Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

A flexible framework for foliar disease modelling for profitable fungicide management

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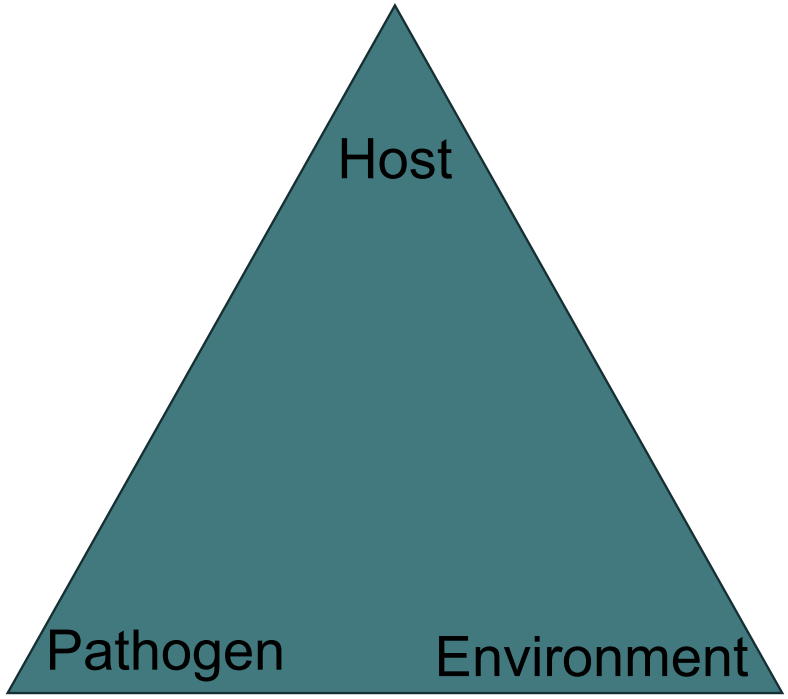
Overview

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

Foliar Disease management

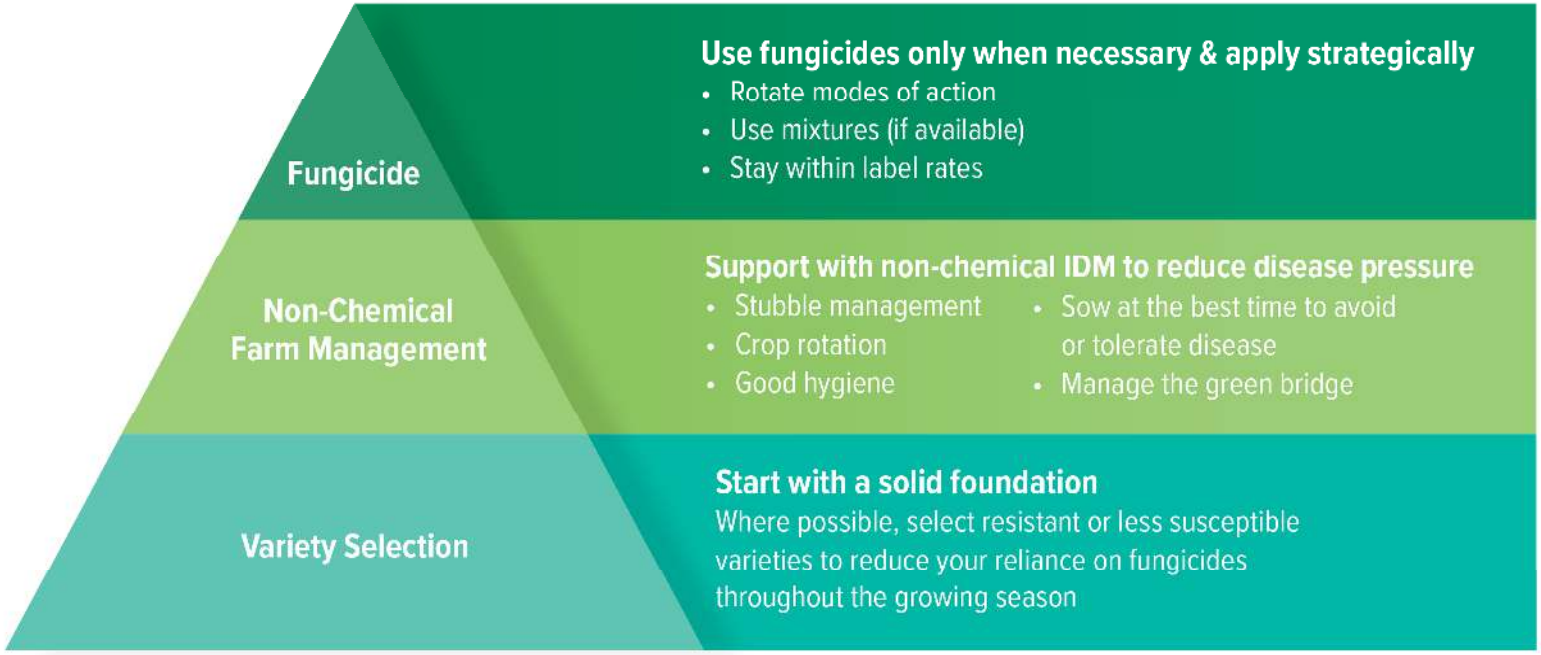
- Variety resistance
- Phenological stage



