



Forward-Looking Statements

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Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, financial situation, development or performance of the company and the estimates given here. These factors include those discussed in Bayer's public reports which are available on the Bayer website at www.bayer.com.

The company assumes no liability whatsoever to update these forward-looking statements or to conform them to future events or developments.



Weed control as an integral part of sustainable food and fibre production- Aspects and prospects



Science For A Better Life

"50th Anniversary of the Weed Science Society of Israel. "

Beit Dagan, Israel | February 25th , 2015 - Hansjörg Krähmer, Hermann Stübler



Science For A Better Life

■ About Bayer

- Major global challenges for agriculture
- Weed control as an essential tool of crop production
- Which factors play a major role in weed infestation?
- We must serve the farmer, not the scientific community
- Outlook



113,200 employees

Full year sales 2013: € 40.2 billion

289 subsidiaries

R&D expenditures: € 3.2 billion

As of December 31, 2013



At Bayer CropScience, we serve agriculture

22,400 employees

Full year sales: € 8,819m

> 120 countries



As of December 31, 2013

We offer innovative agricultural solutions in three business segments

Seeds

- Vegetable seeds
- Seeds for agricultural crops (e.g. cotton, canola, rice, wheat, soybean)
- Traits

Crop Protection*

- Insecticides
- Fungicides
- Herbicides
- SeedGrowth

Environmental Science

- Products for professional users (pest and vegetation management)
- Products for consumers (home and garden use)



*with both chemical and biological modes of action

Bayer CropScience Seeds: Global market position and development in 2013



Oilseeds / Canola m€ 279

Δ% y-o-y Fx- & portfolio adj.



-10% decline
in 2013

InVigor

Worldwide
No. 1
in hybrid-canola

Cotton m€ 176



-7% decline
in 2013

FiberMax
 **Stoneville.**

Worldwide
No. 1
in cotton
(based on acreage)

Rice m€ 52



19% growth
in 2013

Arize

Worldwide
No. 1
in hybrid-rice
(without China)

Vegetables m€ 331

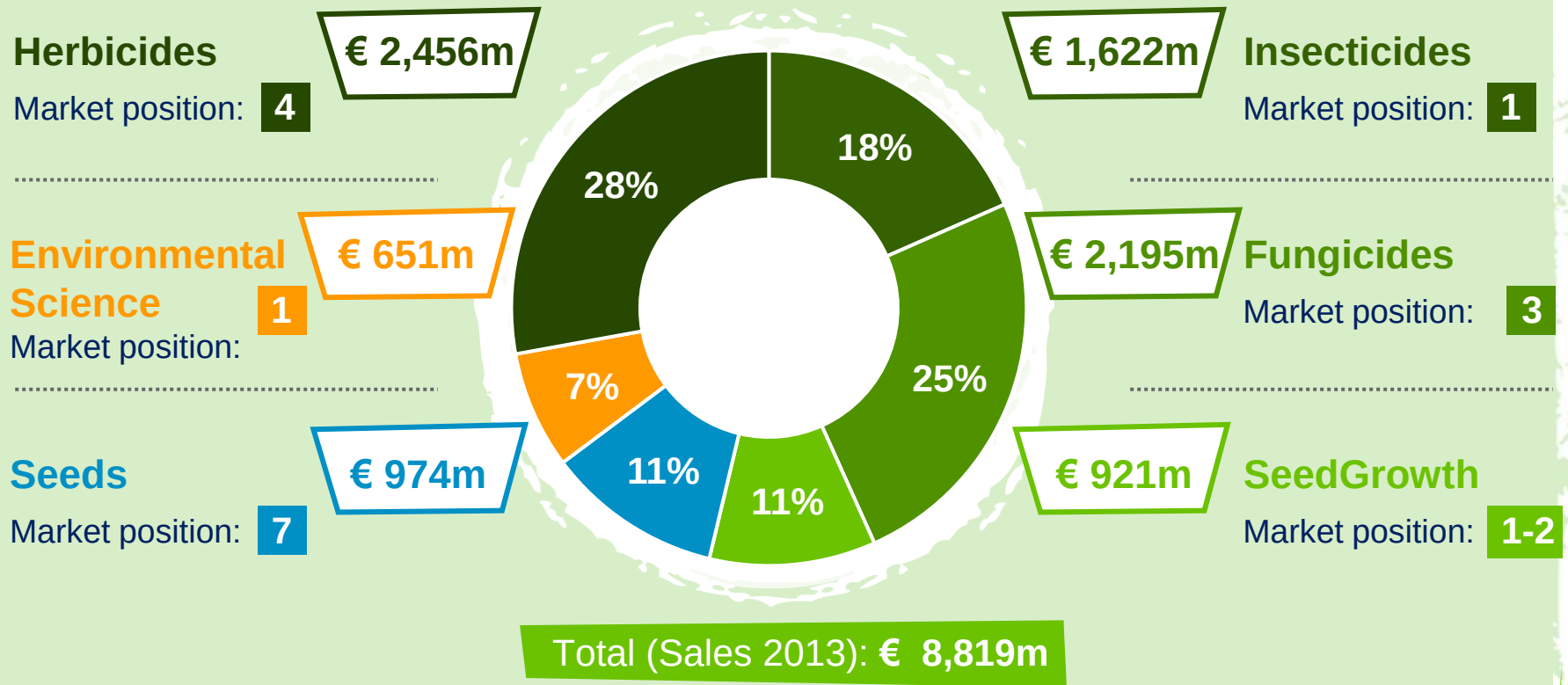


9% growth
in 2013

nunhems

Worldwide
No. 4
in vegetable seeds

In the agriculture market, we have a strong portfolio position*



*Market positions based on company reportings and Cropnosis estimates



Agenda



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Innovation in Crop Protection is vital to safeguard harvests and secure food supply...



