

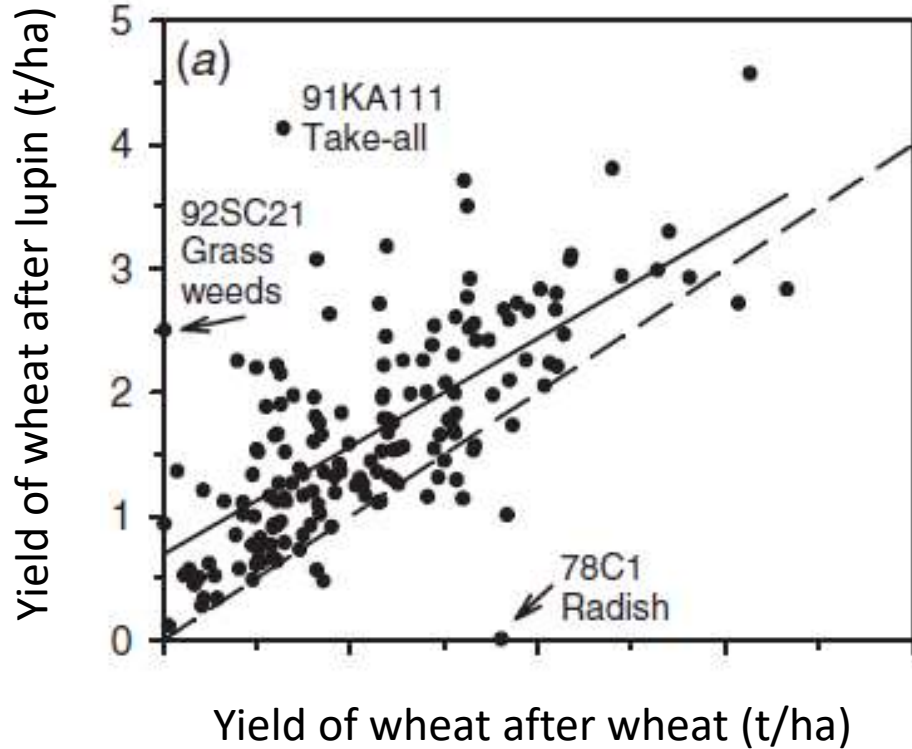
# Planning break crops and profitable rotations in the LRZ

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CSIRO Agriculture and Food

# Break crops



# Break crop effect



Crop	Break crop effect (t/ha)
Lupin	0.60
Canola	0.40
Field pea	0.45
Oats	0.35
Fallow	0.29

Seymour et al. (2012)

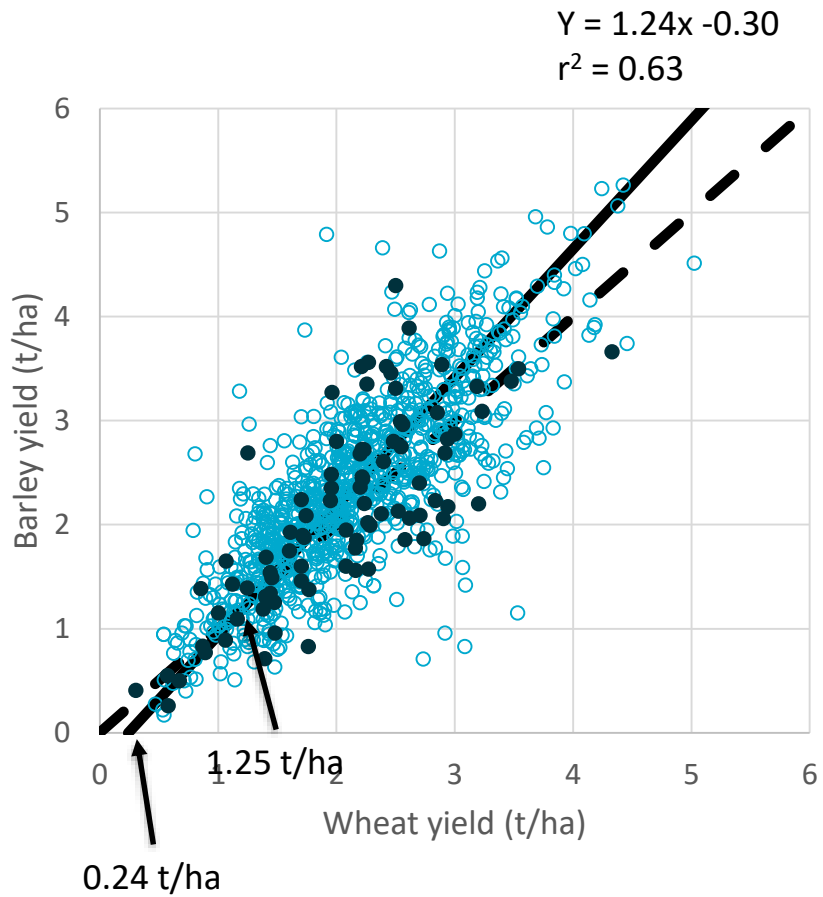
# Causes of break crop effect

- Weeds
- Disease
- N
- Water

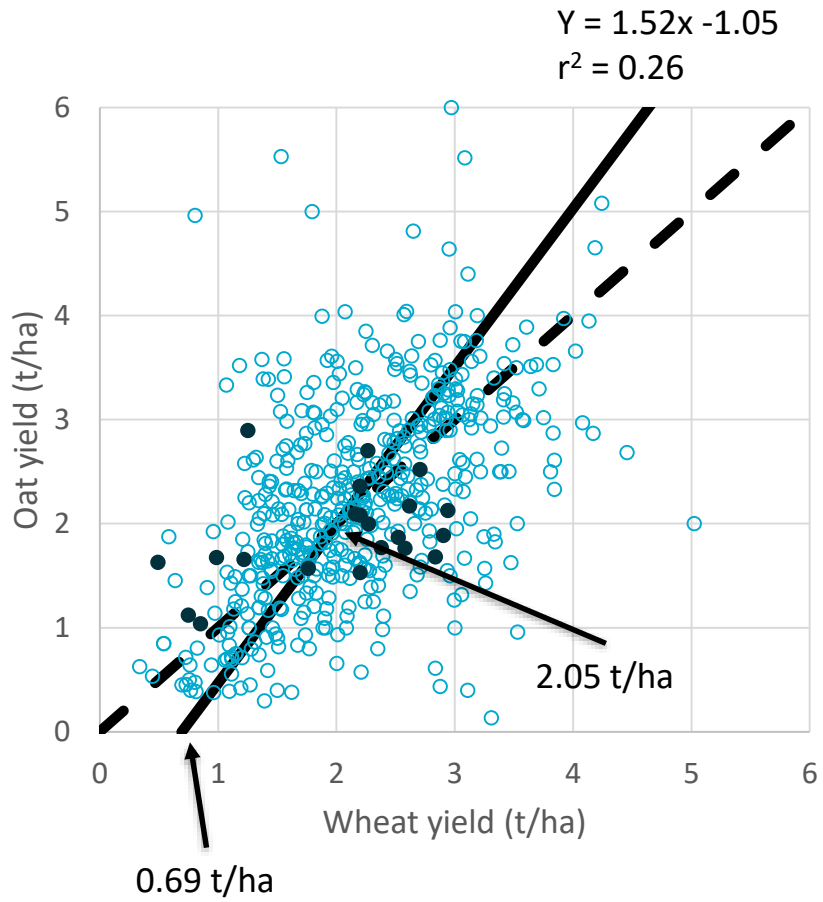
**Need to be balanced against opportunity cost of not growing wheat!**