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

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

Integrated Disease Management



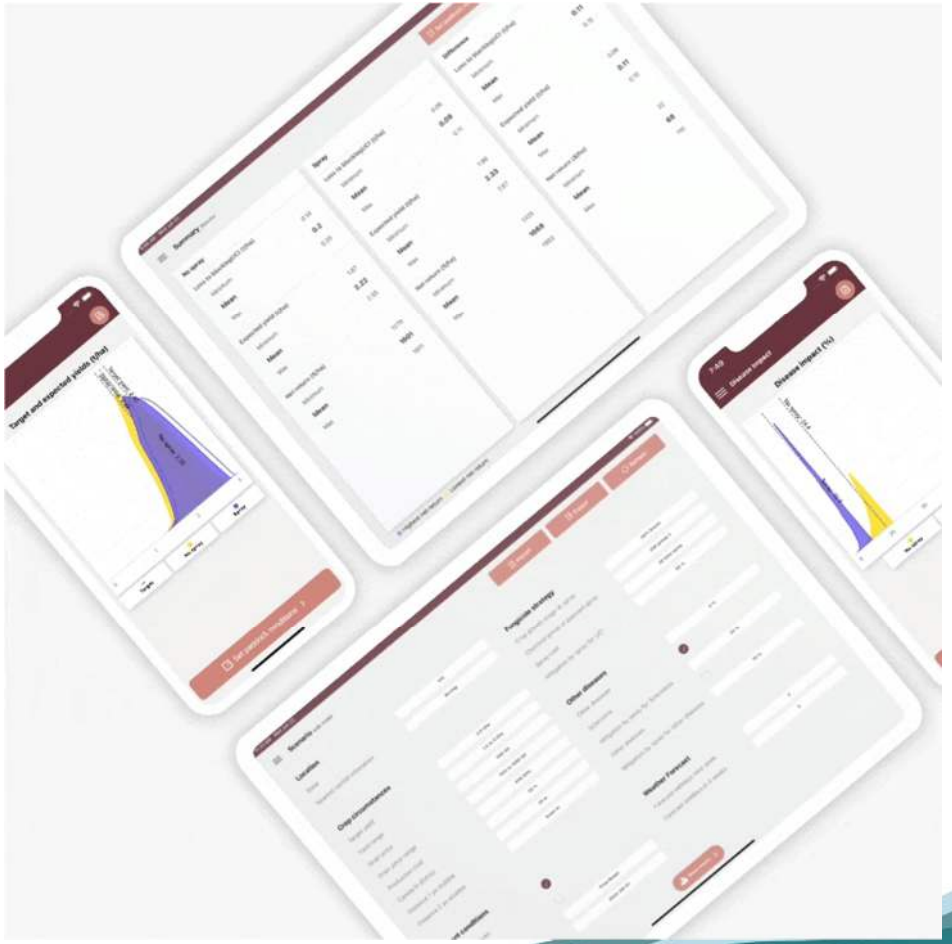
Source: AFREN
https://grdc.com.au/resources-and-publications/all-publications/paddock-practices/2022/west/november/paddock-practices-variety-selections-for-fungal-disease-management-in-2023

