



Department of
Primary Industries and
Regional Development



A flexible framework for foliar disease modelling for profitable fungicide management

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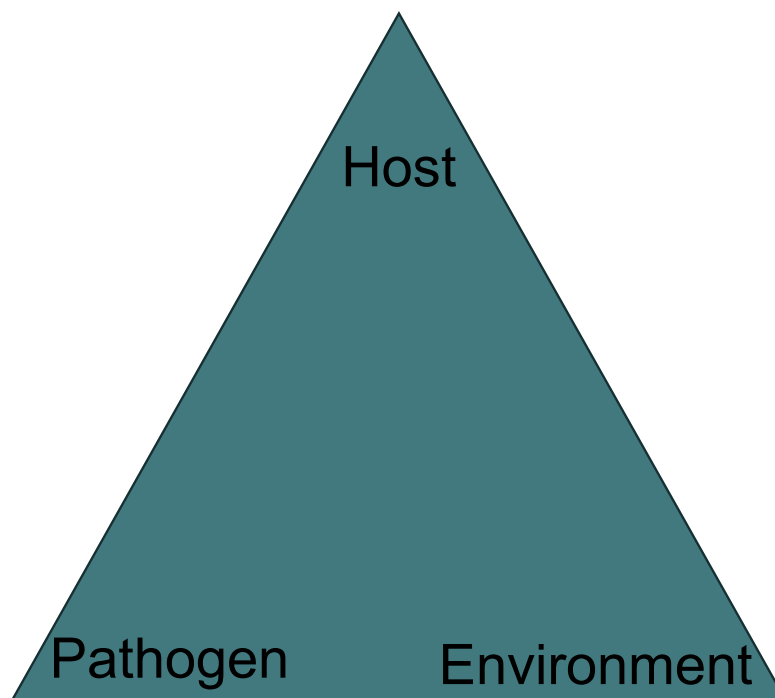
Overview



- Foliar Disease management
- Decision support tools
- Flexible framework
- Disease modelling project
- Future development

Foliar Disease management

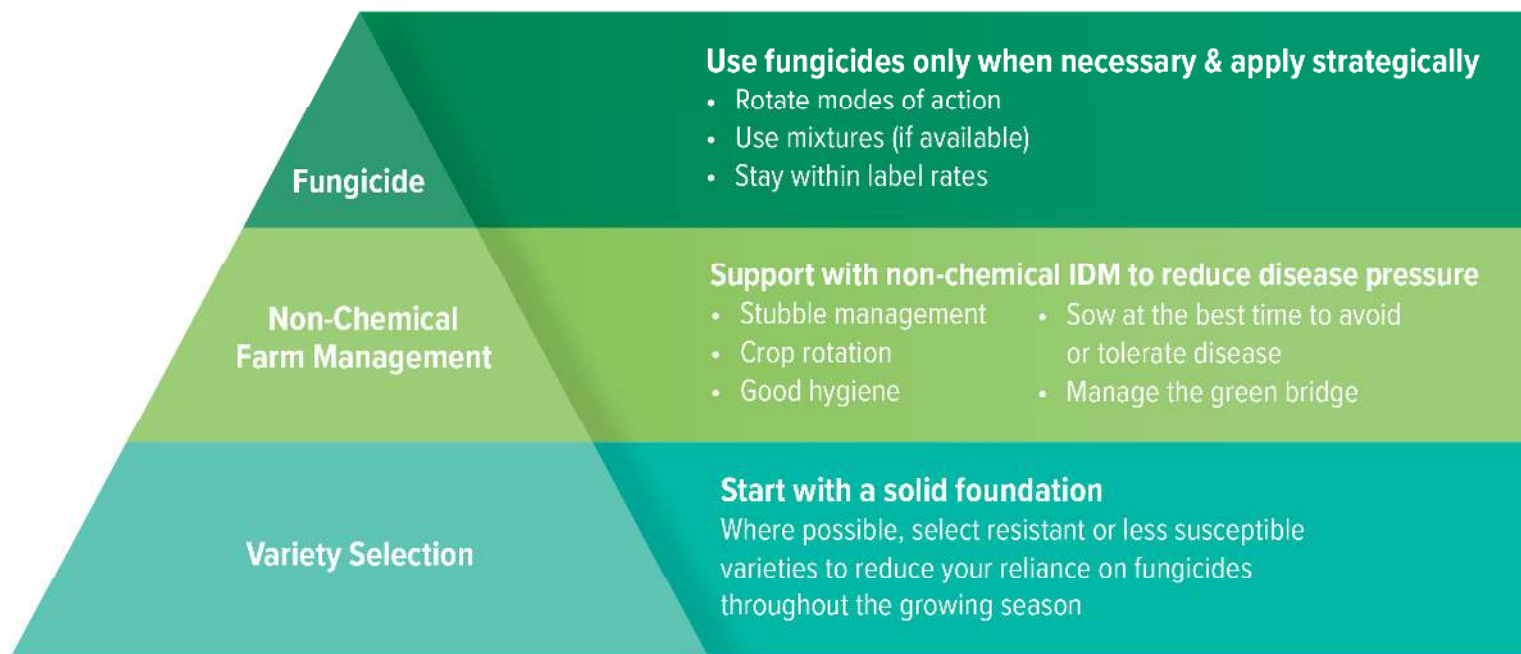
- Variety resistance
- Phenological stage