Major crops analyzed:

rice, wheat, barley, corn,
potatoes, soybeans,
cotton and coffee

30%



Yield without
crop protection

Prevented losses

By pests,
weeds and
diseases

28%

Today
58%



Actual yield with
crop protection

Actual losses

Due to
pests,
weeds
and
diseases

42%

100%



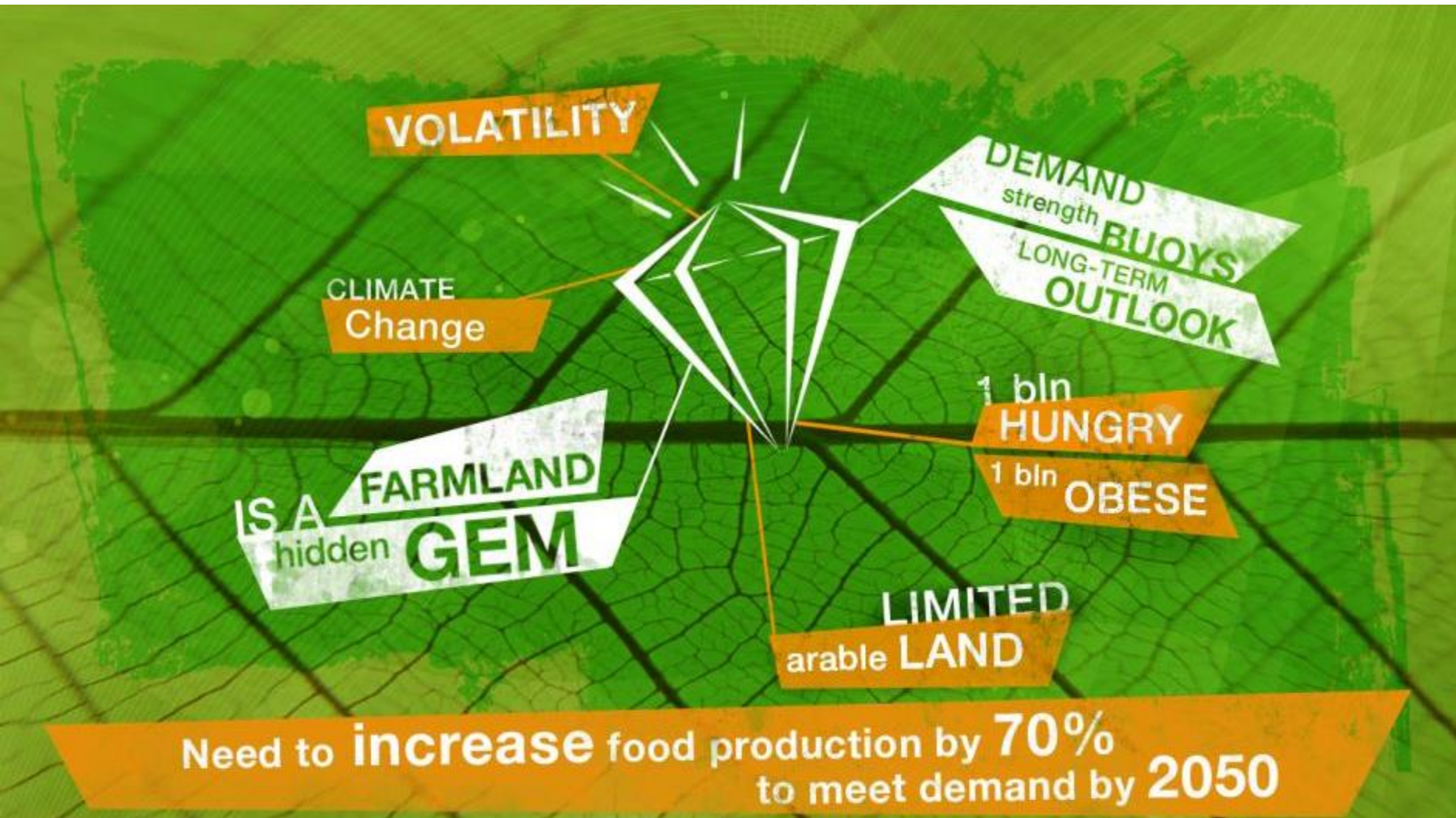
Theoretically
attainable yield

Without crop protection, nearly half of the current harvest would be lost

**Through innovations and adequate use of crop protection solutions,
total yield could be almost doubled**

Source: Oerke et al., Crop Production and Crop Protection, Elsevier, Amsterdam, 1994