Foliar Disease Management

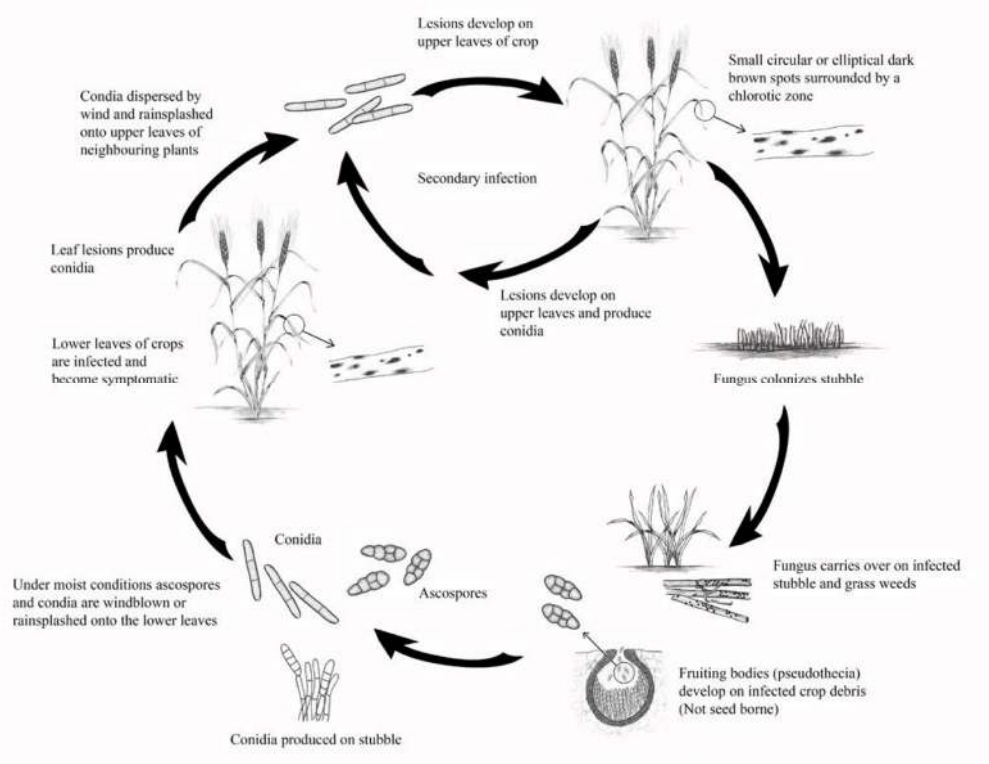
- Disease management is complex.
- Disease occurrence is unpredictable
- Rapid progression is possible under ideal conditions

Decision Support Tools (DSTs)

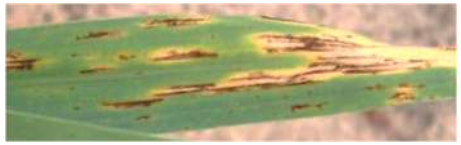
- Improve decision making where knowledge is limited or uncertain
- Integrate knowledge from multiple sources
- Facilitate knowledge transfer



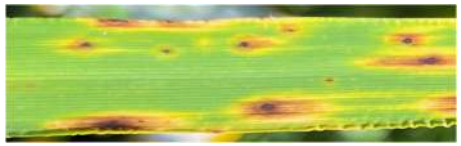
NetBlotchBM



- *Pyrenophora teres.*
  - Net-form



  - Spot-form

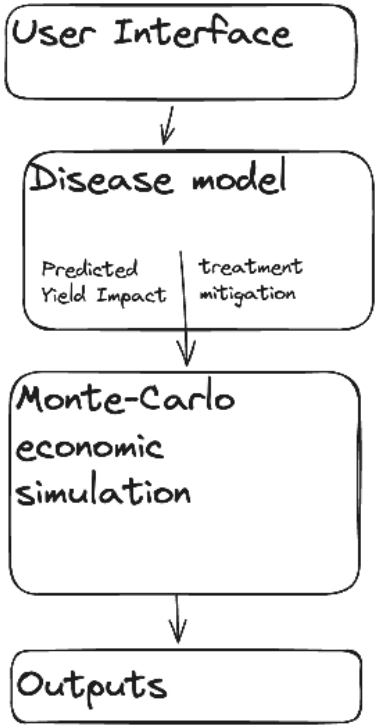


- Initial inoculum from infected stubble
- Rainfall required for spore dispersal and leaf infection
- Secondary infection impacts developing leaves.