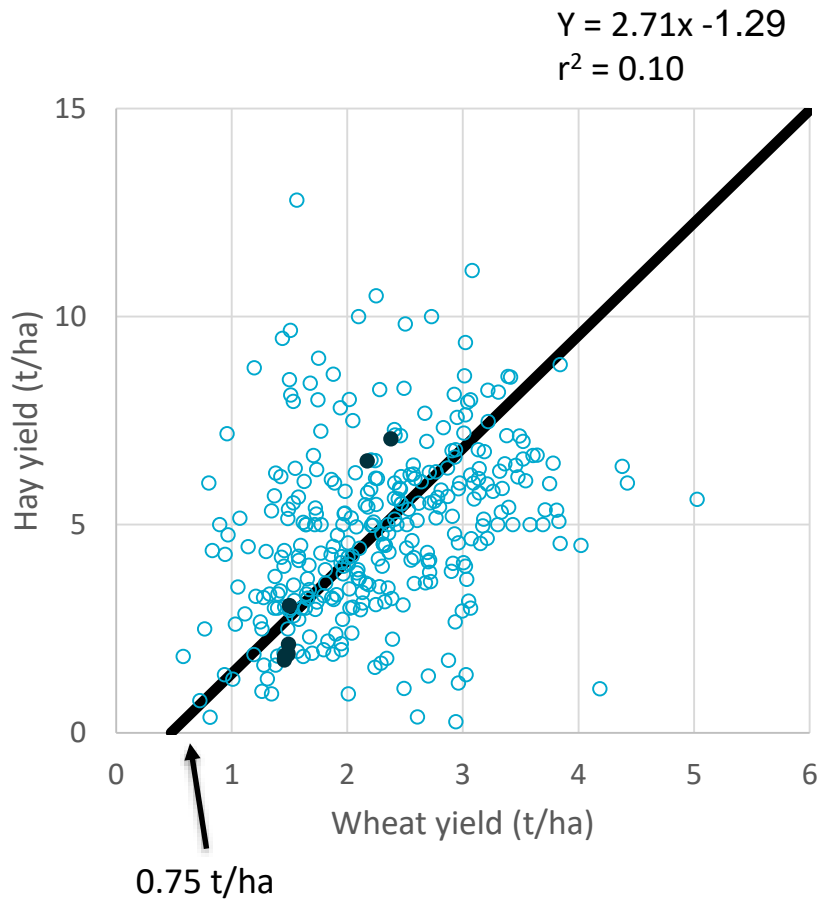
# Barley



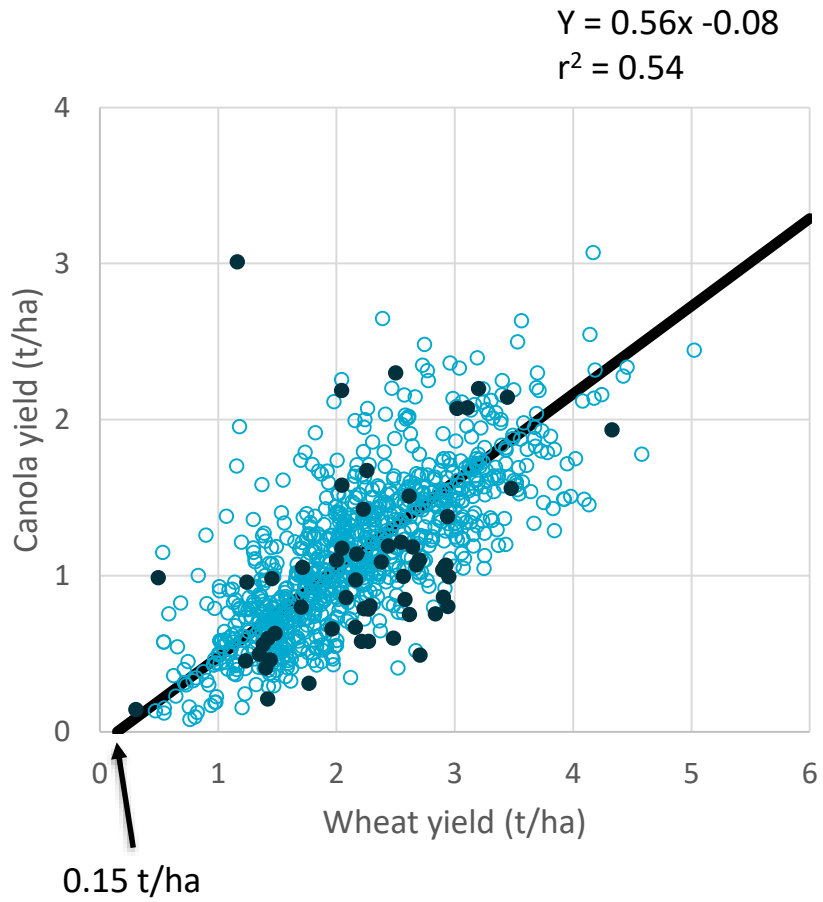
# Oats



# Hay

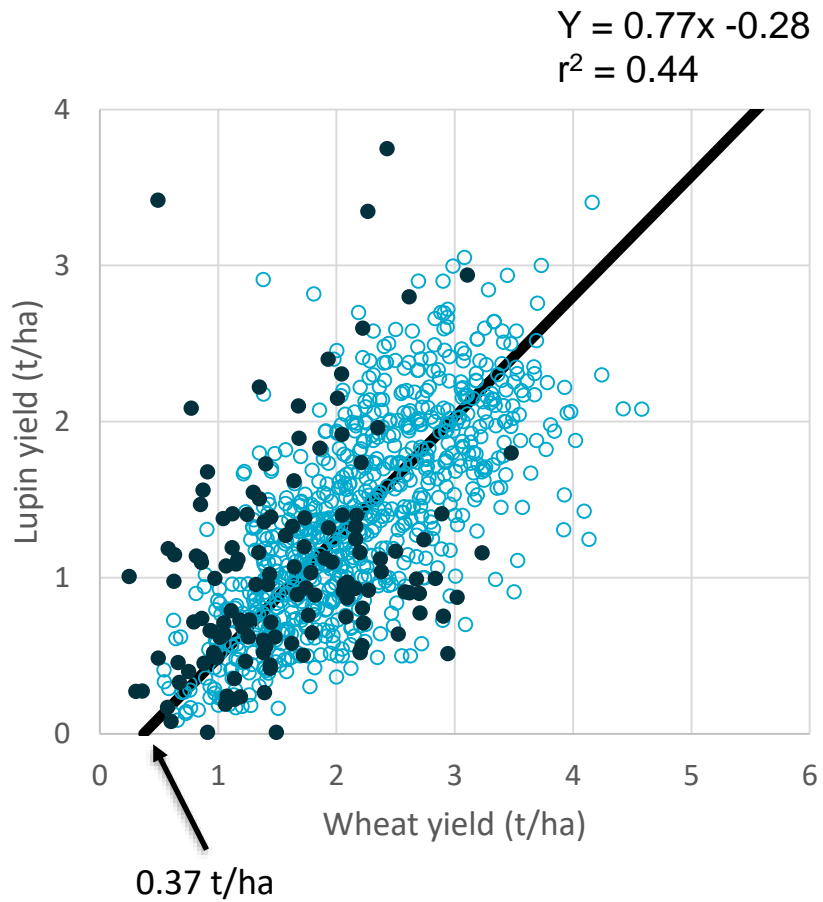


# Canola

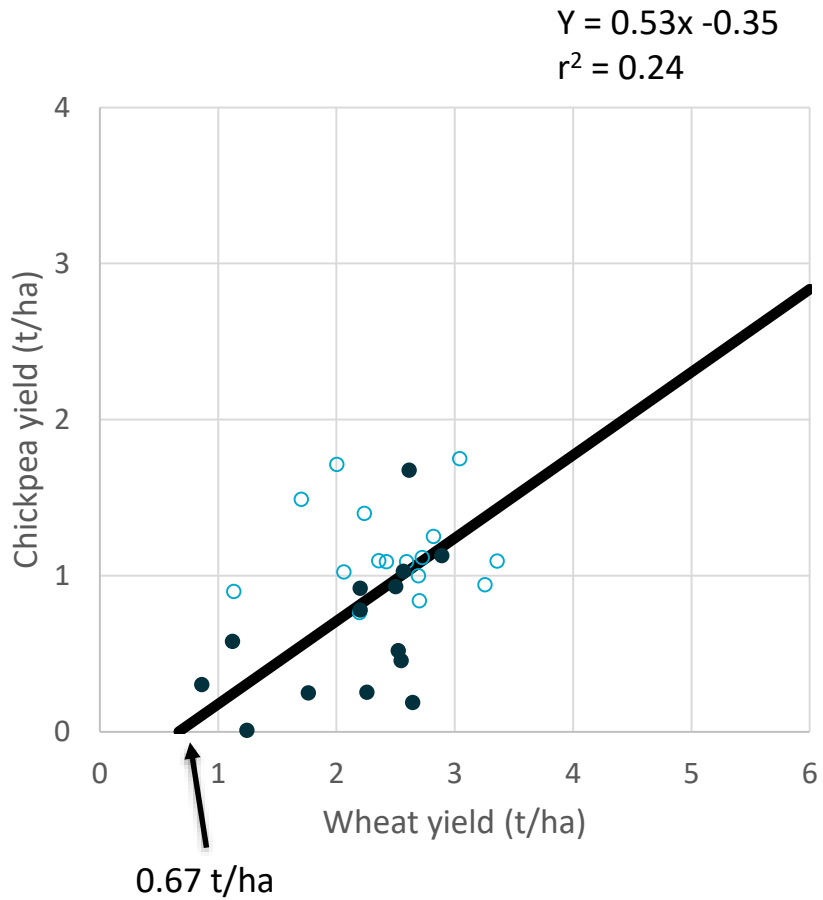




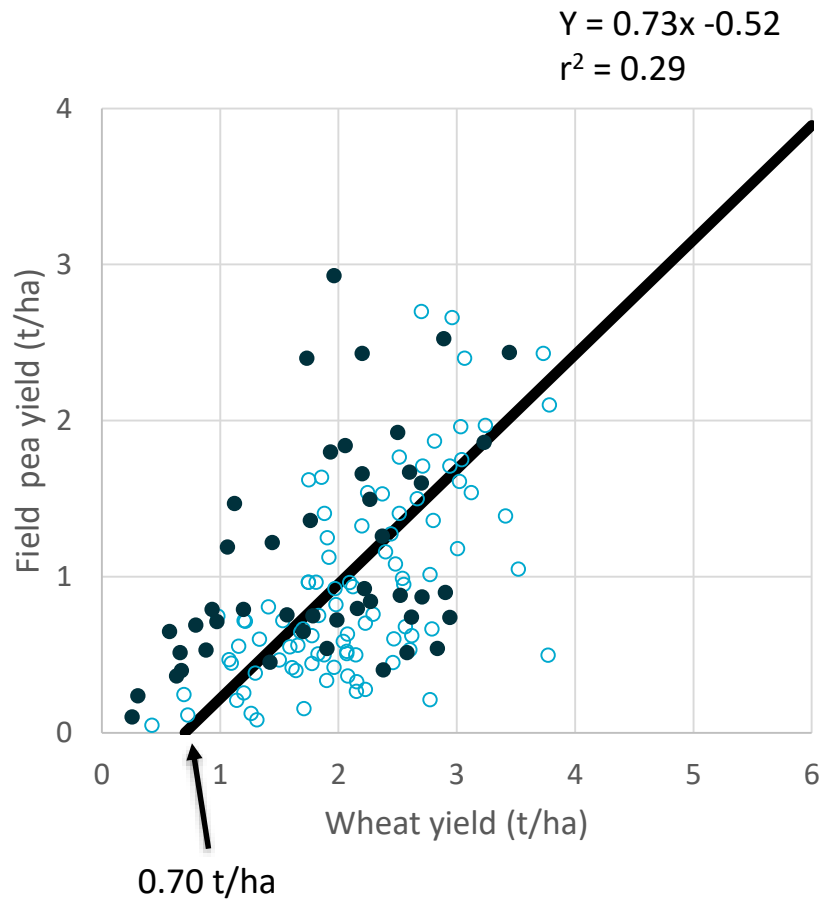
# Lupin



# Chickpea



# Field pea



# Implications

- Break crop yields more risky than wheat
- Break-crops can still be profitable
  - high grain prices
  - future yield benefit to wheat.
- Canola was the most consistent break-crop
- Hay and oats are a good diversification option