We're operating in a dynamic market underscored by global challenges



GLOBAL TRENDS IN AGRICULTURE



GLOBAL FOOD PRODUCTION

By 2050



Need for a sustainable productivity increase

POPULATION GROWTH

7 billion people on the planet today



9.6 billion people in 2050

CHANGING CONSUMPTION PATTERNS



Increasing demand for protein

HUNGER



1 in 8 goes hungry today

WEATHER FLUCTUATIONS

-322 kg rice per hectare

+1°C

Yields under pressure

HECTARES OF FARMLAND PER CAPITA

1950 : 0.52
2010 : 0.20

2050 : 0.15



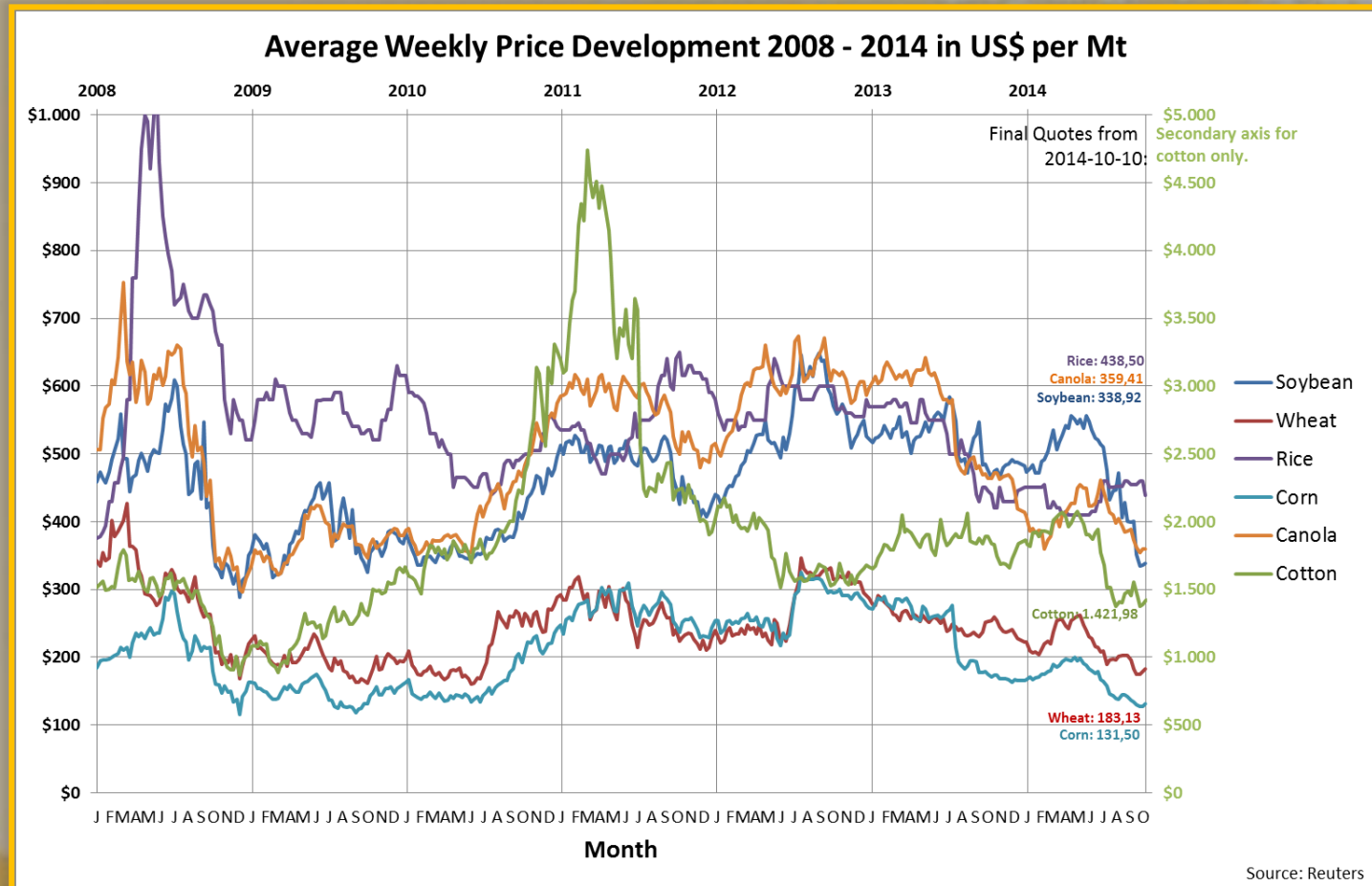
INSUFFICIENT STORAGE



Up to 40% of fruit and vegetables lost in India

Equivalent to the annual consumption in UK

Ample supply expectations are depressing prices through 2014



Mt = metric ton; Source: Reuters, 10 October 2014



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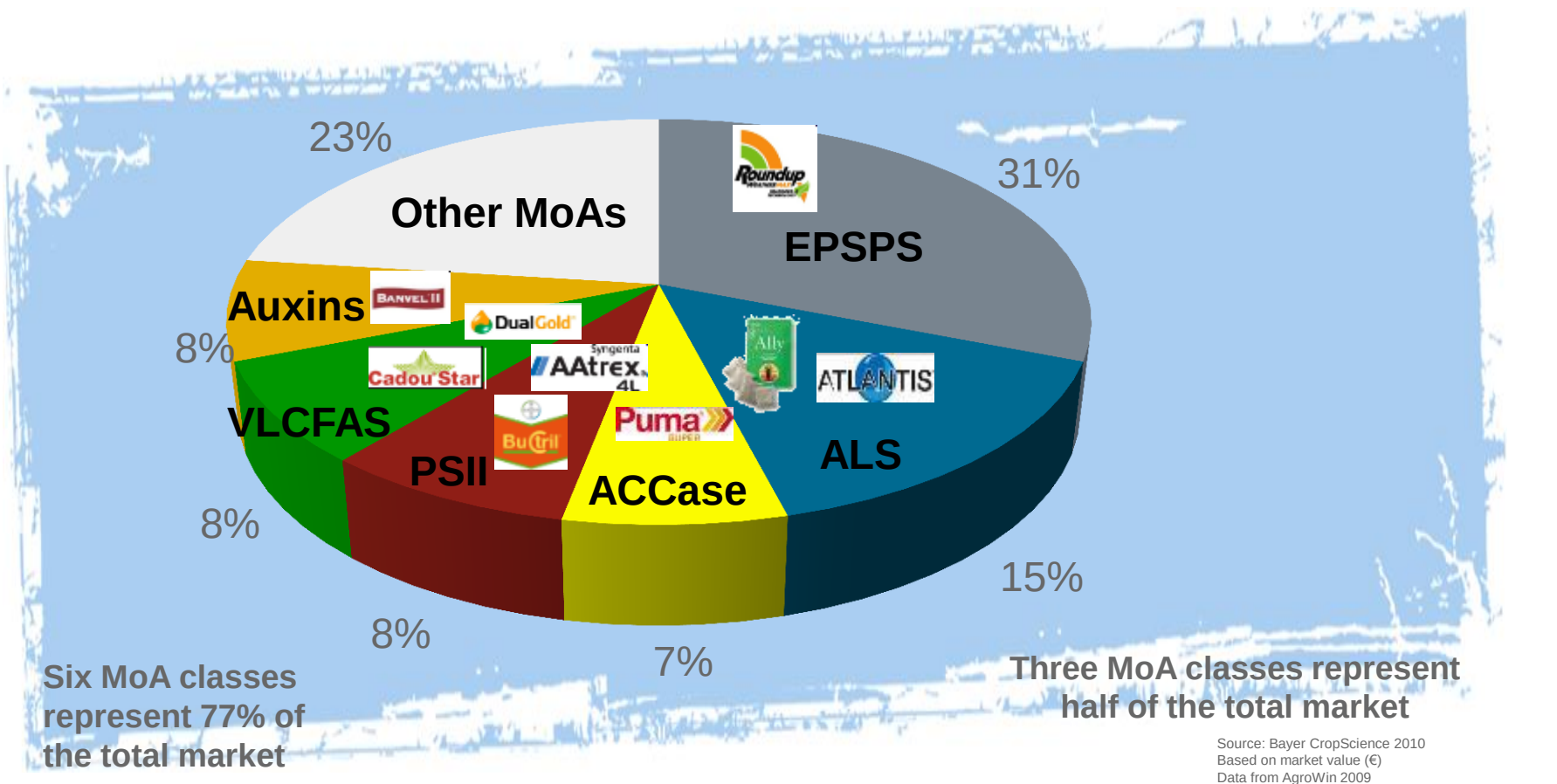
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Weed control is not only herbicides - Sufficient crop production without herbicides is not possible