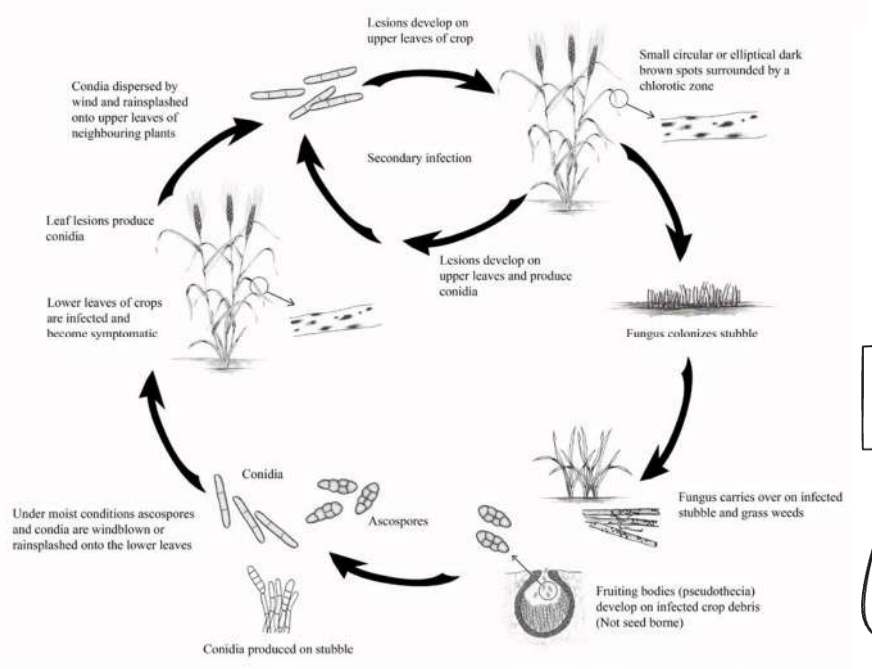
Source: Agriculture Victoria (2022) Identification & Management of Field Crop Diseases in Victoria

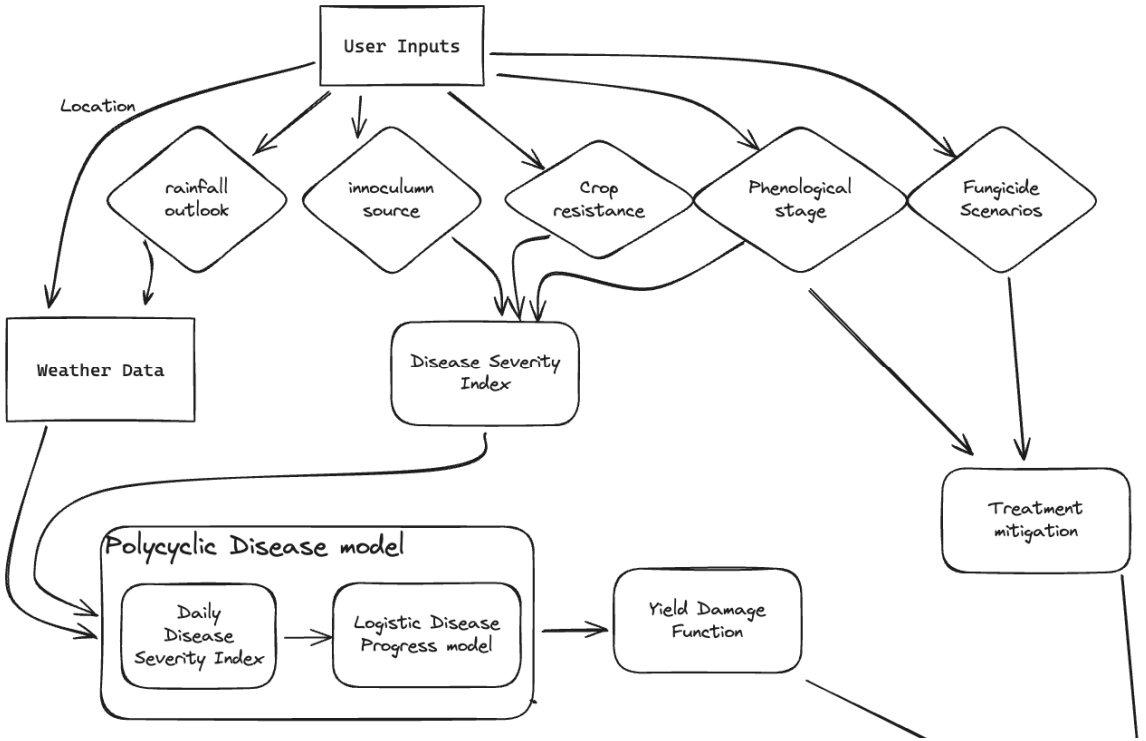
Unified Software Framework for Multiple Diseases