- Need to develop low, cost, profitable break crops



# Land Use Sequence Optimiser

Lawes and Renton (2010)

# LUSO

(A framework for analysing crop sequences, taking account of N, weeds and disease)

## System Inputs

Fixed costs (\$/ha)  
Cost of N (\$/kg)  
Optimisation duration (years)

## For each crop

Yield with no constraint (t/ha)  
Price (\$/t)  
Costs (not N) (\$/ha)  
N requirement/boost (kg/ha)  
Disease < > crop impact  
Weeds < > crop impact

## Sequence Outputs

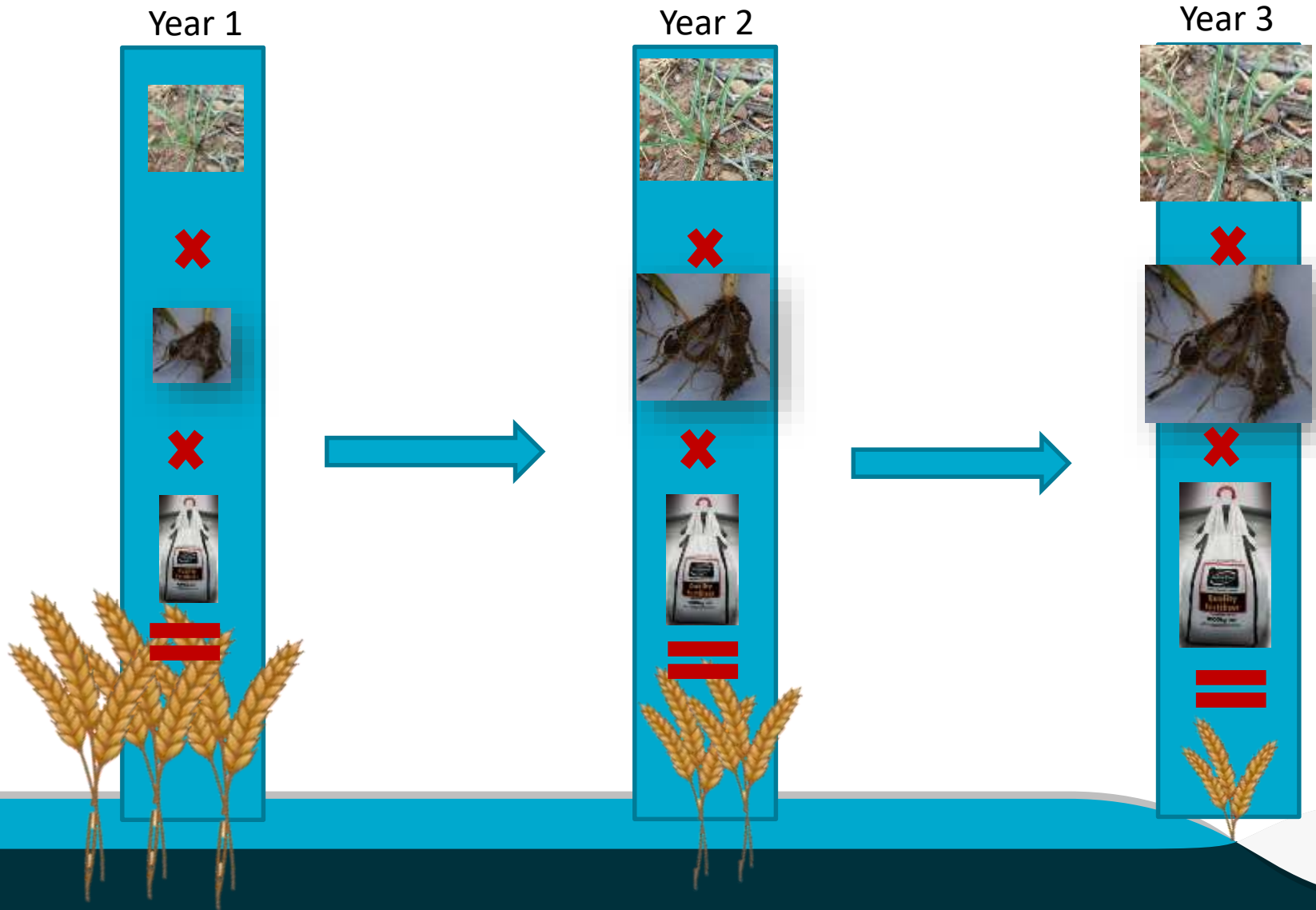
Optimum sequence  
(or defined sequence)