World Herbicide Market by Mode of Action Class



Lack of herbicide diversity = strong resistance selection pressure



Weed Resistance Competence Center



**WEED
RESISTANCE**
COMPETENCE CENTER





Herbicide Resistance Mechanisms

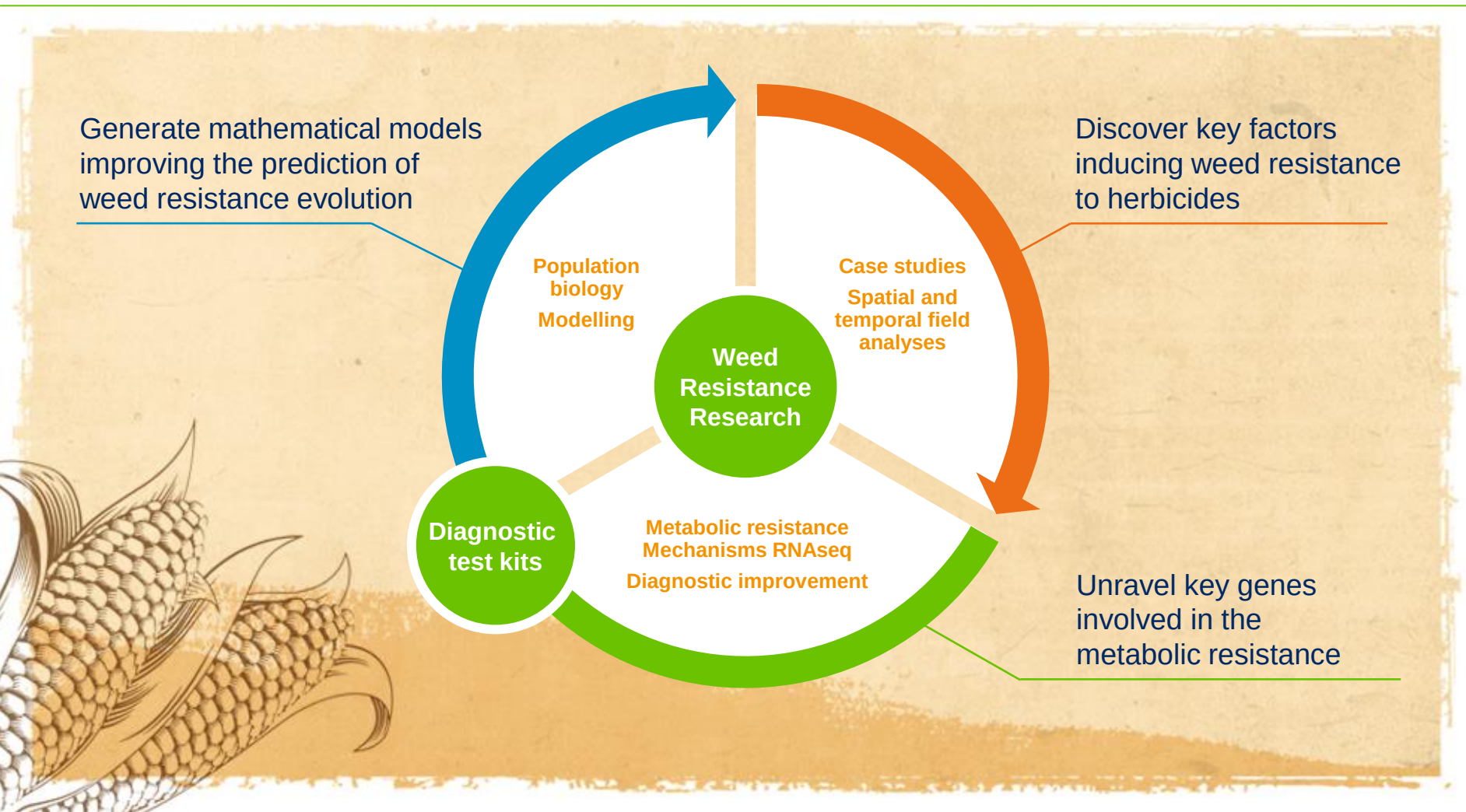
Most Common

- Target-site mutation
- Enhanced metabolism
- Differential uptake
- Differential redistribution
- Sequestration
- Increased gene copy number
- Enzyme overexpression
- Delayed germination
- Rapid necrosis / defoliation