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



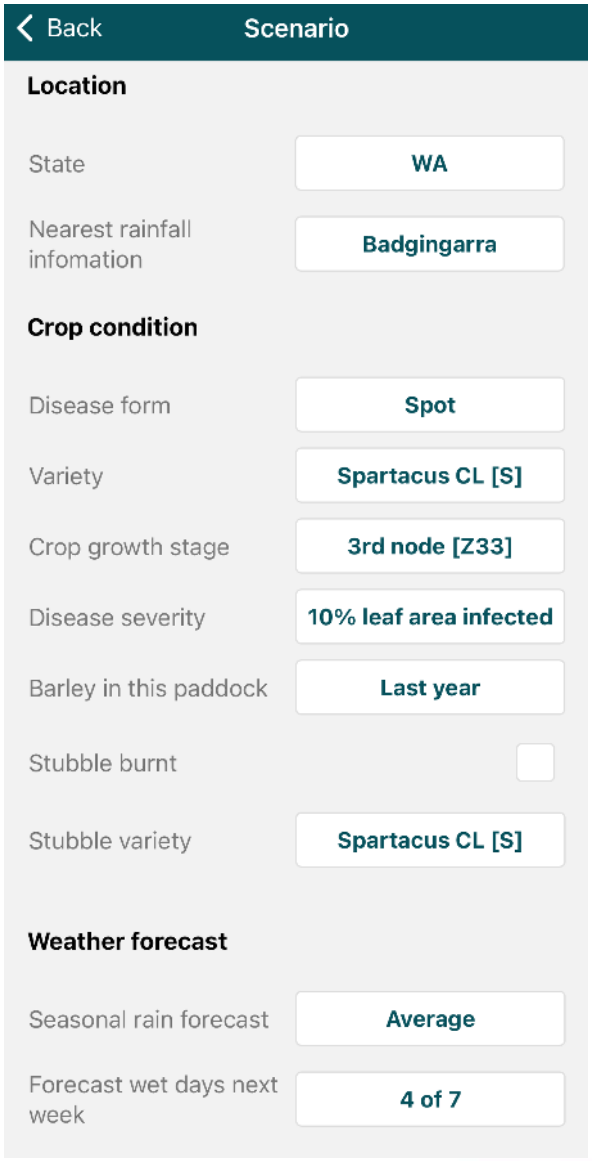
NetBlotchBM - Disease Model





Model example - inputs

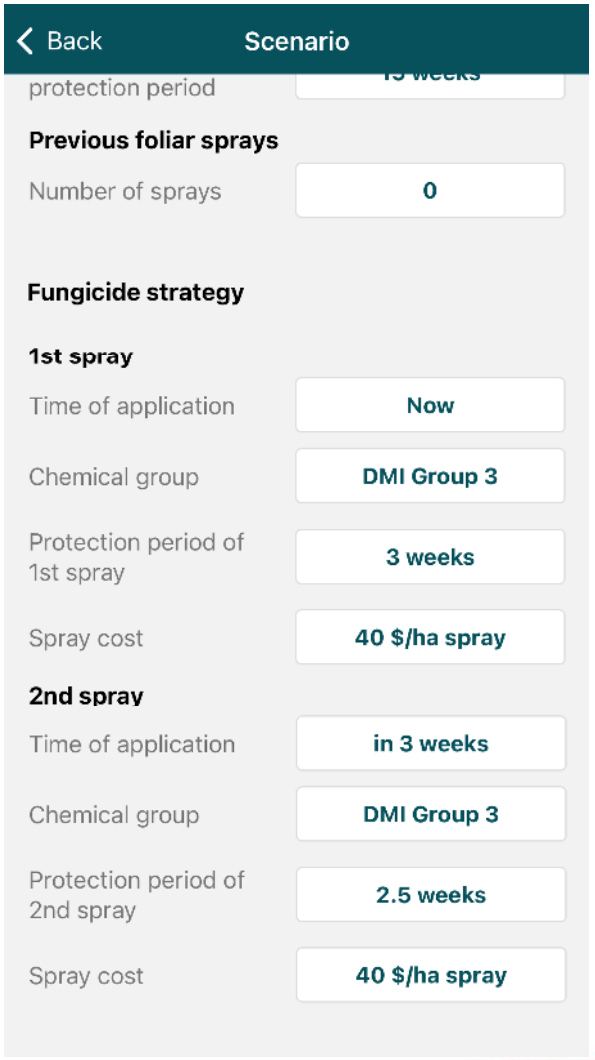
- Epidemiological parameters are collected.