- Virulent strain
- inoculum present
 - Rotation
 - Stubble
 - Green-bridge
 - Local observation

- Rainfall
- Temperature
- Micro-climate
 - Soil type
 - Canopy density

Integrated Disease Management



Source: AFREN

<https://grdc.com.au/resources-and-publications/all-publications/paddock-practices/2022/west/november/paddock-practices-variety-selections-for-fungal-disease-management-in-2023>

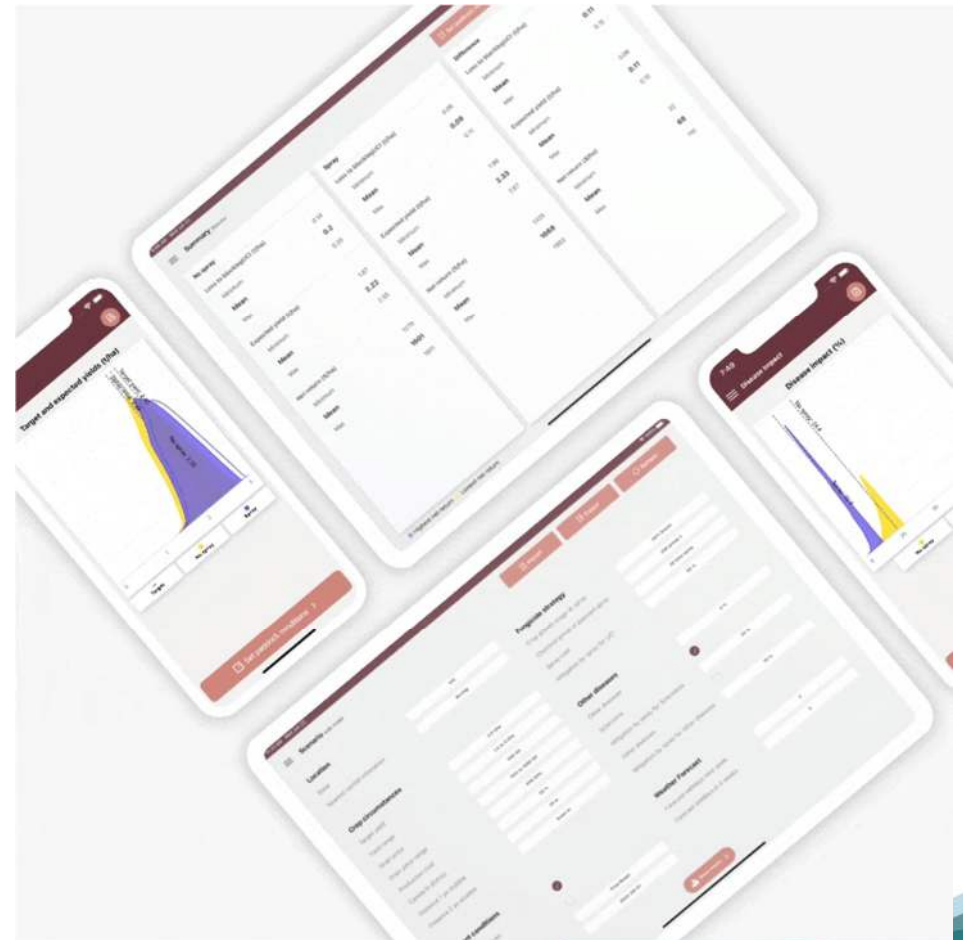
Foliar Disease Management

- Disease management is complex.
- Disease occurrence is unpredictable
- Rapid progression is possible under ideal conditions



Decision Support Tools (DSTs)

- Improve decision making where knowledge is limited or uncertain
- Integrate knowledge from multiple sources
- Facilitate knowledge transfer

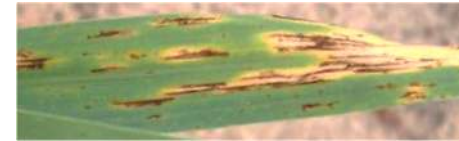


NetBlotchBM

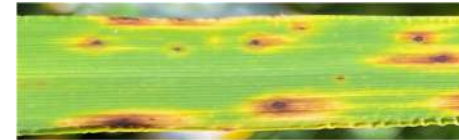


- *Pyrenophora teres*.