Weeds are constantly evolving new mechanisms of herbicide resistance

Weed resistance research

External collaborations overview



Key Operational Tasks



**WEED
RESISTANCE**
COMPETENCE CENTER

Discovery
Support

Support search for
new MoAs

Diagnostic
Bioassays

Greenhouse
testing

Resistance
Mechanisms &
Lab Diagnostics

Biochemistry &
molecular biology

IWM Strategy
Development &
Outreach

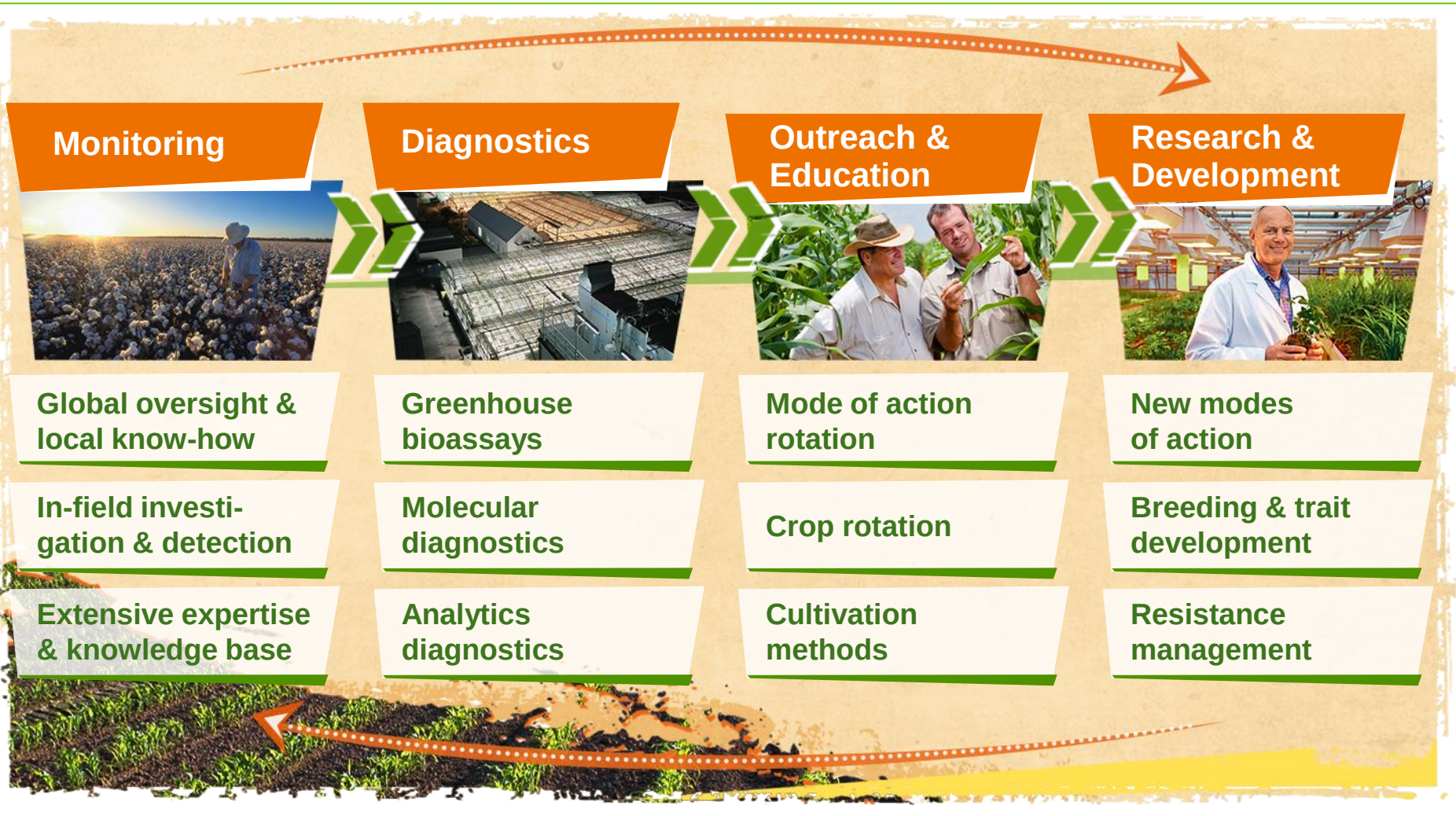
Modeling &
scientific
communications

External
Collaborations

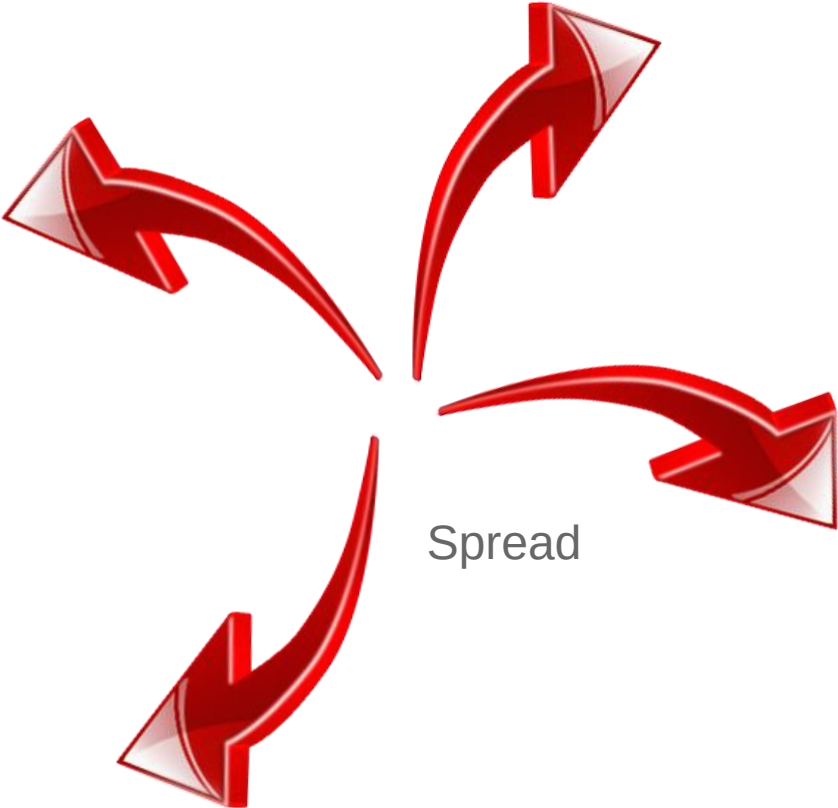
Projects with
universities/
institutes



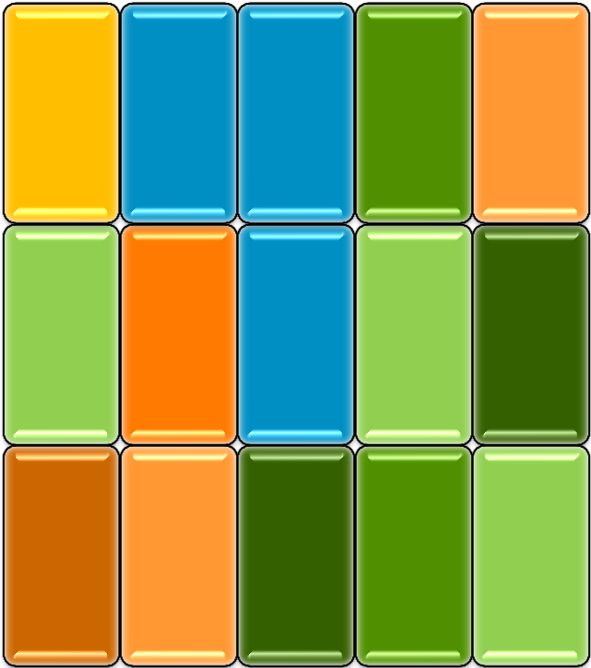
Weed Resistance is a major challenge in agriculture and needs a holistic approach



