United Oilseeds
THE LEADING BREAK CROP SPECIALIST

AHDB

United Oilseeds & AHDB Joint Seminar Networking lunch

Thursday 30 January 2020

United Oilseeds Marketing & AHDB
Oilseed Rape Conference

30 January 2020

The future for IPM

Dr Bill Parker

Head of Technical Programmes

AHDB

Integrated Pest Management
Why Now?

- **Practical**
  - The ‘conventional’ plant protection product toolbox is under pressure
  - Key products are being lost with few/no alternatives
  - Significant resistance issues are arising with no alternatives
- **Legal**
  - A requirement under the EU Sustainable Use Directive
  - Revised pesticides National Action Plan will have IPM focus
- **Environmental**
  - Concerns over biodiversity
- **Economic**
  - Future farm support payment regimes may require greater IPM implementation
- **Social**
  - Pesticide residues
  - ‘Conventional’ plant protection products seen as ‘bad’ by consumers

What is **I**ntegrated **P**est **M**anagement

Integrated Pest Management Plan

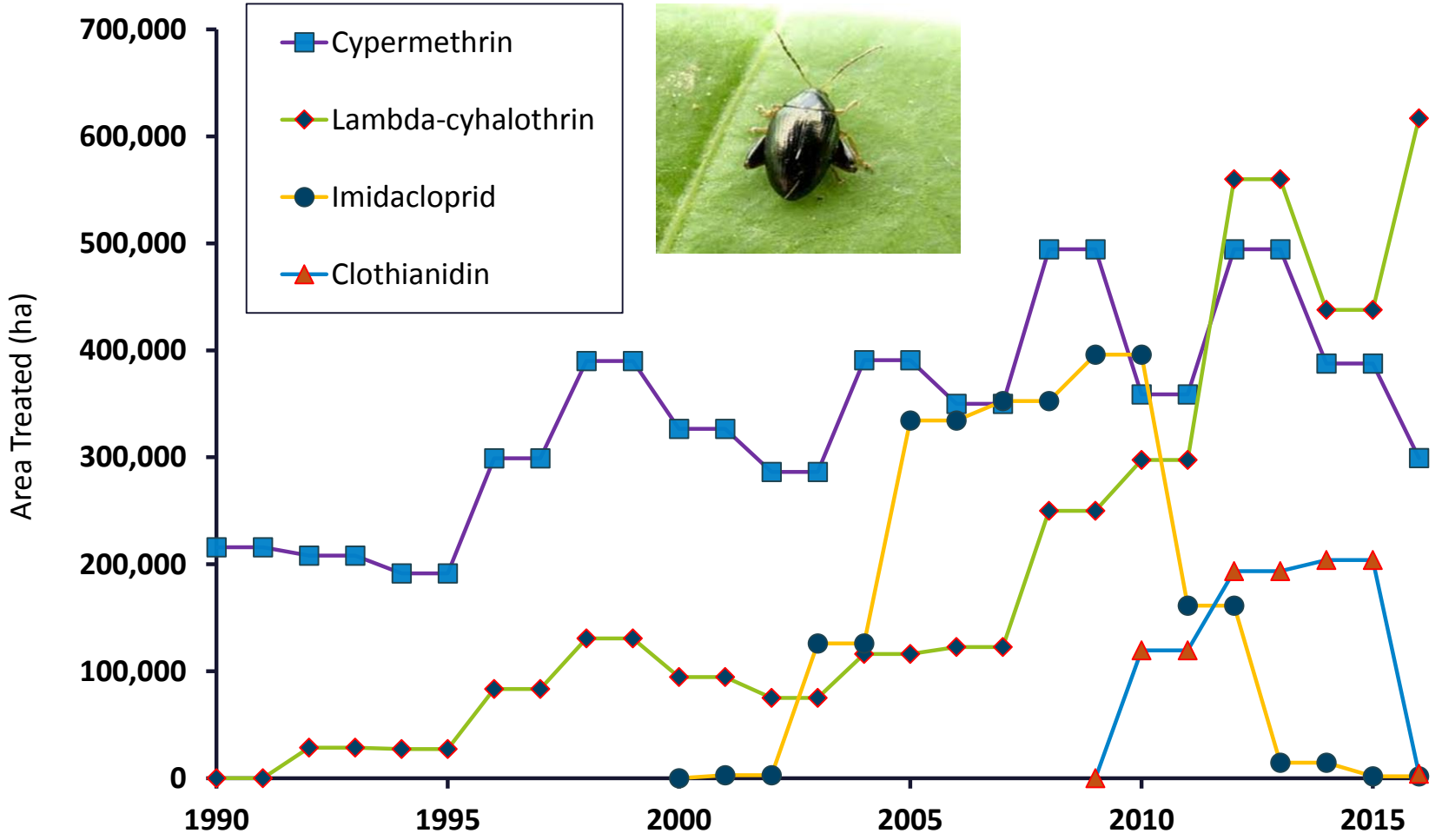
The Voluntary Initiative

LEAF
LINKING ENVIRONMENT AND FARMING
Integrated Farm Management
CROP HEALTH & PROTECTION

IPM – a way of thinking and acting

- **PREVENT – what you do before you drill**
  - Rotation
  - Plant resistance/tolerance to key pests & diseases
  - Soil management
- **DETECT – what, when & how bad**
  - Identifying key pests & diseases in the crop
  - Timely enough to take action ***if necessary***
  - As quick and easy as possible – otherwise you won't do it
- **CONTROL – every tool in the box, but chemistry as a last resort**
  - Consider every option – biological, cultural, physical etc.
  - Don't just reach for the can…
  - Avoid 'insurance' treatments

Insecticide Usage on Oilseed Rape Area Treated1990 – 2016



Pyrethroid resistance in Cabbage Stem Flea Beetle

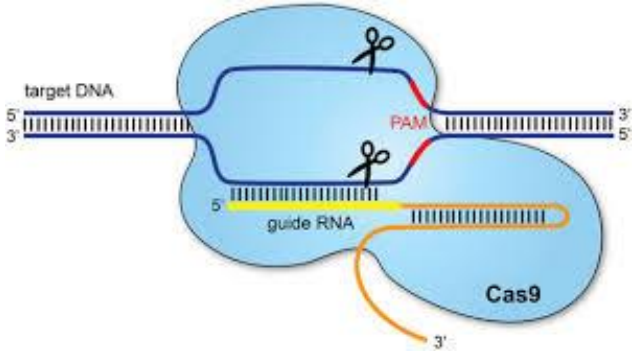
Response to
100% lambda-cyhalothrin
(7.5 g ai/ha) in 2019

