

Crop Sequence Considerations When Growing Canola

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Canola Crop Sequence and Rotations

- Usually best paying crop
- Can only be grown every 4 years
- Grow it where it will be most productive



Moisture Effects

Maturity differences

- As crops mature they stop using water
 - Earlier maturity can increase storage for subsequent crops

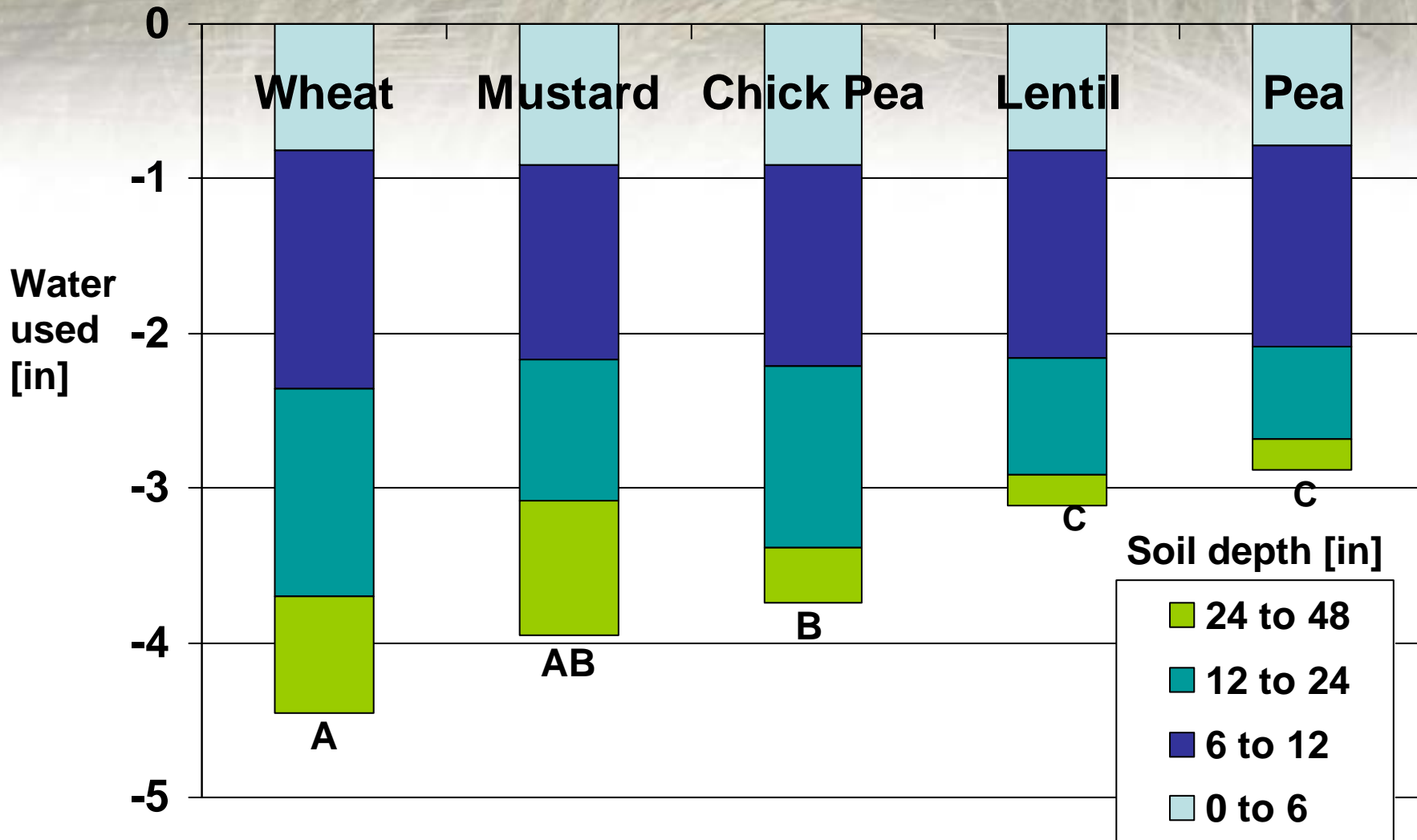
Differences in crop water use

- Rooting depth decreases in the order
perennials>biennials>winter cereals>spring cereals
and oilseeds>pulses

Snow trapping

- Taller stubble crops [cereals, canola, mustard] trap more snow more effectively than shorter stubble crops [pea, lentil, flax]
- Results depend on how much snow and on infiltration

Soil Water Used by Crops in Southern SK. Average of 3 years [1996-98] at 2 locations