## Annual outputs

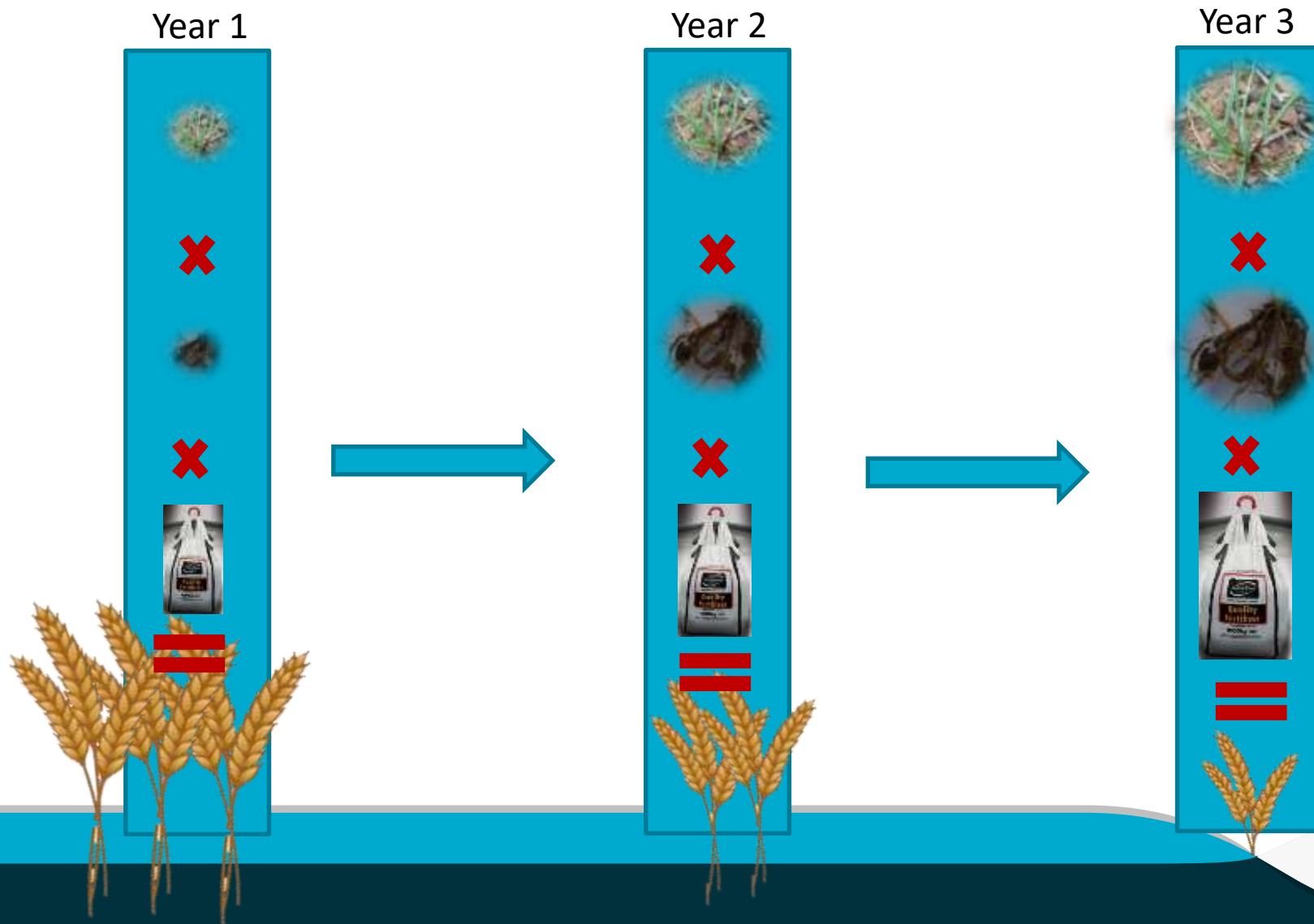
Yields (t/ha)  
Profit/loss (\$/ha)  
Disease  
Weeds  
N