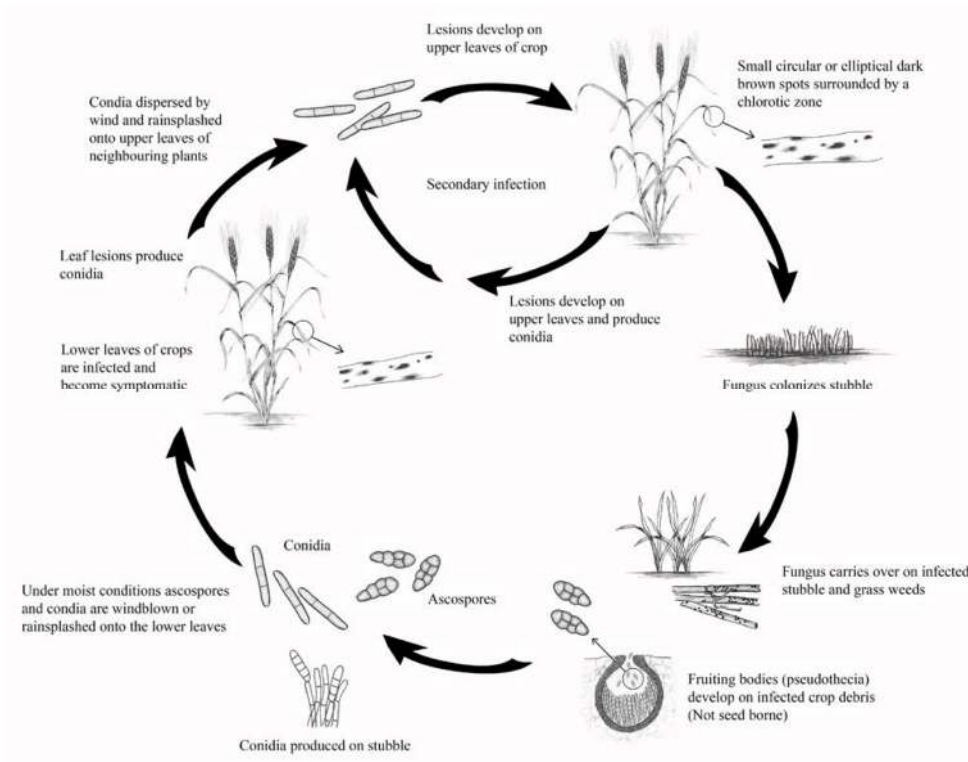
- Net-form



- Spot-form



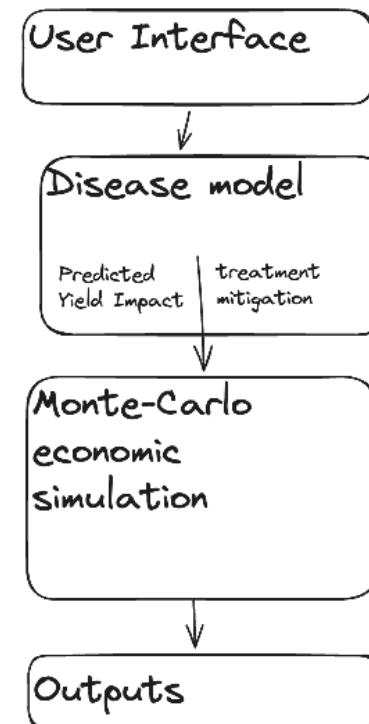
- Initial inoculum from infected stubble
- Rainfall required for spore dispersal and leaf infection
- Secondary infection impacts developing leaves.