ROTHAMSTED RESEARCH

Prevention

Plant genetic science – 150 years in the making

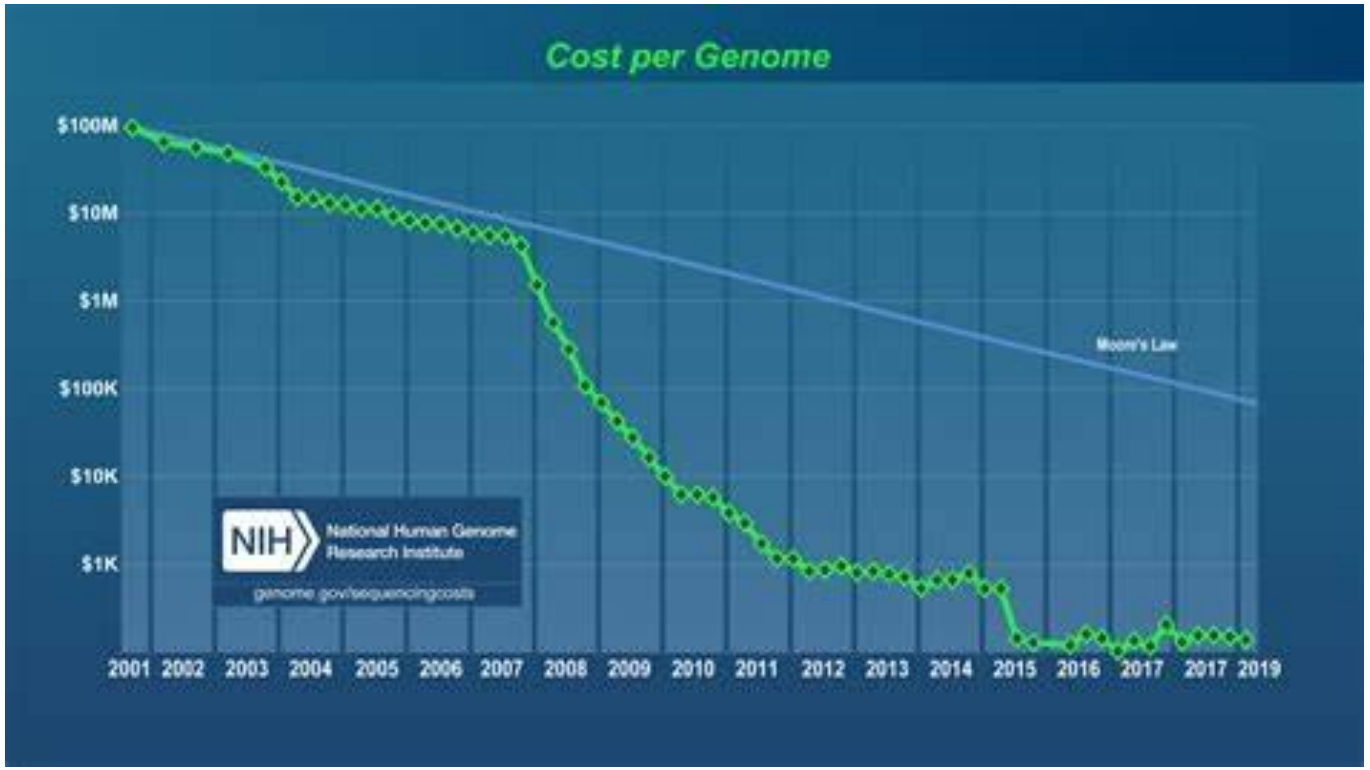
From Mendel (1855)……..to…… CRISPR cas9 (2005)



(Other gene editing techniques are available!)

….and next?

The cost of sequencing a genome vs Moore's Law



Genome sequencing is now fast & cheap…..

Bread **wheat** has one of the most complex **genomes** known to science, containing an estimated 16 **billion base pairs**

…but we have barely scratched the surface

Plant resistance to Cabbage Stem Flea Beetle?

John Innes Centre

- **Research**
  - Screen cruciferous plants to identify varieties which may have some form of resistance (potential trap crops?)
  - Determine the genetic sequence that confers that trait.
  - Seek to introduce resistance trait(s) into oilseed rape.
- **Timescale**
  - Can use GM/gene editing techniques which may speed up gene identification
  - Traits currently still need to be introduced into commercial varieties by conventional breeding
  - On-farm resistance may be some years away

innolea

LG

UKRI Biotechnology and Biological Sciences Research Council

Isn’t gene editing ‘pie in the sky’?

Tropic Biosciences™

We develop high-performing commercial varieties of tropical crops which promote grower wellbeing, enhance consumer health, and improve sustainable environmental practices, using cutting edge genetic editing technologies

calyxt®

A brighter future for food **starts now**.

Food is an integral part of our culture and our well-being. But as our population grows, the demand for food increases, as well as the demand on our earth. At the same time, obesity rates, food-related health issues and allergies are on the rise. At Calyxt, we have the opportunity – and the ethical responsibility – to address these issues head on, making the food you love healthier, sustainable and completely traceable from concept to fork.

Yield10 BIOSCIENCE

Yield10 Bioscience is an agricultural bioscience company focusing on the development of disruptive technologies to produce step-change improvements in crop yield for food and feed crops to enhance global food security. Experts forecast that food production must be increased by over 70% in the next 35 years to feed the growing global population, which is expected to increase from 7 billion to more than 9.6 billion by 2050. Yield10 is focused on new agricultural biotechnology approaches to improve fundamental elements of plant metabolism through enhanced photosynthetic efficiency and directed carbon utilization.

PAIRWISE

Driven by the belief that healthy food should be affordable, convenient, and sustainable, Pairwise is bringing together leaders in agriculture and technology to harness the potential of genome editing to address consumers' and farmers' needs. From developing novel genome editing tools to leveraging the natural genetic diversity of plants, we are working to address challenges facing all of us, today and in the future.