Model example - inputs

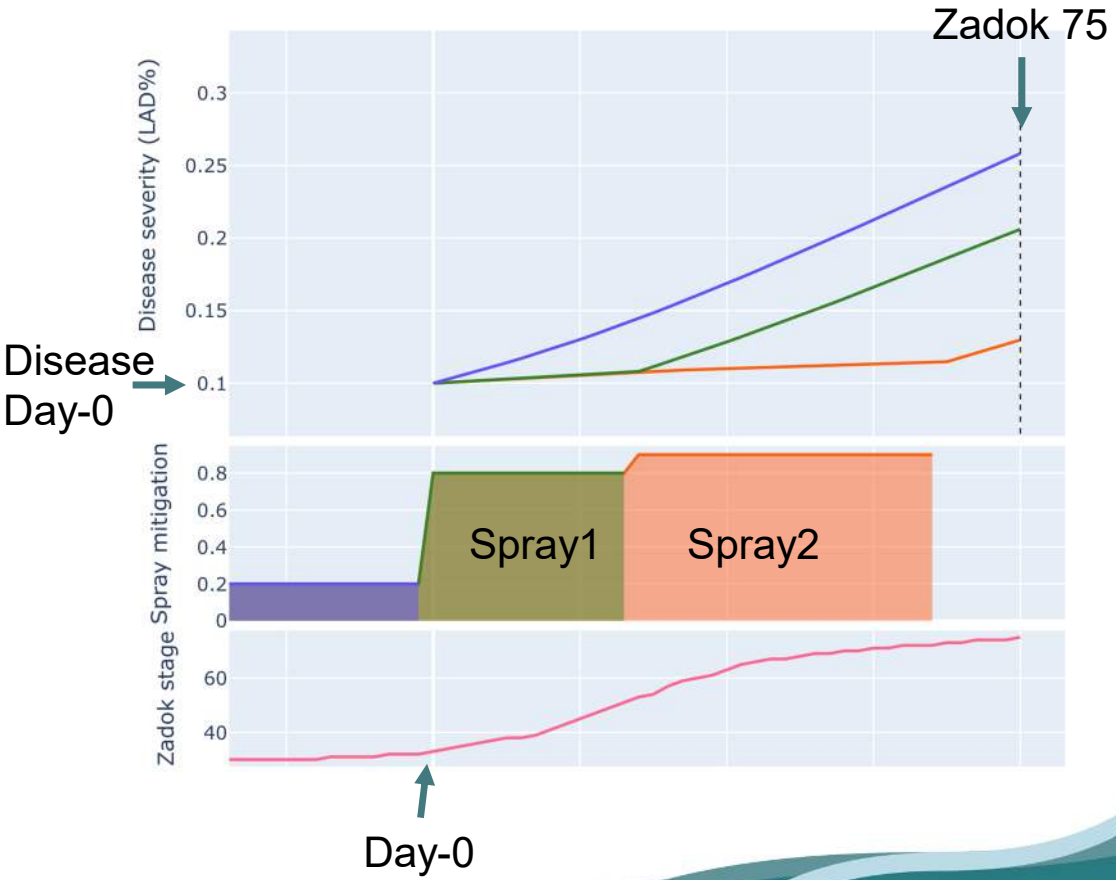
- Fungicide strategies can be evaluated.

- Each fungicide has:
  - Time of application
  - Chemical group
  - Protection period
  - Cost.

