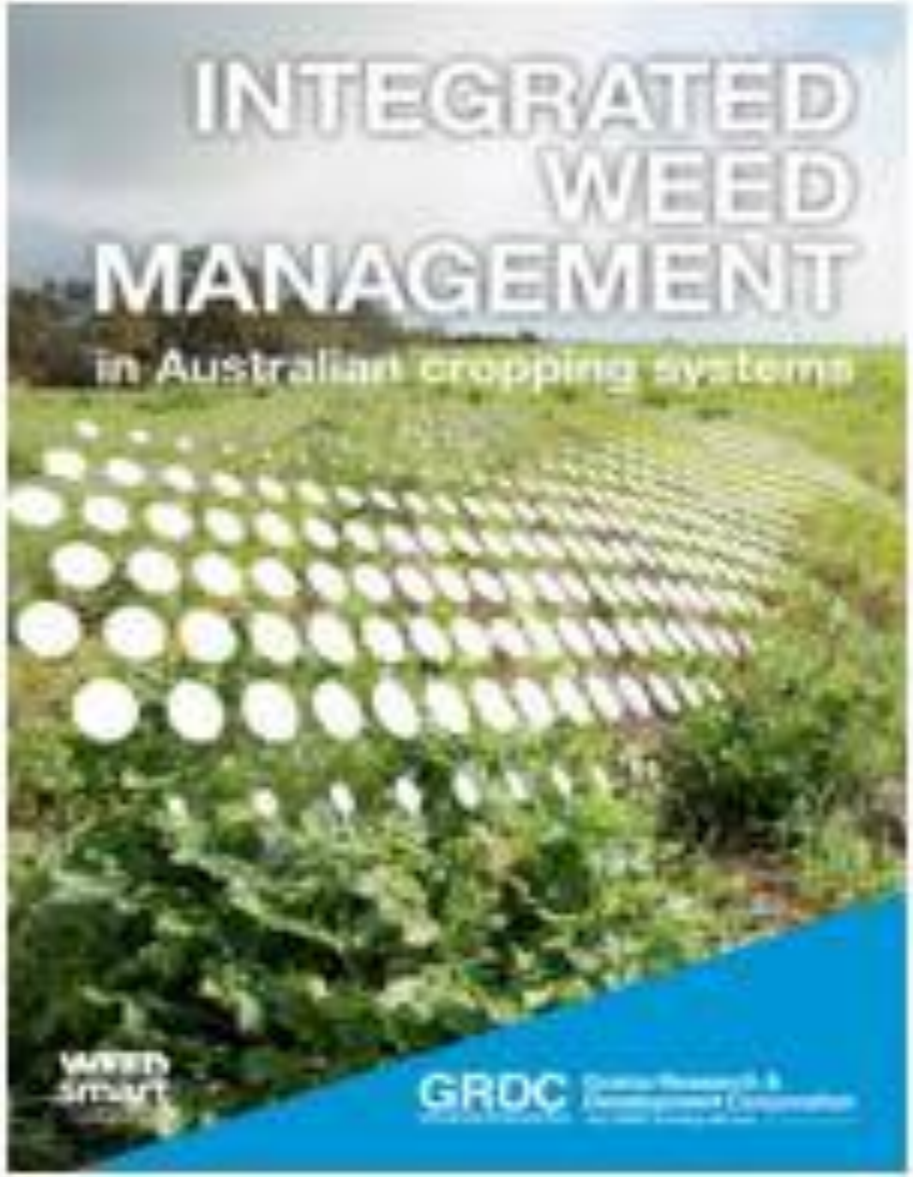



This manual is an on-line resource to assist Australian grain growers and advisers to quickly locate useful web based information on weed management in Australian broadacre cropping systems.

This manual is a road map to information. It summarises the role, use and benefits of different weed management tactics. The many links embedded in these web pages provide access to a myriad of more detailed on-line multi media resources. These links provide access to the detailed information that readers will need on the topics being researched for on-farm adoption.

It is intended that this manual will continue to evolve with links added and updated on a regular basis as new material comes to hand.

One of the key resources that is linked to extensively in the IWM Hub is the Integrated Weed Management Manual. This manual, Updated in 2014 is a key reference in the management of weeds.