Herbicide resistance spread in European cereal grass weeds



Independent Evolution





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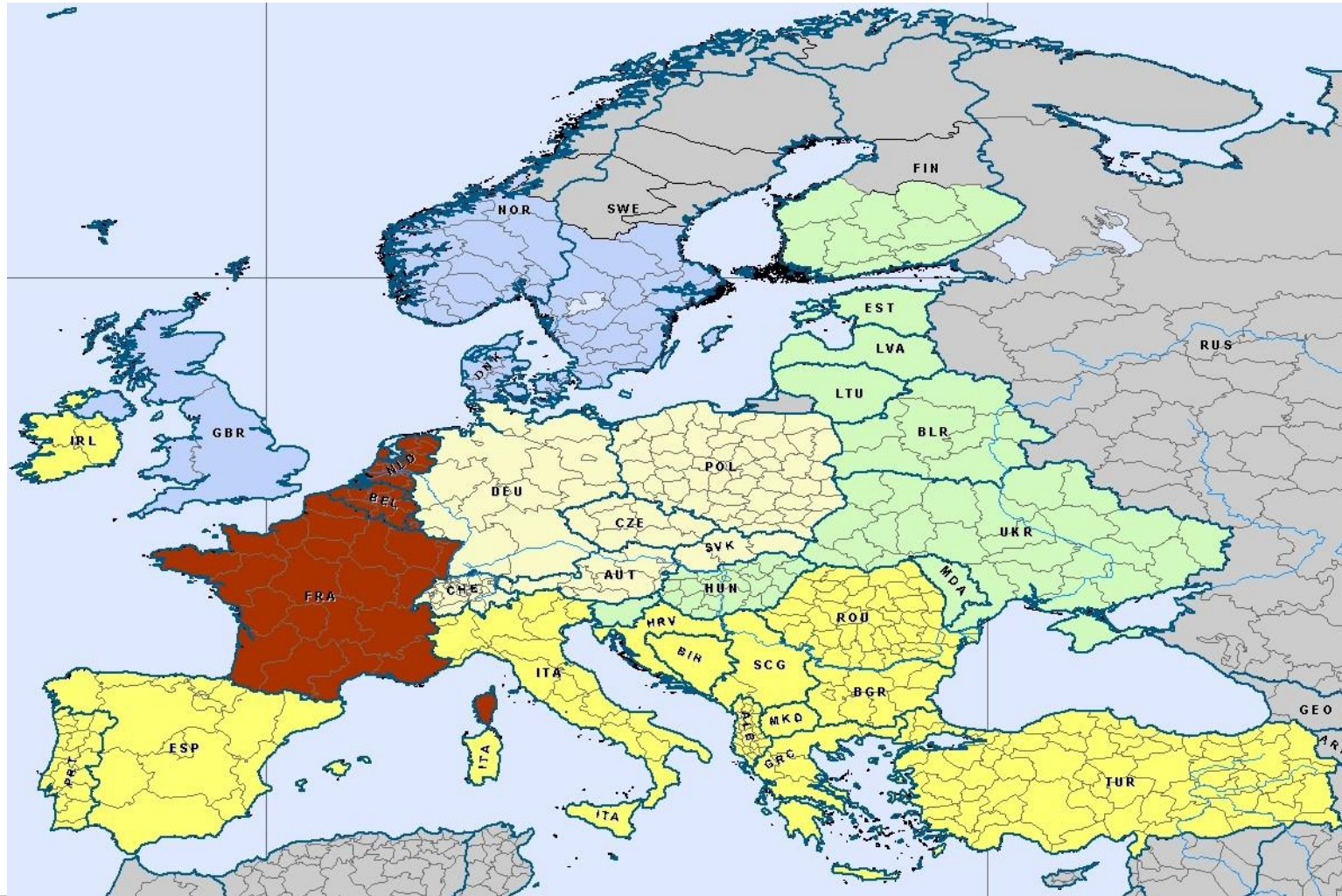


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Why and how do weed spectra change?

Europe: Cereals / most frequent grasses



	<i>Apera spica-venti</i>
	<i>Alopecurus myosuroides</i>
	<i>Avena sterilis</i>
	<i>Poa annua</i>
	<i>Elytrigia repens</i>

Changing Weed Rankings

Winter wheat – Weed ranks in Hungary (Novák et al. 2009)



Weed species	1947-53	1969-71	1987-88	2007-08
<i>Tripleurospermum inodorum</i>	44	15	1	1
<i>Ambrosia artemisiifolia</i>	20	12	4	2
<i>Apera spica-venti</i>	37	20	6	3
<i>Cirsium arvense</i>	2	3	10	4
<i>Galium aparine</i>	103	30	3	5
<i>Convolvulus arvensis</i>	1	2	2	6
<i>Papaver rhoeas</i>	12	8	7	8
<i>Stellaria media</i>	63	16	9	11

Acreage changes in US crops during the last 100 years (million acres harvested)



Source: USDA Crop Production Historical Track Records, April 2013

	1920	1970	2012
Barley	7.5	9.7	3.2
Canola	<0,1	<0,1	1.6
Corn	101.4	66.1	97.2
Cotton	34.4	11.2	9.4
Hay	73.1	61.5	56.3
Oats	42.8	18.6	1.1
Potatoes	3.3	1.5	1.2
Rice	1.3	1.9	2.7
Rye	4.9	1.5	0.3
Soybeans	<0.5	42.3	76.1
Sugarbeets	0.9	1.5	1.2
Wheat	62.4	43.6	49
All crops	347	283	309



Which factors play a major role for weed infestation?

▶ Crop

▶ Crop management

▶ Habitat and environmental conditions

▶ Long term adaptation of weeds (incl. resistance) to agricultural practice



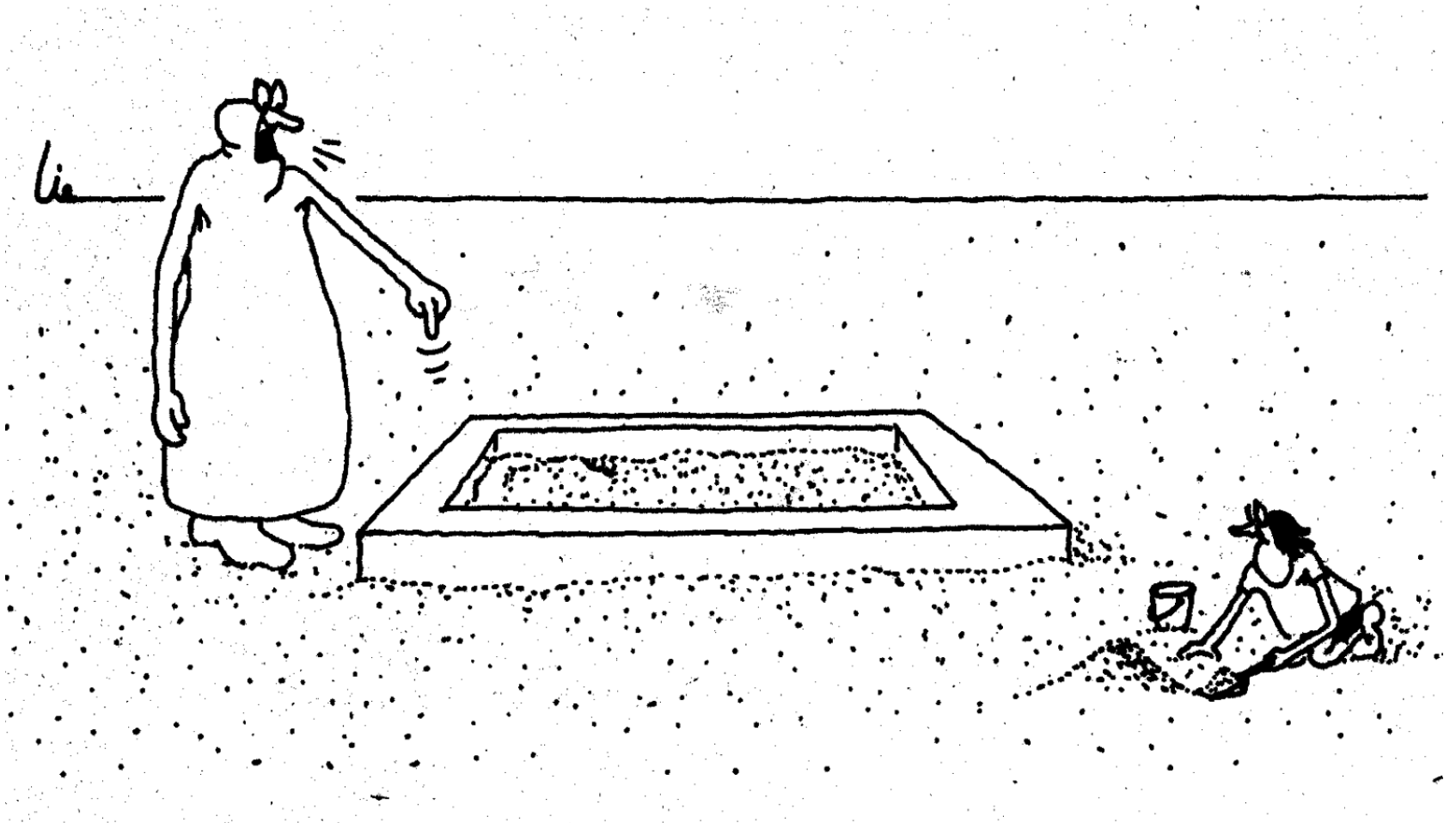
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Relative convenience factor: Outsiders know everything better