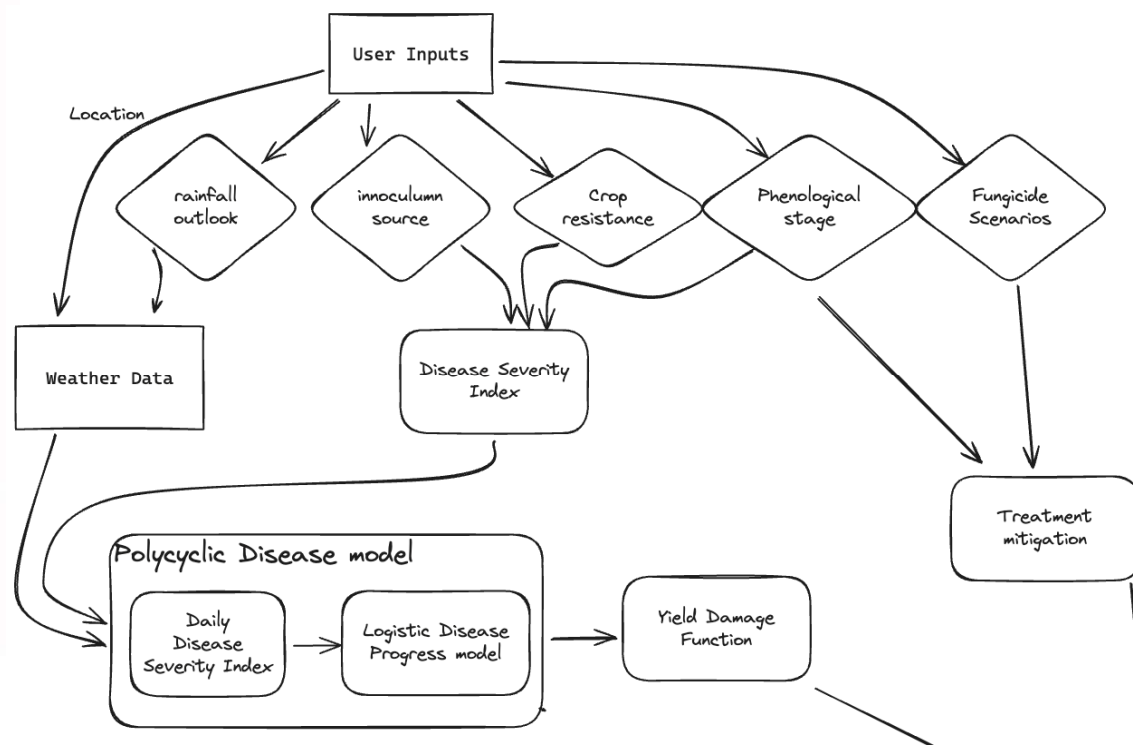
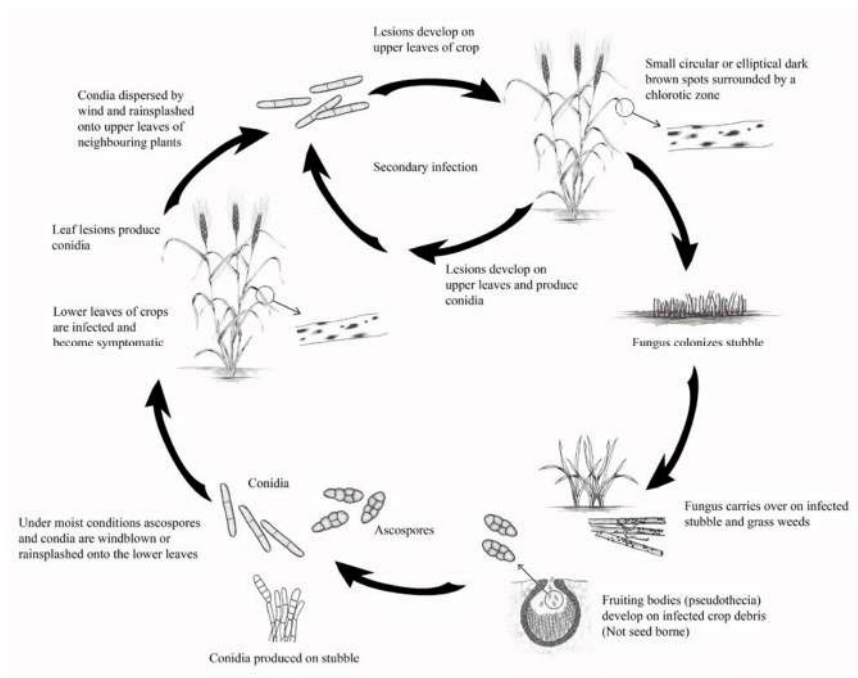
Source: Agriculture Victoria (2022) Identification & Management of Field Crop Diseases in Victoria

Unified Software Framework for Multiple Diseases

- Three high level modules were identified:
 - User-interface (front-end)
 - Disease model
 - Economic simulation



NetBlotchBM - Disease Model



Model example - inputs

- Epidemiological parameters are collected.