Detection

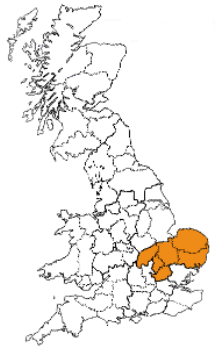
AHDB Light Leaf Spot Forecast Tool

Click name to select area:

- Rest of Scotland
- Moray Firth
- Grampian
- Lothian/Fife/Angus
- Borders and North of England
- East of England
- Wales and the West of England
- East Anglia
- South East of England
- South of England
- South West of England

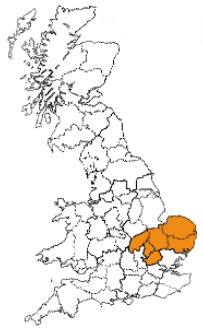
Forecast for East Anglia

Campus (6)



Sowing date:

14th August - 20th August

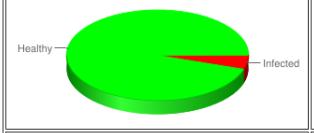
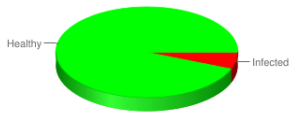


Cultivar resistance rating, 0 - low, 9 - high

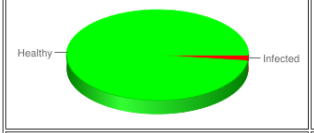
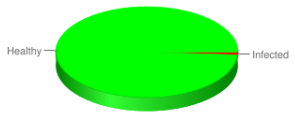
Customized forecast for a farm in East Anglia

Cultivar	Campus
Resistance Rating	6
Week Sown	14th August - 20th August

If no Autumn fungicide spray applied

Percent of Plants Infected.	Percent of Crops Infected.
	
About **5 %** of the plants will be infected.	About **6 %** of the crops will have more than 25% of plants affected by light leaf spot.

If Autumn fungicide spray was applied

Percent of Plants Infected.	Percent of Crops Infected.
	
About **2 %** of the plants will be infected.	About **1 %** of the crops will have more than 25% of plants affected by light leaf spot.

Light leaf spot forecast data

- Final forecasts (2013–19)
- Preliminary forecast (2019/20)

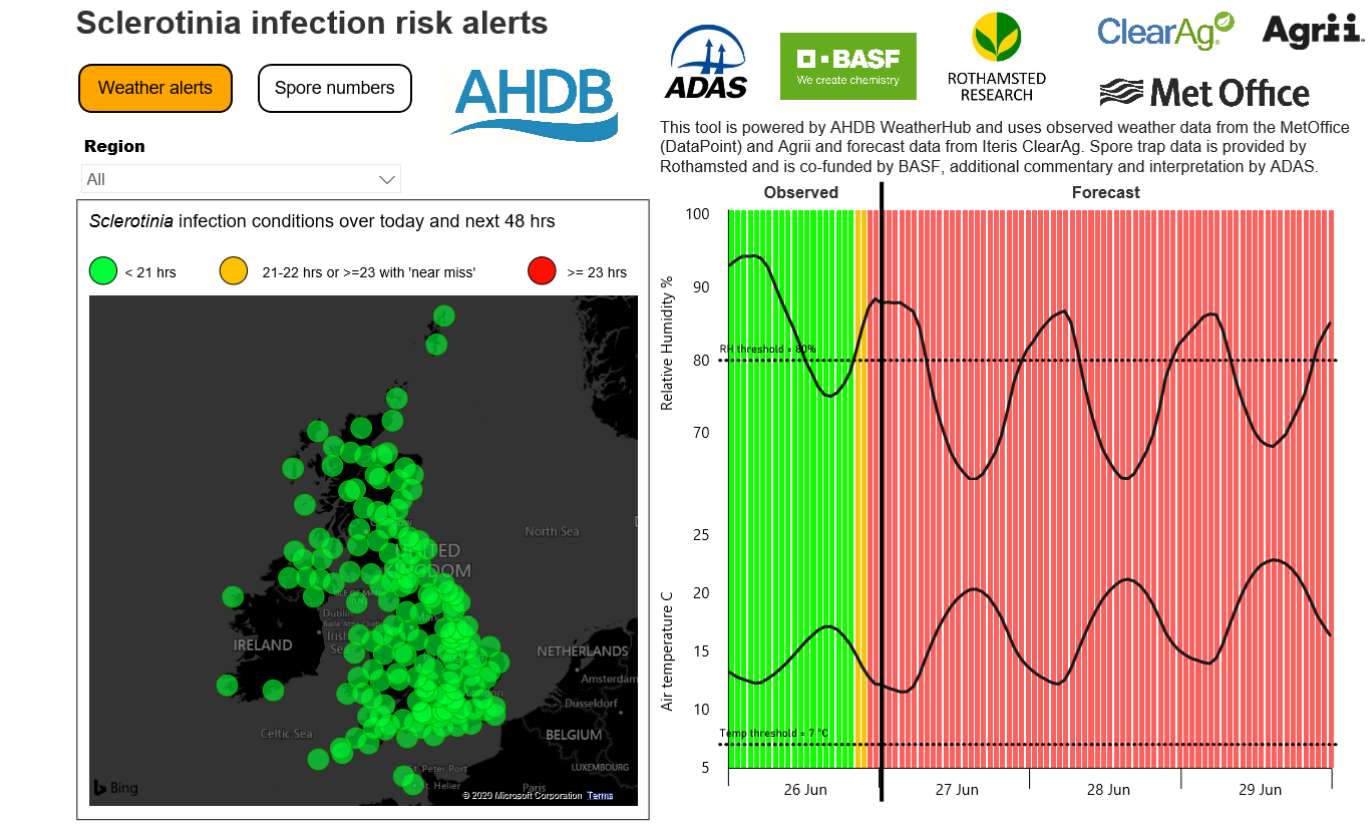
- Issued in autumn, the preliminary forecast shows the proportion of the oilseed rape crop (disease resistance rating of 5) estimated to have more than 25% of plants affected by LLS in the spring.
- The preliminary forecast uses previous season pod incidence data and deviation from the 30-year mean summer (July/August) temperature data.
- In spring, the forecast is updated to account for the deviation in winter rainfall from the 30 year mean.