Agricultural production costs per acre USA 2013

(according to USDA-ERS, Jan 2014)



Item*/Crop	Corn	Soybean	Wheat	Cotton
Value**	722	540	276	476
Value***	1	-	11	141
Seed	98	59	16	100
Fertilizers	153	38	46	98
Chemicals	29	28	14	70
Total operating costs	356	180	128	497
Total overhead costs (rent, labour..)	321	287	183	307
Value of production	47	73	-25	-186
Value less operation costs	368	360	158	121

*USA 2013, \$ per acre

** Primary product

*** Secondary product (silage, straw, cottonseed...)

Agricultural production costs and revenues for winter wheat in Germany based on 18€/dt

(according to Mann and Brinkmann, praxisnah 3, 2014)



Item	Top farm, soil value ø 62	Average farm, soil value ø 45
Yield	90 dt/ha	72 dt/ha
Value/ha (18 €/dt)	1620 €	1296 €
Direct Payments	280 €	303 €
Seed	70€	60 €
Fertilizer	230 €	240 €
Plant protection	155 €	155 €
Labor	480 €	600 €
Other costs (storage, drying, land rent..)	980 €	1230 €
Value less total costs	+465€/ha	-84€/ha

→ Yield makes the profit



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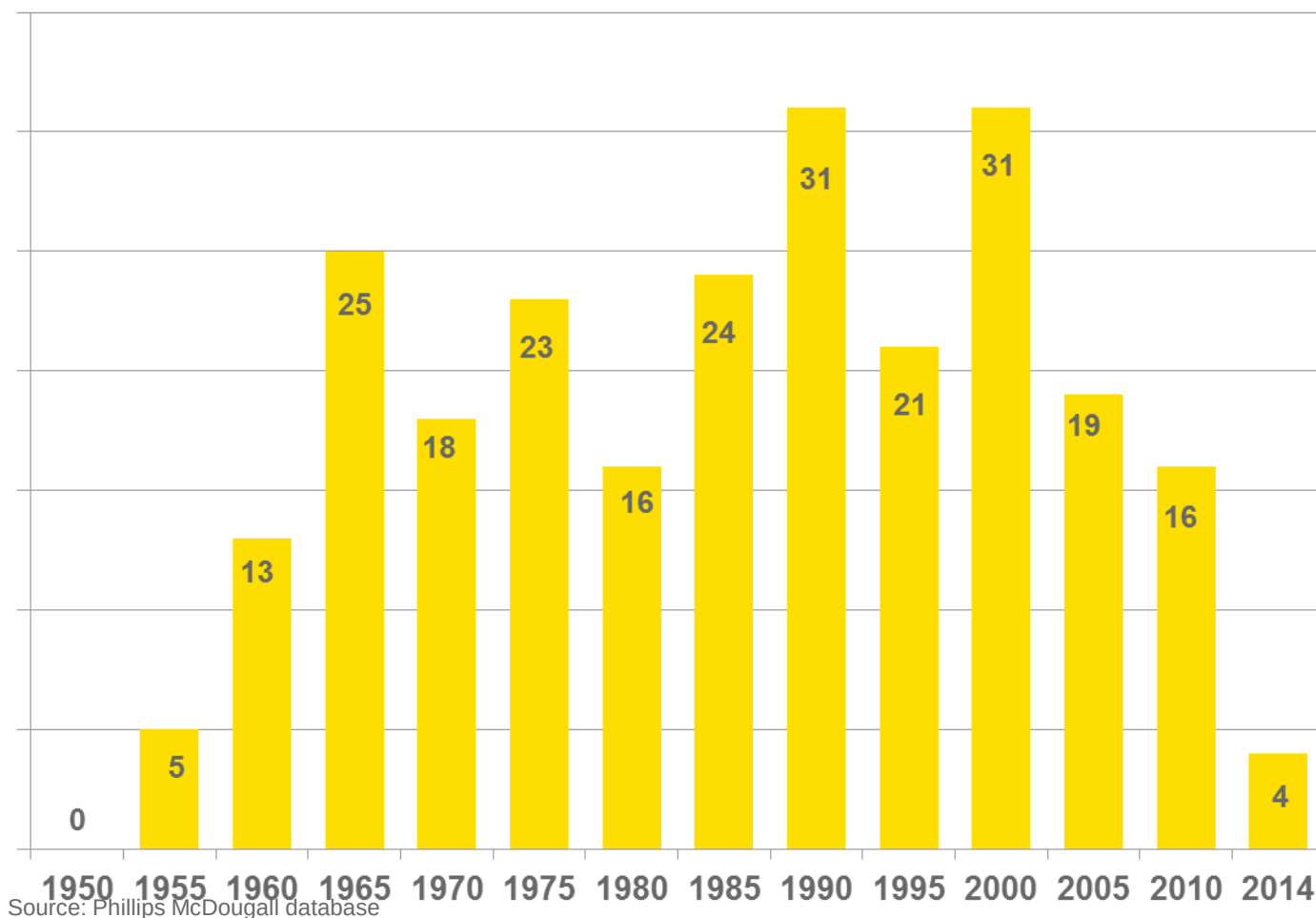