# LUSO – A state and transition model (Annual time step) of weeds, disease and nitrogen



# LUSO – A state and transition model (Annual time step) of weeds, disease and nitrogen





# Inputs

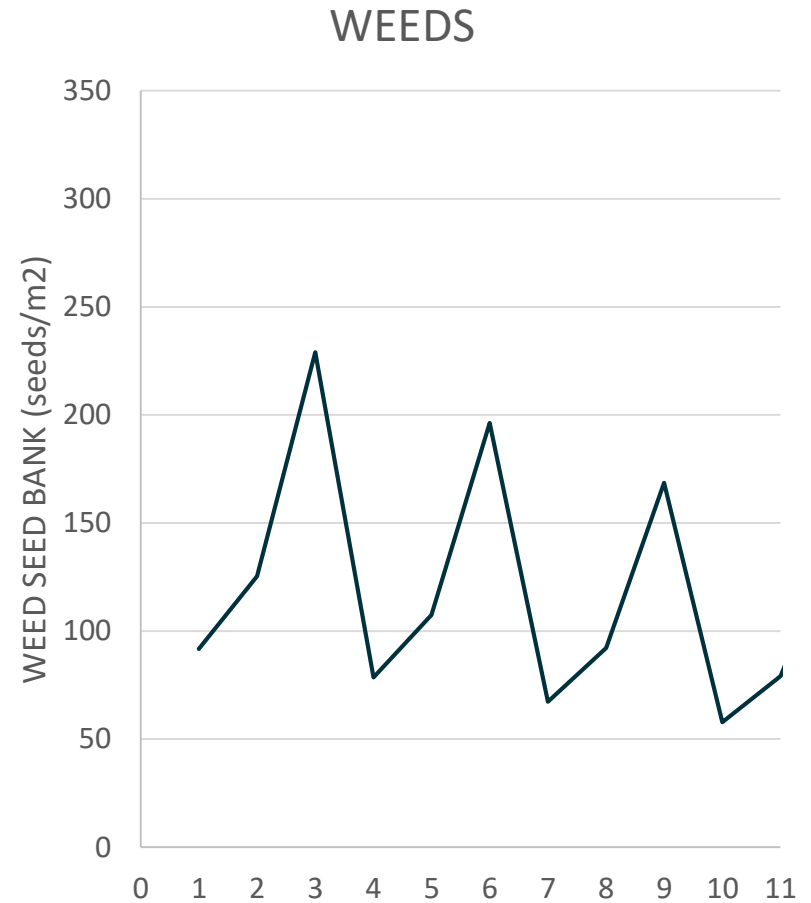
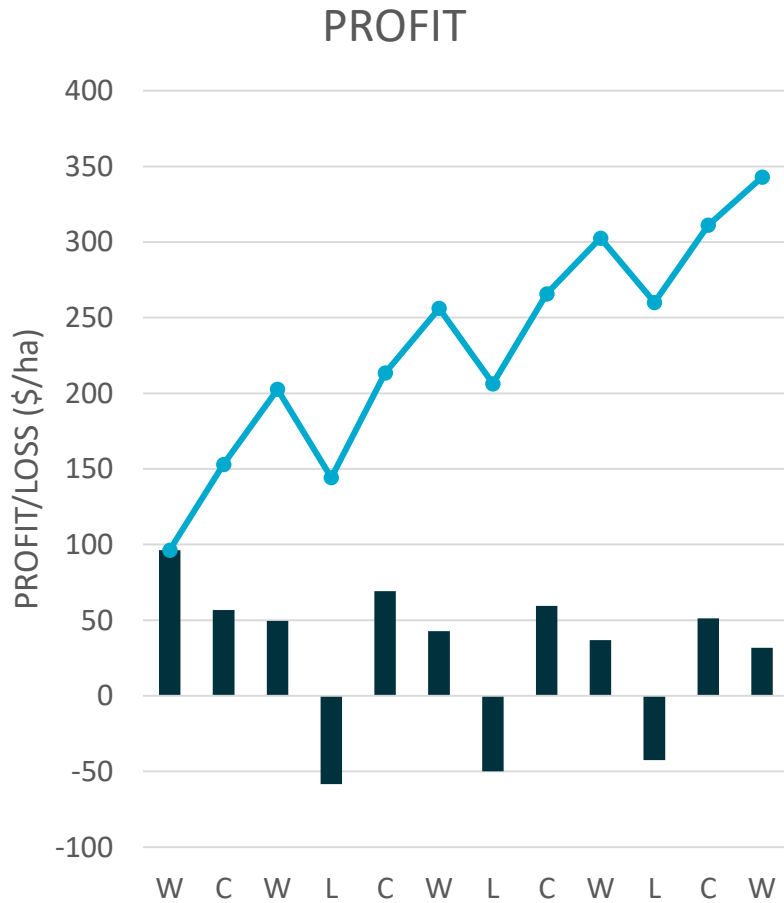
Crop	Yield (t/ha)	Price (\$/t)	Costs (\$/ha)	N requirement (kg/ha)	Weed survival	Weed seed return
Wheat	1.9	275	250 (260)	35	5%	100%
Barley	2.1	230	290 (300)	38	5%	100%
Canola	1	540	261	35	2%	100%
Lupin	1.2	300	239	(25)	1%	15%
Field pea	0.9	320	259	(50)	2%	15%
Chickpea	0.65	800	285	(25)	2%	15%
Fallow	0	0	70	(25)	0%	0%

Fixed costs - \$115/ha

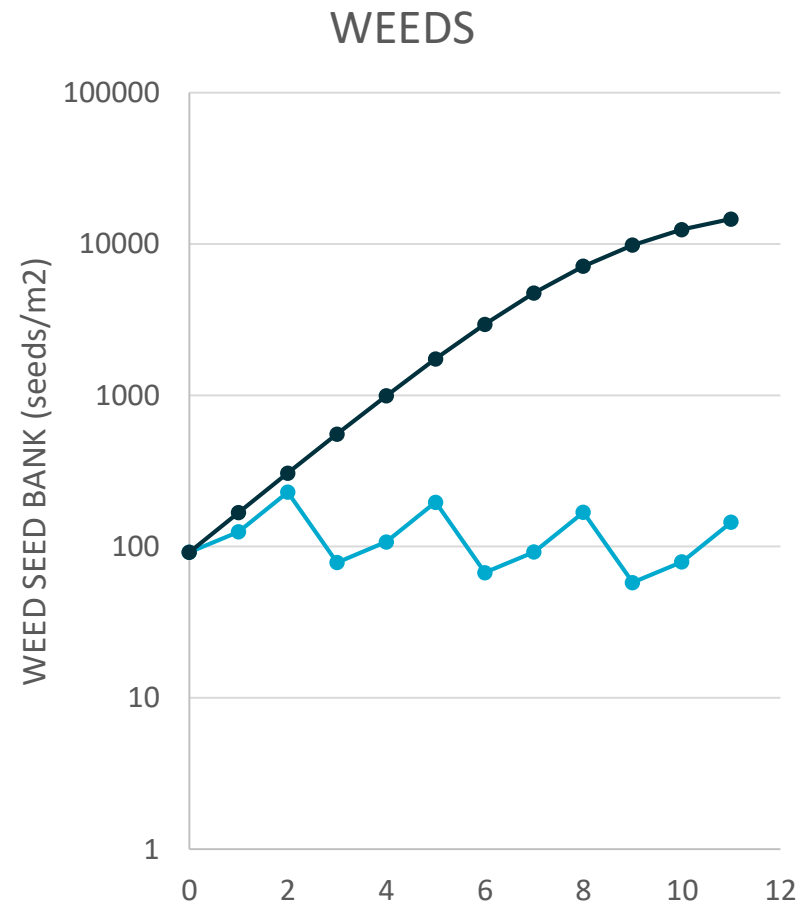
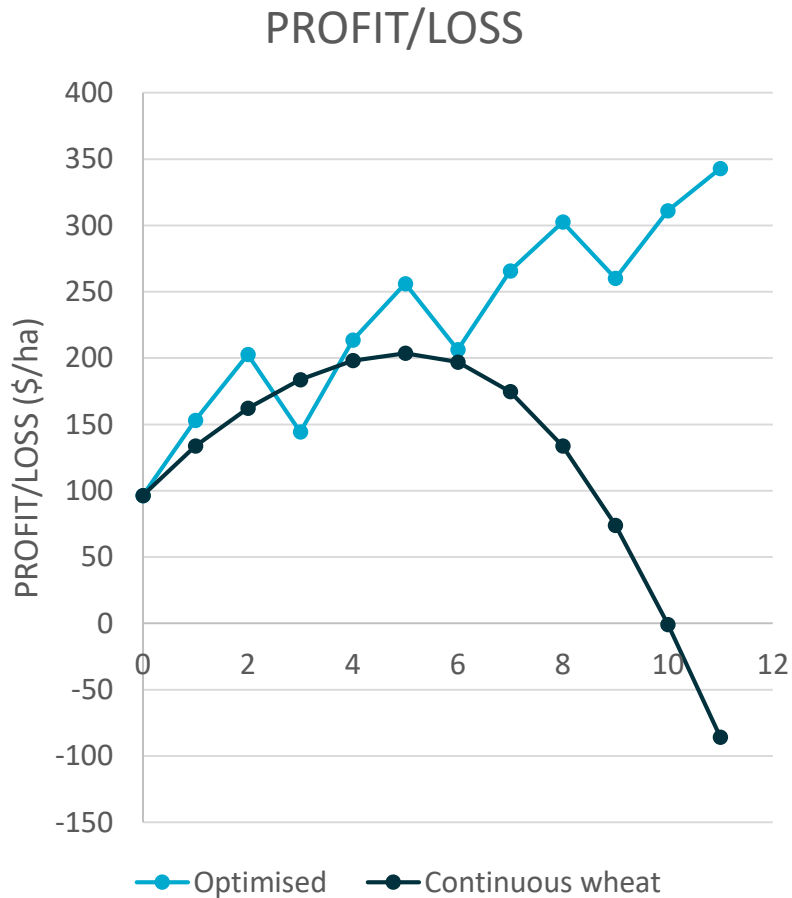
N cost - \$1.05/kg