< Back Scenario

Location

State WA

Nearest rainfall information Badgingarra

Crop condition

Disease form Spot

Variety Spartacus CL [S]

Crop growth stage 3rd node [Z33]

Disease severity 10% leaf area infected

Barley in this paddock Last year

Stubble burnt

Stubble variety Spartacus CL [S]

Weather forecast

Seasonal rain forecast Average

Forecast wet days next week 4 of 7

Model example - inputs

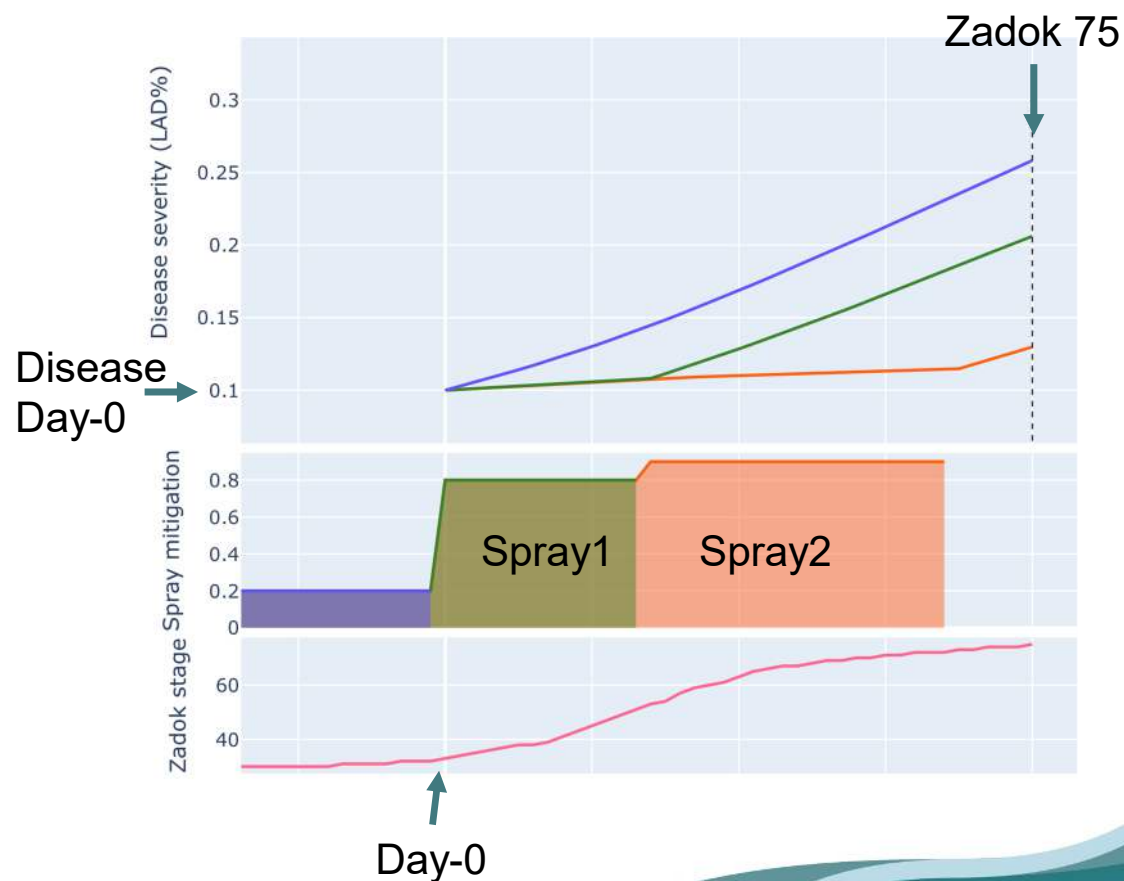
- Fungicide strategies can be evaluated.
- Each fungicide has:
 - Time of application
 - Chemical group
 - Protection period
 - Cost.

The screenshot shows a mobile application interface for configuring fungicide scenarios. At the top, there is a dark teal header with a back arrow and the word "Scenario". Below the header, the interface is organized into sections with input fields for various parameters. The "protection period" is set to "15 weeks". The "Previous foliar sprays" section shows "Number of sprays" set to "0". The "Fungicide strategy" section is divided into "1st spray" and "2nd spray". For the "1st spray", the "Time of application" is "Now", the "Chemical group" is "DMI Group 3", the "Protection period of 1st spray" is "3 weeks", and the "Spray cost" is "40 \$/ha spray". For the "2nd spray", the "Time of application" is "in 3 weeks", the "Chemical group" is "DMI Group 3", the "Protection period of 2nd spray" is "2.5 weeks", and the "Spray cost" is "40 \$/ha spray".