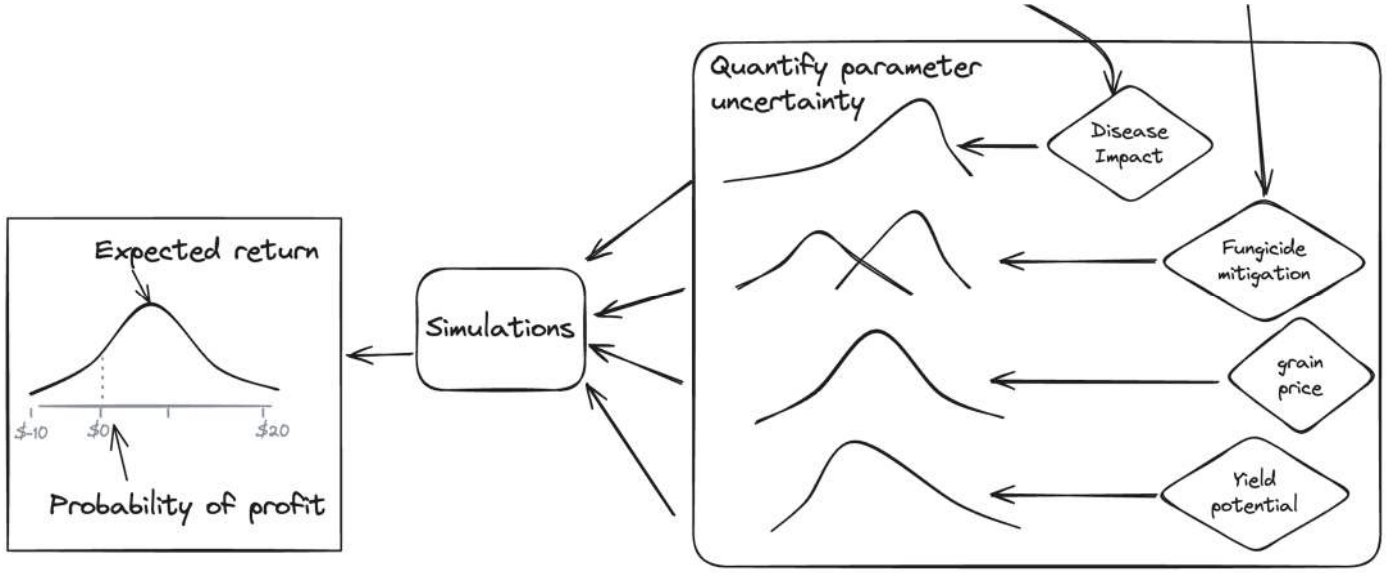


Model example – results

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



Economic Model

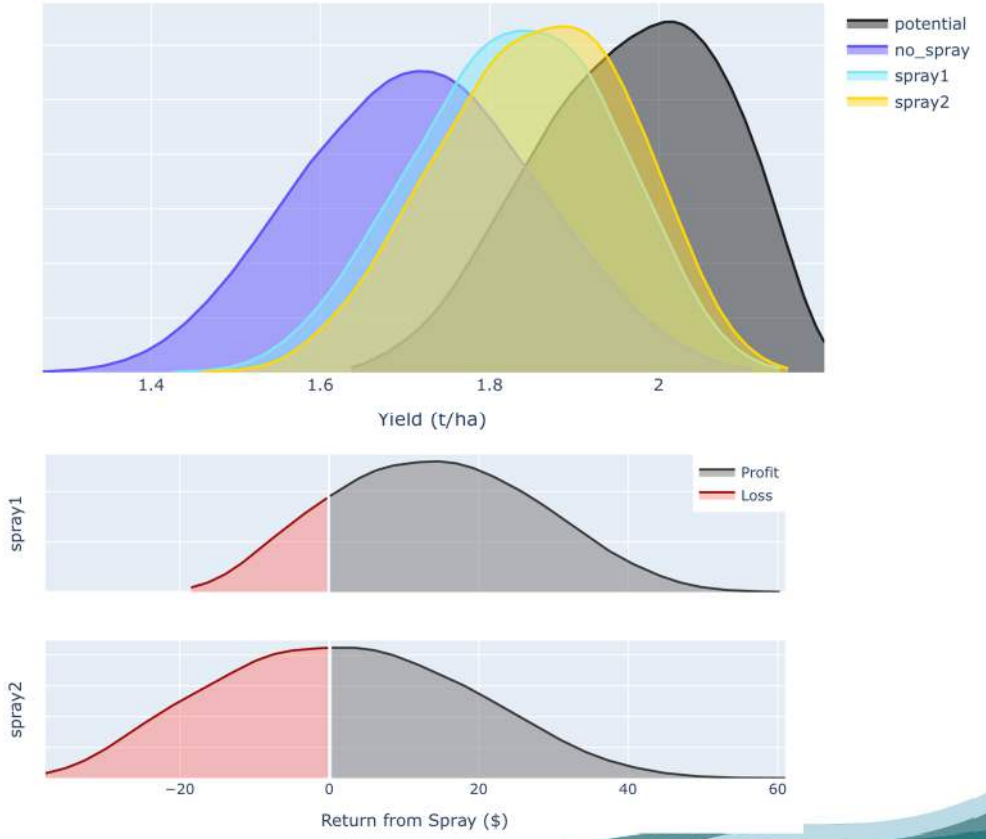


Crop circumstances