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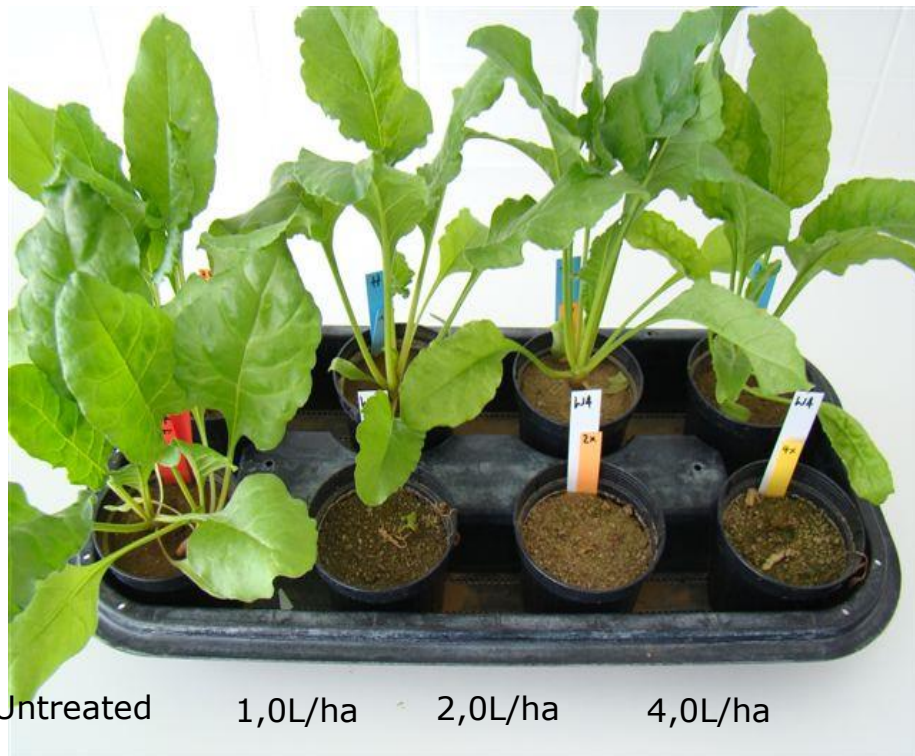
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Herbicide Active Ingredient Launches 1950 -2014



ALS Tolerant Sugar Beet Based on Mutant Selection



ALS tolerant hybrid

Susceptible normal hybrid

Untreated 1,0L/ha 2,0L/ha 4,0L/ha

FSN+TCM co-formulation

▶ After regeneration of plants from cell culture – Tolerance even at 4x rates.

Indaziflam – A New Innovative Herbicide

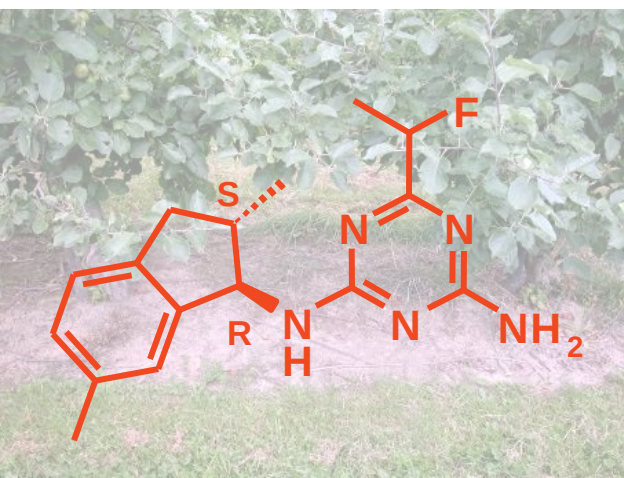
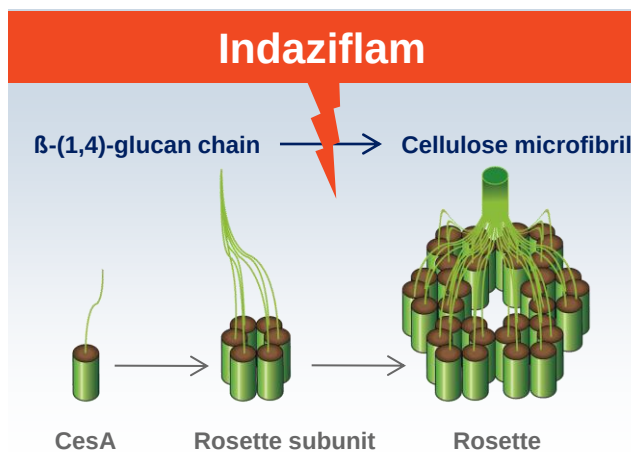
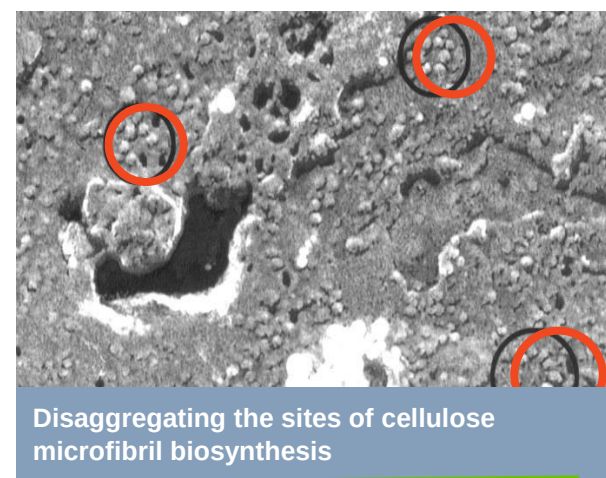
Alkylazine herbicide

Highly effective inhibitor of cellulose biosynthesis (CBI)

Broad spectrum weed control in perennial fruit, nut and grape crops

For annual grasses and broadleaf weeds in turf, ornamentals and industrial vegetations (e.g. golf/lawn care)

Effective tool to manage weed populations resistant to other modes of actions (incl. EPSP, ALS, PSII)



▶ Indaziflam is an innovative herbicide inhibiting cellulose biosynthesis (CBI)



**Thank
you**





Indaziflam Herbicidal Action: A Potent Cellulose Biosynthesis Inhibitor¹[C][W][OPEN]

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Plant Physiology 166, 1177-1185, 2014