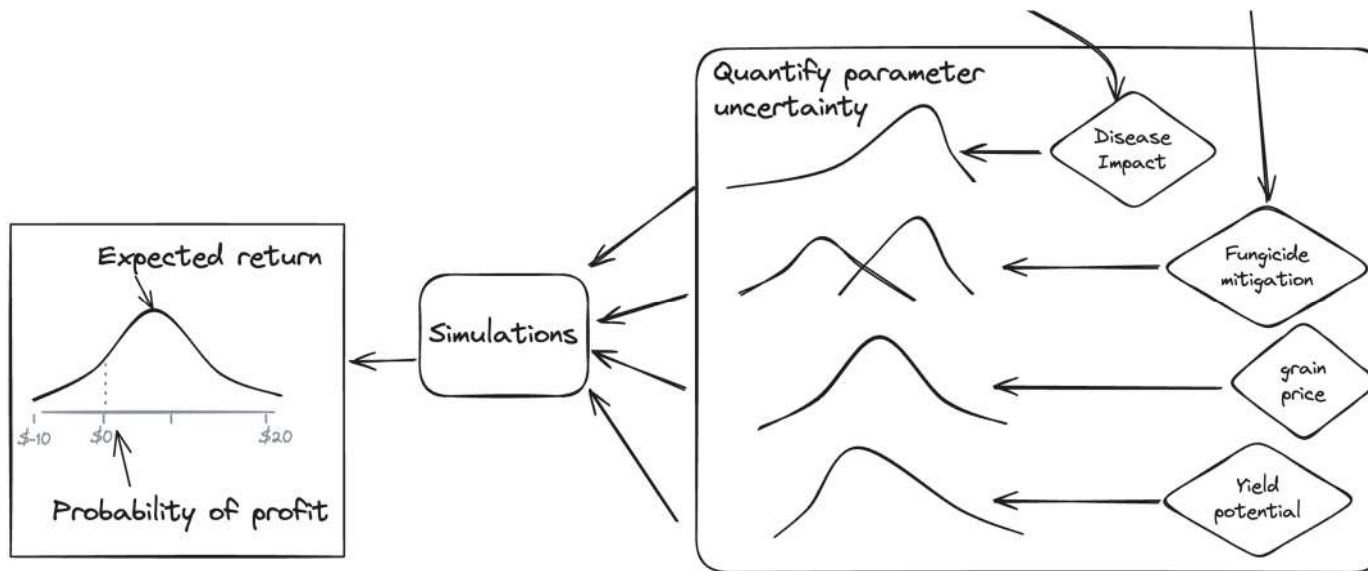
Scenario	
protection period	15 weeks
Previous foliar sprays	
Number of sprays	0
Fungicide strategy	
1st spray	
Time of application	Now
Chemical group	DMI Group 3
Protection period of 1st spray	3 weeks
Spray cost	40 \$/ha spray
2nd spray	
Time of application	in 3 weeks
Chemical group	DMI Group 3
Protection period of 2nd spray	2.5 weeks
Spray cost	40 \$/ha spray

Model example – results

- The progress of disease is simulated.
- This is used to estimate yield impact.