Discount rate – 5%

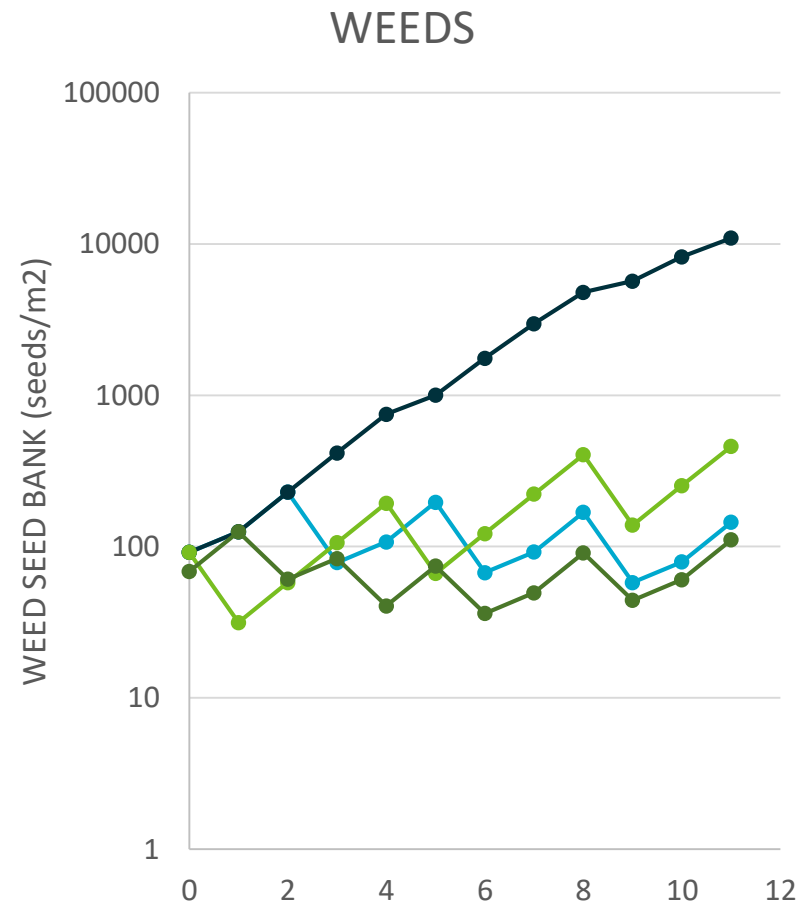
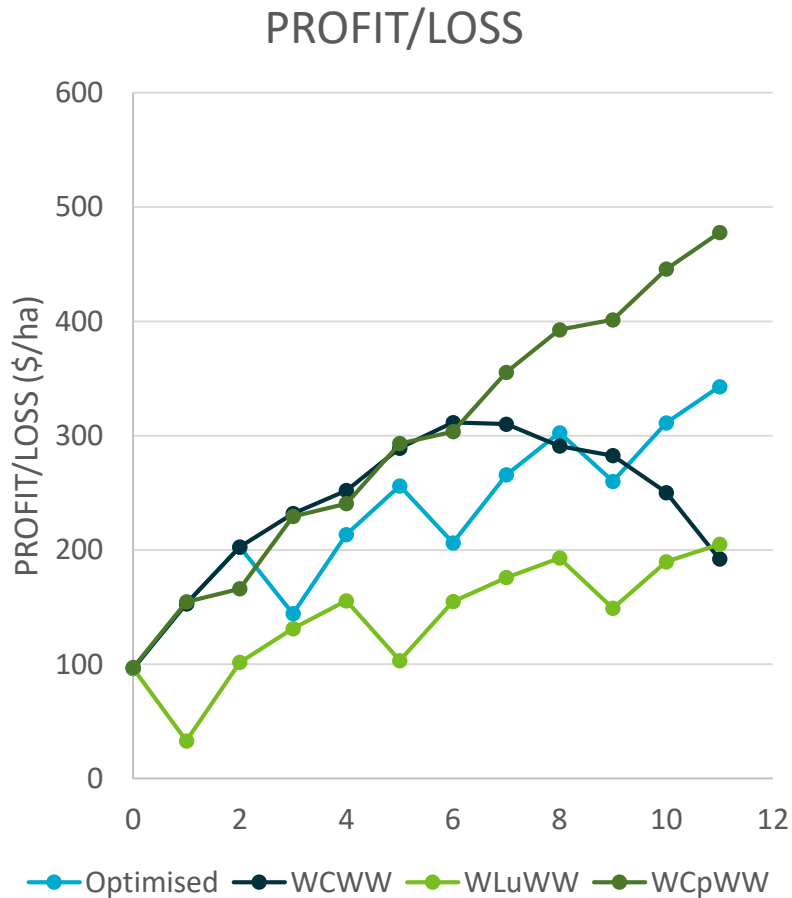
# Optimised (no chickpea or fallow)