AHDB Sclerotinia Forecast Tool

Sclerotinia infection risk alert map

A traffic-light system highlights the weather-based sclerotinia infection alert status at UK sites.*

Sclerotinia control products are protectants and should be applied prior to infection (before charts show amber/red)



Automatic fungal spore sampling & identification

- In-field sampling and detection for specific diseases including *Sclerotinia* on oilseed rape
- Samples airborne spores and deposits in analytical equipment.
- On-board analysis detects the amount of spores of a target species in the air during the sampling period.
- DNA analysis techniques used for identification
- Data transmitted by 4G for rapid analysis & reporting

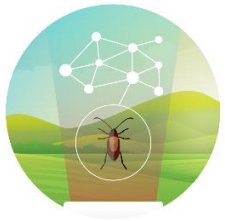
AHDB

UKRI Innovate UK

Burkard Manufacturing Co Ltd

Scientific equipment for Medical, Environmental, Agricultural and Laboratory Sciences

Fauna Photonics



In Field Automated Data Collection

Cloud Database and Machine Learning

Digital Platform Integration

Precision Spraying

- **Integration of:**
  - Novel optical sensors identifying insects by wingbeat frequency including pollen beetle, stem weevil & seed weevil on oilseed rape.
  - Machine learning algorithms to classify data
  - Precision spraying application
- **Timescale**
  - Now to next couple of years

Control

Control – what is coming next?

- Varieties with greater resilience/resistance to pests & diseases
  - Without gene-editing this could take time
- Conventional chemistry is NOT dead
  - New products will appear
  - Good stewardship by everyone is essential
- More ‘biological’ options will appear but….
  - Not a direct replacement for conventional chemistry
  - Will require a higher level of knowledge & management
- Will need to understand what works & why
  - Data sharing & ‘big data’ analysis will be essential

Putting the ‘I’ in IPM

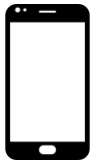
- **Gathering data & assessing risks and trade-offs**
  - Build on what we already know – but apply in a different way
- **Judging risk is a combination of experience and data**
  - On-farm ‘experience’ needs to be measured, pooled and analysed
  - ‘Big data’ analytics will be required
- **Data, data everywhere but what is really useful?**
  - Where are we data poor where being data rich would enable a better decision/risk calculation?
- **Farmers, growers & agronomists must have confidence**
  - Data sharing is the way forward but issues of ownership, trust and commercial sensitivity need to be resolved.
  - Who does the analysis?