Economic Model

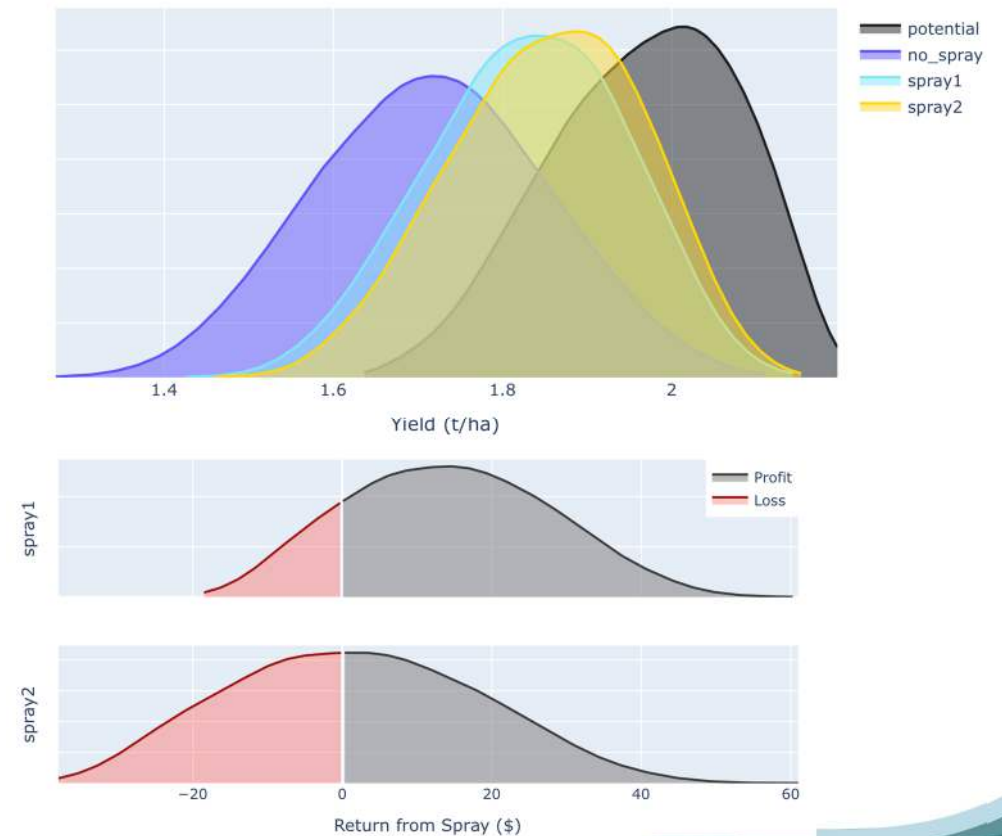


Crop circumstances

Target yield	3 t/ha
Yield range	2.4 to 3.3 t/ha
Grain price	300 \$/t
Price range	270 to 330 \$/t
Cost of production	400 \$/ha

Economic Model – results

- Incorporates uncertainty in the estimates.
- Economic threshold for action dependent on yield and grain price.



Foliar Disease Modelling Project

- **DPIRD, GRDC Co-investment**

Disease epidemiology, modelling and delivery of management decision support tools
DAW2112-002RTX

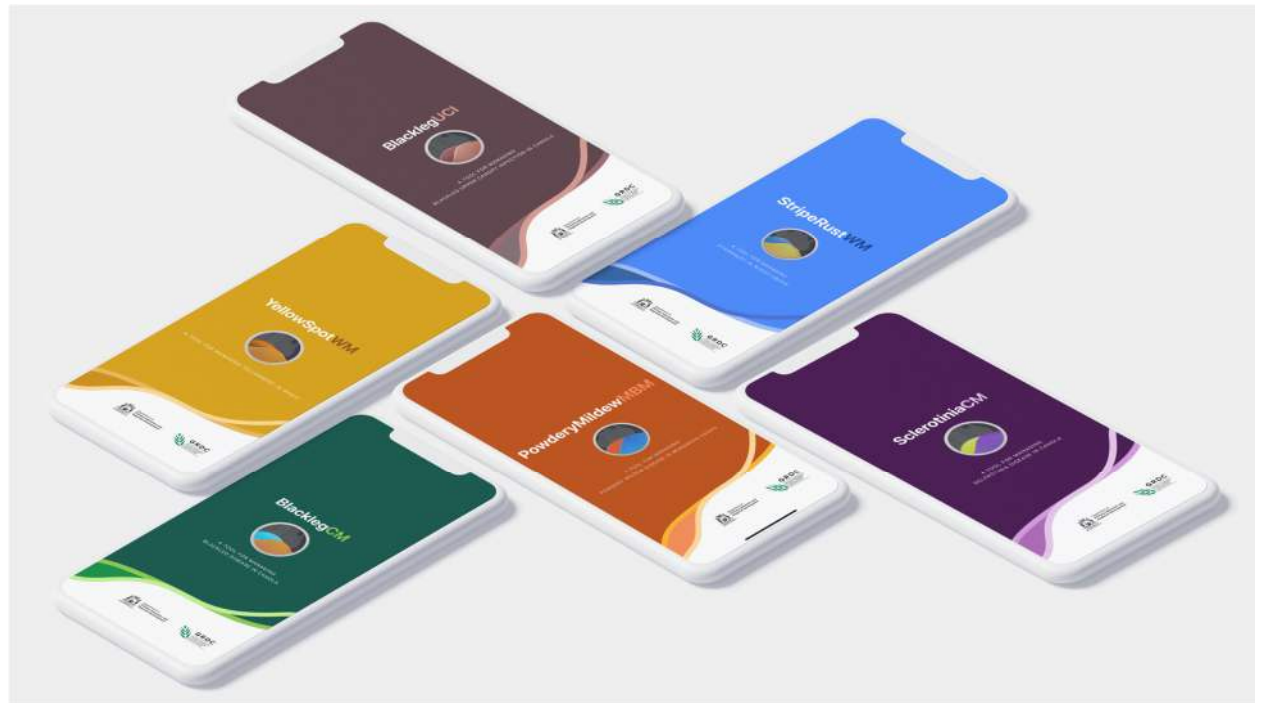
- **Decision Support Tools (DST) for mid-season tactical decision making.**

- **7 apps currently available**


- Stripe Rust - Wheat
- Yellow spot - Wheat
- Blackleg - Canola
- UCI-Blackleg - Canola
- Sclerotinia - Canola
- Powdery Mildew - Mung Bean
- Net Blotch - Barley

- **Other tools also produced**

- Blackleg sporacle
- Blackspot manager
- Blackspot.sp



Future development

- Unification of apps into crop-specific apps
 - Canola
 - Wheat
 - Online functionality
 - Reduce requirement for manual input
 - More accurate weather observation / forecast (defaults)
 - Delivery of models to third-party providers via API.
- 

Acknowledgements

Modelling

Anna Hepworth, Rodrigo Pires , Balwinder Singh, Adam Sparks, Jean Galloway

Development

Brad Baxter, Jason Bradley, Steve Collins, Matt Foster, Tara Garrard, Andrea Hills, Fumie Horiuchi, Kith Jayasena, Liz Mackle, Mark McLean, Paul Melloy, Jimmy Ng, Steven Simpfendorfer, Lisle Snyman, David Stead, Geoff Thomas, Steve Marcroft.