# Optimised and continuous wheat



# Optimised and other rotations

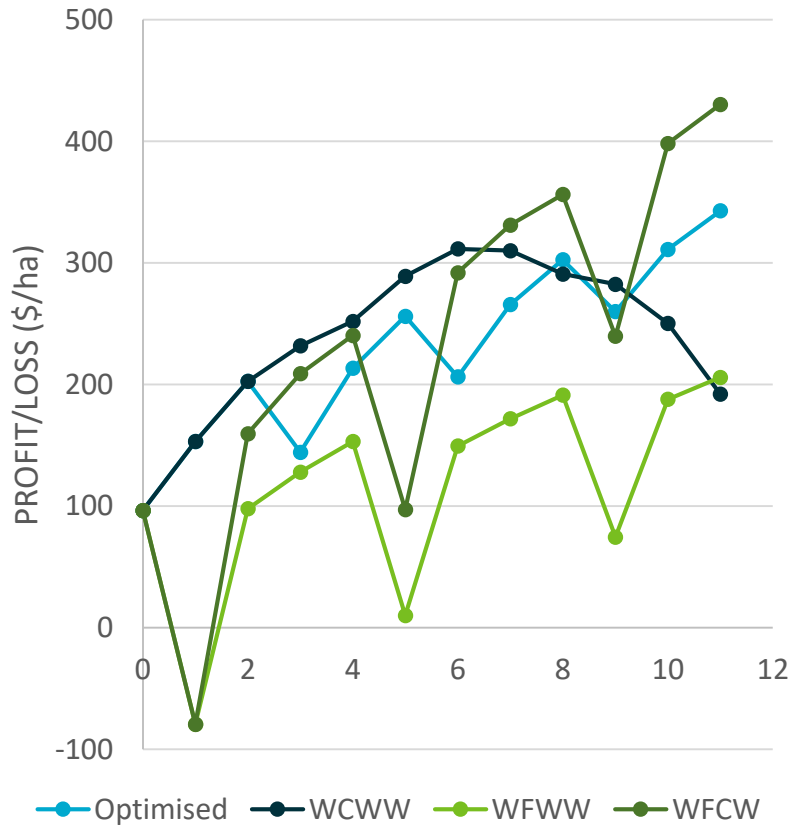




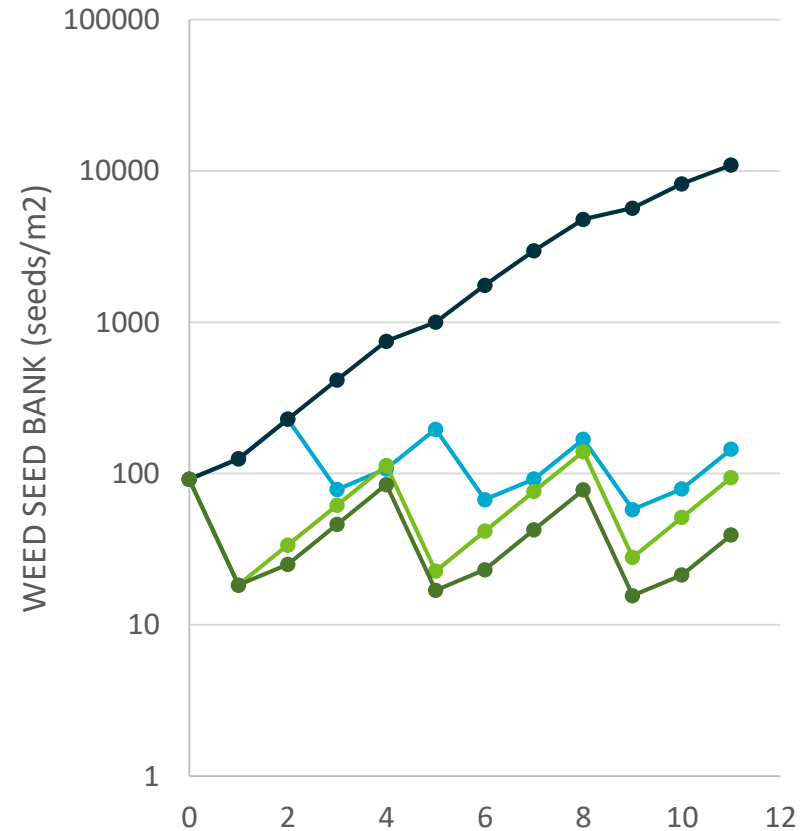
# Fallow rotations

Doesn't allow for reduced fixed costs?

## PROFIT/LOSS



## WEEDS



# Conclusions

- No such thing as a fixed rotation
  - Long term strategy
  - Respond to season
  - Prices
  - biotic triggers
- Break crops are more risky than wheat
  - But not including them is also a risk!
- A loss making break crop can contribute to a profitable sequence
- Can we find a high value reliable break crop for the LRZ?
- Are fallows profitable?
- Can a double break option work?

# Acknowledgements

- Farmanco (LUSO inputs)
  - Rob Sands
  - Ben Curtis
- Planfarm (Break crop data)
  - Cameron Weeks
  - Alex House
- GRDC
  - Developing farming systems solutions for the LRZ of Western Australia
  - CSA00056

# Thank you

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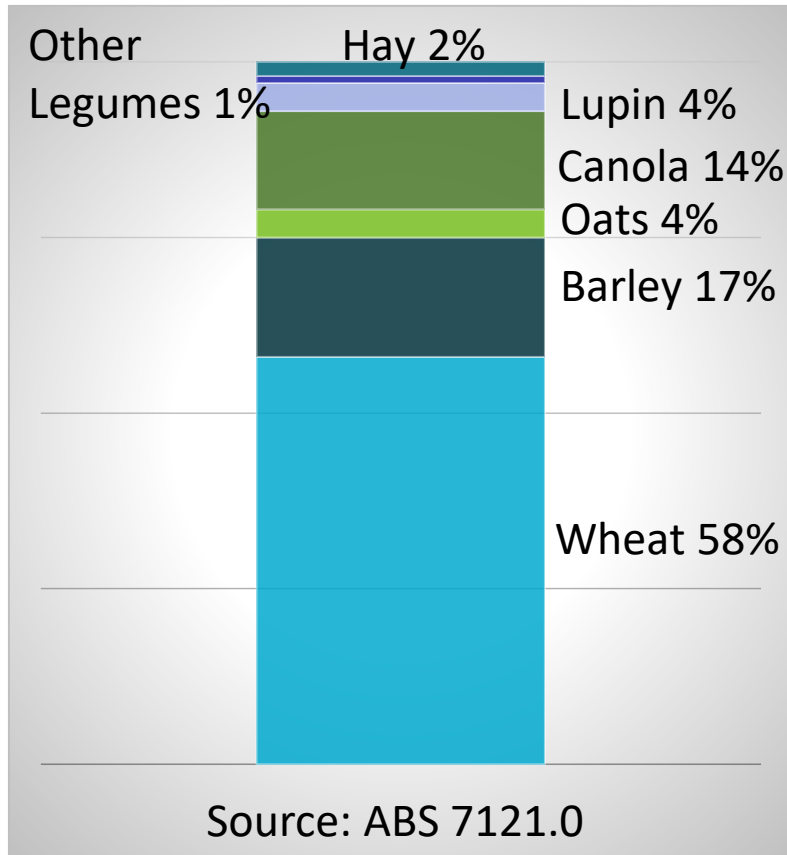
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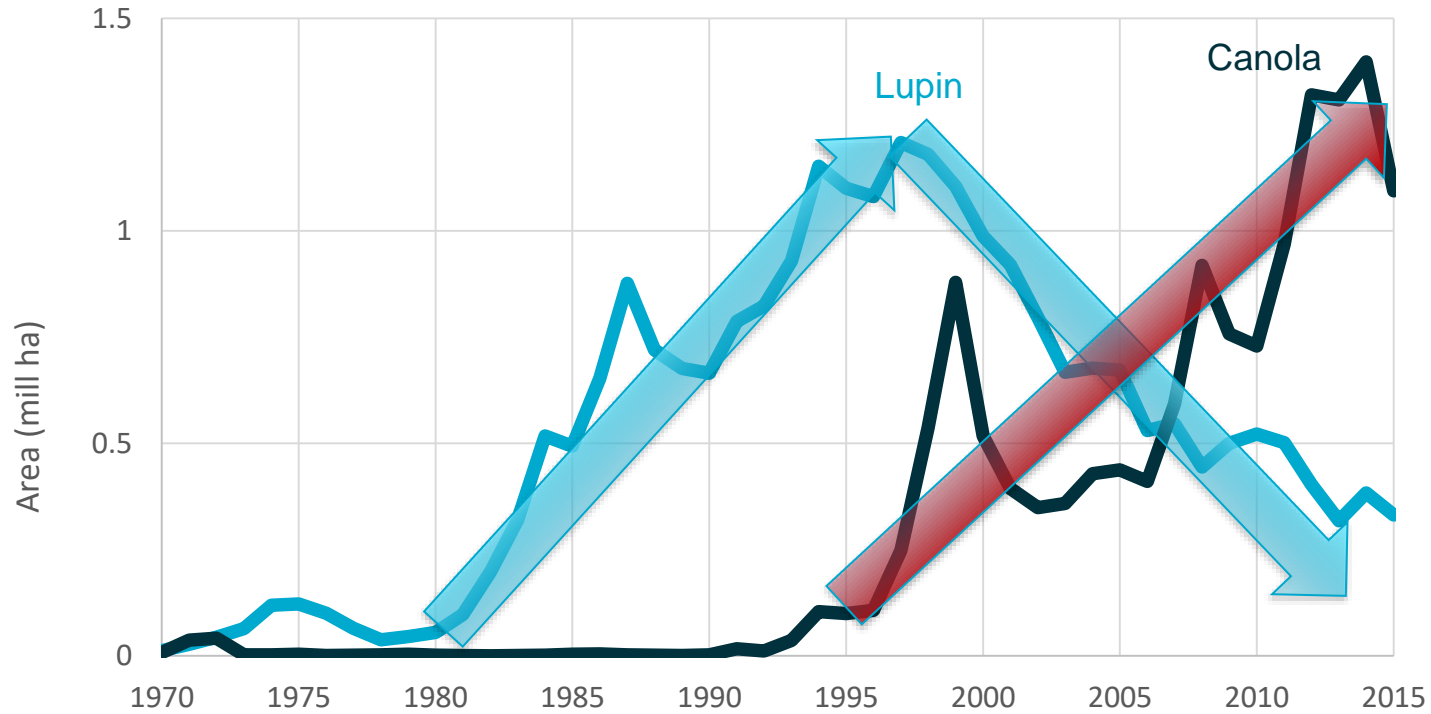