GROWER OWNED & GOVERNED
GiSC is the only grower-owned and governed data cooperative that encourages better management decisions. **By aggregating and analyzing data, growers are able to utilize their data to gain business insights** through our partnerships with experienced technology companies that have game-changing tools.

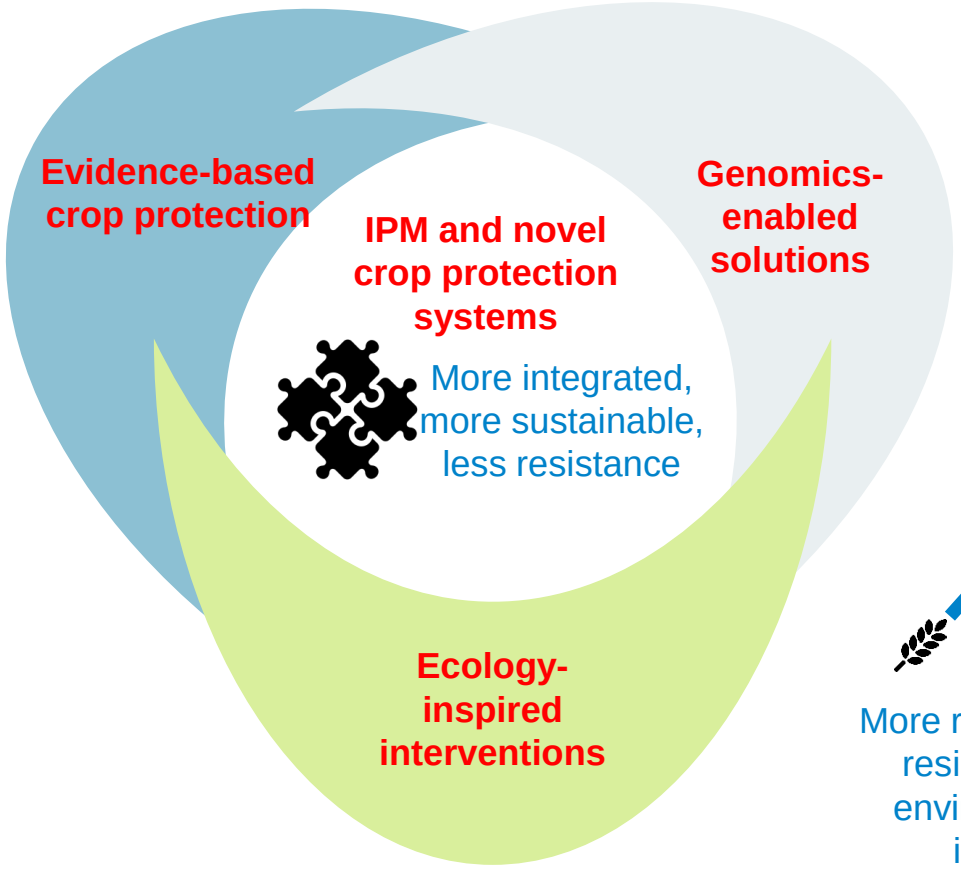
GiSC

One Crop Health:

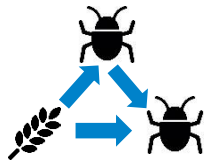
Less chemistry, fewer pests, weeds & diseases



More data, more timely, more precise



New knowledge, new targets, new tools



More robust, more resilient, less environmental impact

A lesson from history?

- Implementation of almost everything in commercial growing depends on cooperation between the researcher, the agronomist and the progressive farmer/grower.
- The researcher must respect the risks taken by the agronomist — the agronomist carries the risk of failure after all.
- New methods must be technically sound and feasible for the farmer/grower i.e. as simple and short as possible. Possibly less critical if benefits are large.
- Cost:benefit analysis is required
- Growers/Farmers will be increasingly seen as ‘progressive’ if they reduce pesticide use

J Theunissen & H van Ouden, 1985. P*rogress on Pest Management in Field Vegetables.* Edited by R. Cavallo.