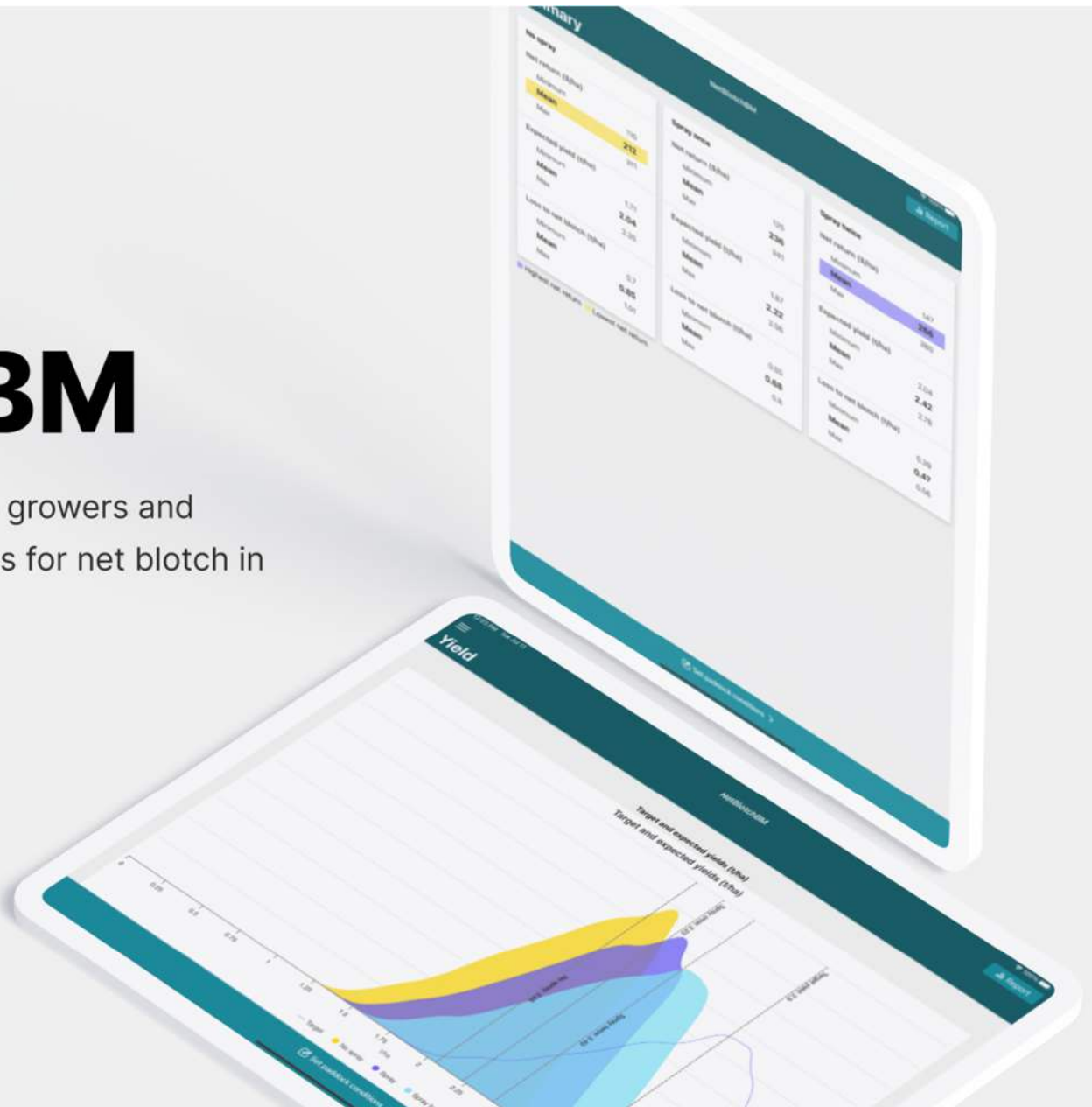


NetBlotchBM

NetBlotchBM is a tool designed to help growers and consultants with management decisions for net blotch in barley infections in Australia.



Scan QR Code



Thank you

dpird.wa.gov.au    

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