- Break crops improve wheat yields but not widely grown



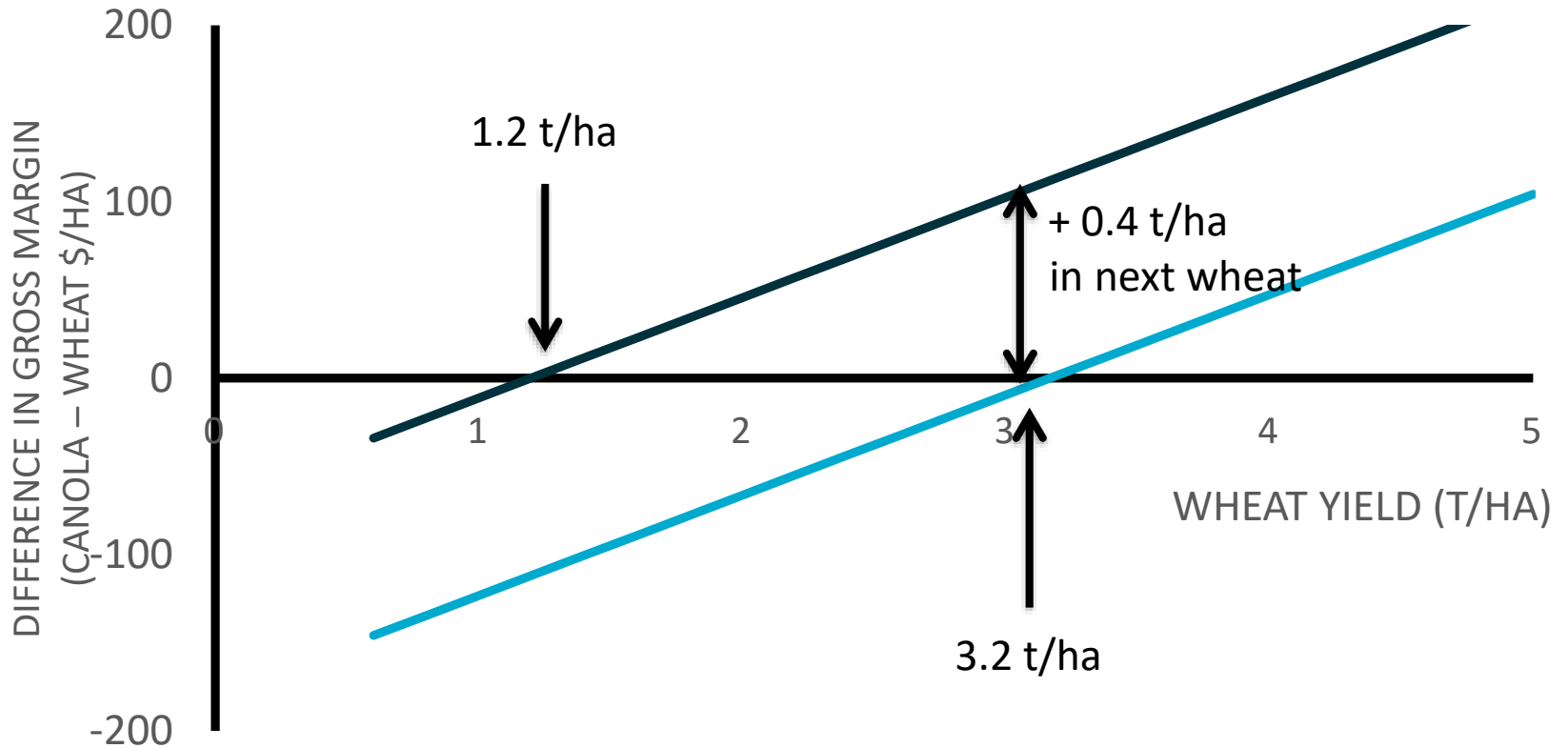
- Optimum 36 -50 of cropped area%  
Robertson et al. (2010)
  - Depends on prices/costs
- Focus on future benefits
  - e.g. Seymour et al. (2012)
    - Lupin +0.6t/ha
    - Canola +0.4 t/ha
- Farmers respond to break crop yield
  - Determines immediate profitability
  - Compare them to wheat

# Canola has replaced lupin





- Canola economics



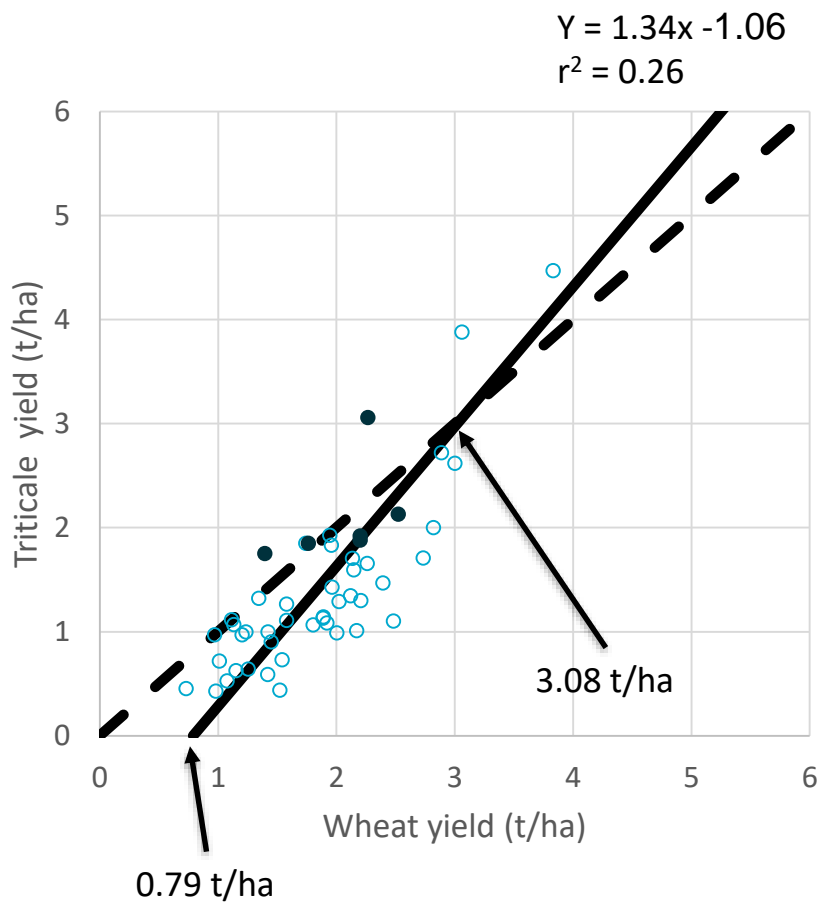
- Cereal economics

Crop	Variable costs (\$/ha)	Price (\$/t)	Yield benefit (t/ha)	Wheat yield to break even with wheat (t/ha)	
				This season	+ Yield benefit
Wheat	280	280	-		
Barley	280	250	0	2.9	2.9
Oats	280	265	0.35	2.5	0.5
Hay	350	210	0.2	1.1	0.9

- Broadleaf economics

Crop	Variable costs (\$/ha)	Price (\$/t)	Yield benefit (t/ha)	Wheat yield to break even with wheat (t/ha)	
				This season	+ Yield benefit
Wheat	280	280	-		
Canola	320	520	0.4	3.2	1.2
Lupin	280	310	0.6	Never	1.8
Field pea	250	390	0.45	5.2	2.7
Chickpea	300	700	0.6	2.3	1.8

- Triticale



- Lupin economics