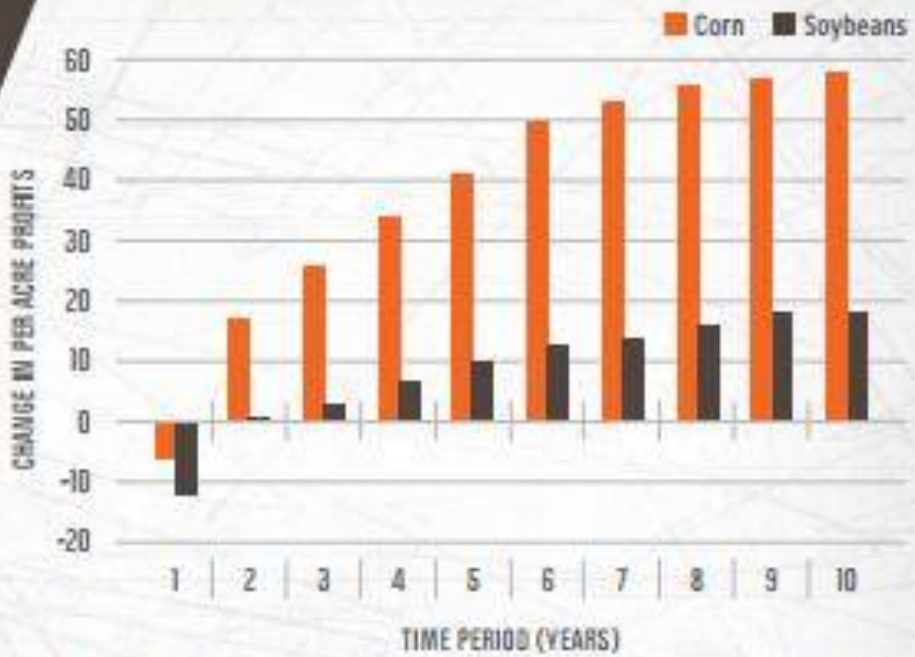

- Section 1 - Herbicide resistance
- Section 2 - Agronomy to enhance weed management
- Section 3 - Managing weed seedbank
- Section 4 - Managing weed seedlings
- Section 5 - Stopping weed seed set
- Section 6 - Managing weeds at harvest
- Section 7 - Managing farm hygiene
- Section 8 - Profiles of common weeds of cropping
- Section 9 - Case studies
- Integrated Weed Management Manual


THE PROFIT ADVANTAGE OF PROACTIVE MANAGEMENT CAN CONTINUE TO GROW AFTER THE SECOND YEAR. THE CHART AT RIGHT SHOWS **PROJECTED ANNUAL PER-ACRE PROFIT ADVANTAGES.**

**CORN:** Profit advantage over a three-year time period averages $26 per acre per year, with a profit advantage of nearly $60 per acre per year over a 10-year time period.

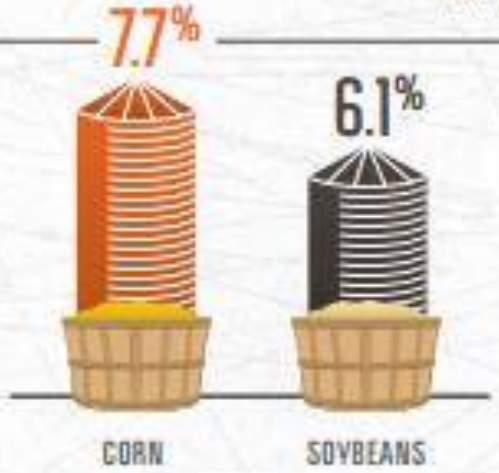
**SOYBEANS:** Profit advantage over a five-year time period averages $10 per acre per year, with a profit advantage of almost $20 per acre per year over a 10-year time period.

**ANNUAL AVERAGE PROFIT ADVANTAGE** of Proactive Resistance Management




*These values are in constant (current) dollars, accounting for the fact that people place more weight on costs and benefits today than identical costs and benefits in the future.

# HRM GROWS YIELDS




BETTER WEED CONTROL IS LEADING TO HIGHER LONG-RUN YIELDS. LONG-RUN AVERAGE YIELDS WHEN USING PROACTIVE WEED-MANAGEMENT PRACTICES WERE MORE THAN **6 PERCENT HIGHER** FOR SOYBEANS AND NEARLY **8 PERCENT HIGHER** FOR CORN.

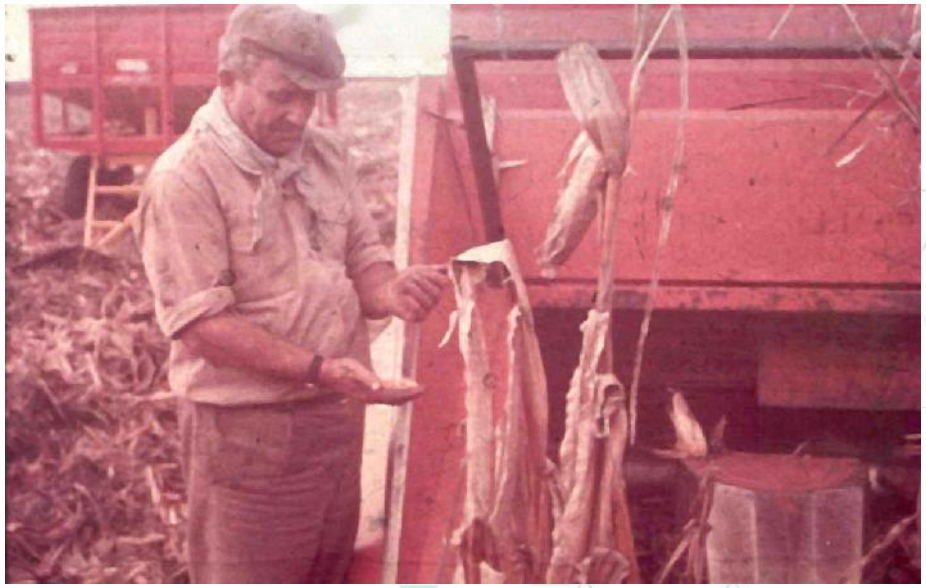

# Soybean check-off

The soybean checkoff is supported entirely by soybean farmers with individual contributions of **0.5 percent of the market price per bushel sold each season**.

It is composed of 68 volunteer farmer-leaders

# Plan Piloto Salto – INTA Pergamino- 1975/80


PLAN PILOTO
ONTROL SORGO DE ALEPO
LOTE
DEMOSTRATIVO









http://www.missouriplants.com/Grasses/Sorghum_halepense_page.html

**En términos relativos, el control de la maleza representaba en 1981, entre el 30 y el 45 % del costo operativo total de una secuencia T/S-M**

# ¡ Manos a la Obra !

Seminario ACSOJA 2016

*Muchas Gracias !!!*