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

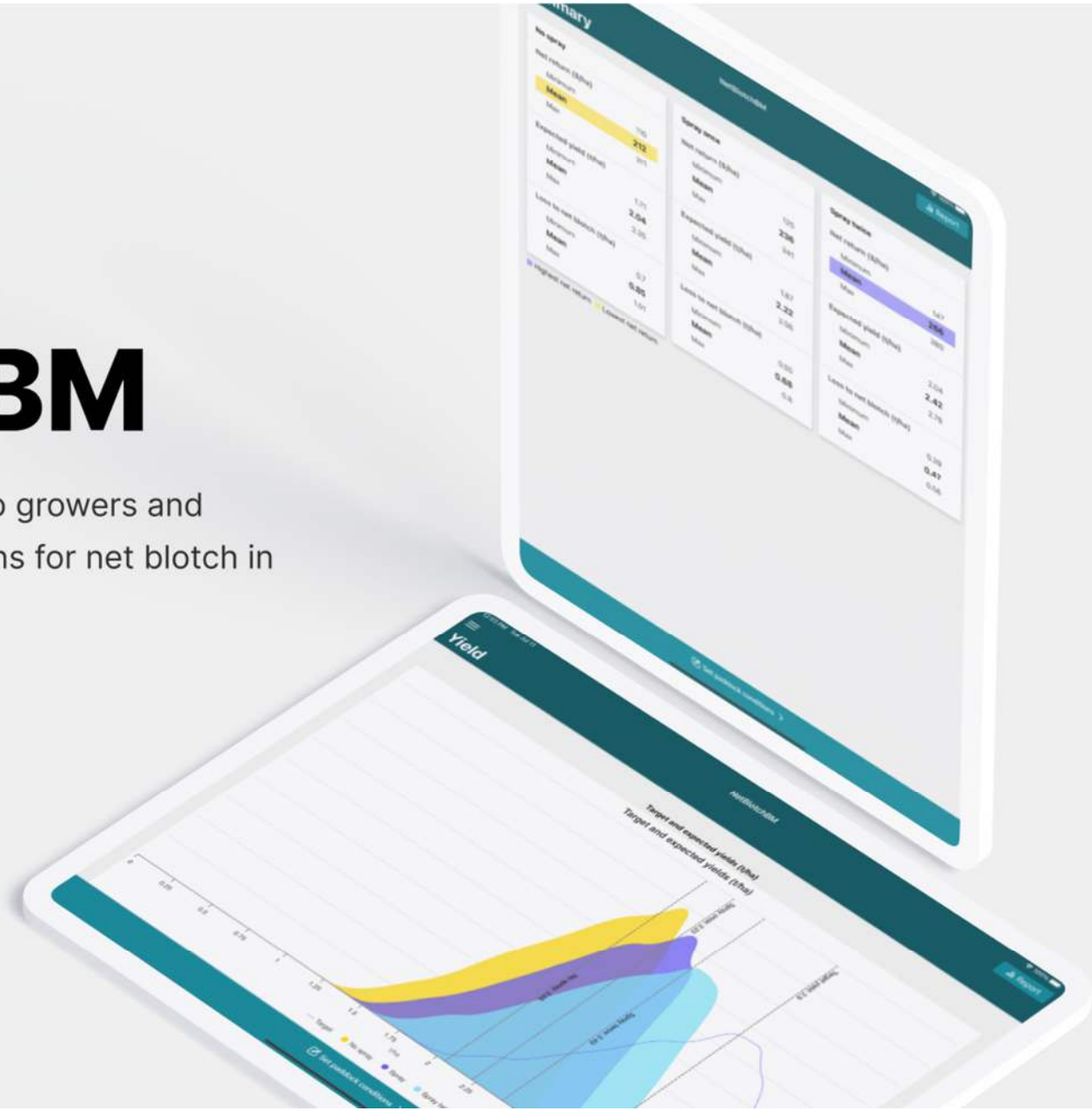
Development

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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