Weed Control Considerations

Target annual broadleaf weeds in cereal crops

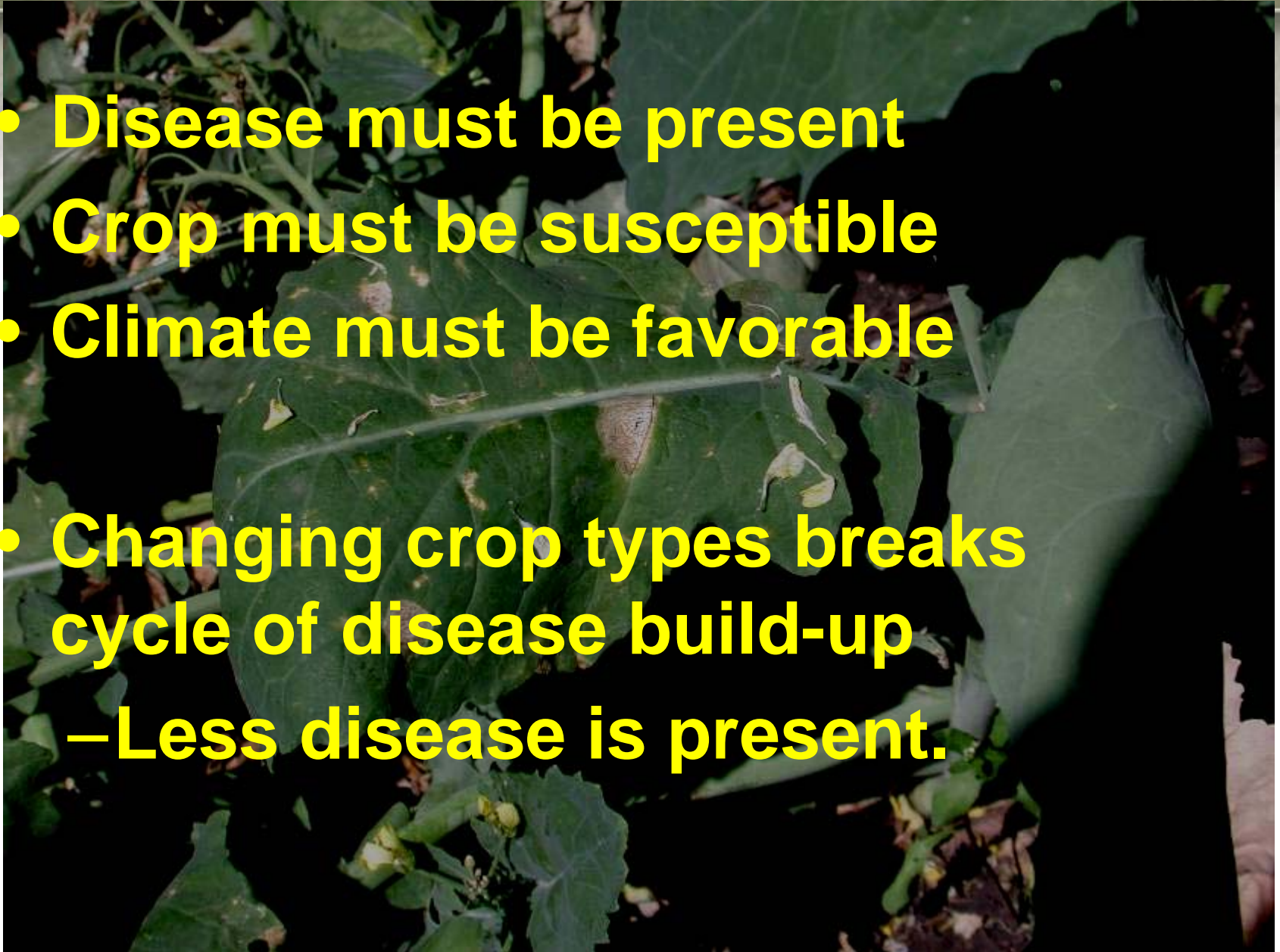
- costs are lower (\$2-6/ac vs \$ 10-25/ac)
- numerous species controlled
- can reduce losses, control costs in broadleaf crops

Target grassy weeds in broadleaf crops

- costs may be lower
- permit herbicide rotation to avoid weed resistance
- can reduce losses and control costs in cereal crops

Disease Considerations

- **Disease must be present**
- **Crop must be susceptible**
- **Climate must be favorable**
- **Changing crop types breaks cycle of disease build-up**
 - **Less disease is present.**



Disease considerations in Canola

- After canola and field pea need to watch out for sclerotinia as medium to high risk for 3 years
- Sclerotinia also identified in risk after alfalfa
- Blackleg is the concern on canola-canola rotation
- Club root
 - Rotation will slow spread on infected fields
 - Best to avoid introducing club root spores in soil etc.

Nutrient Use by Crops

Nitrogen-fixing crops

- Fix nitrogen from the air
- May extract less N from soil
- Provide more N to subsequent crops from decomposing residues

Mycorrhizal vs non mycorhyzzal crops

- Form loose associations with fungi in soil
- Increase effective size of roots
- Improves uptake of nutrients like P
- Canola non-mycorrhizal can affect crops that rely on mycorrhizae like flax, pulses, corn.

Nutrient cycling from residues

- Dependent on crop type, quantity and quality



**Yield responses in
varying sequences**

Crops Yield More When Grown on Stubble of Another Crop Type : Research Results

Yield as % of yield when grown on their own stubble

<u>Stubble Type</u>	<u>Cereal</u>	<u>Oilseed</u>	<u>Pulse</u>
Cereal	100	100-150	100-125
Oilseed	100-135	100	100-115
Pulse	100-150	100-190	100

Source: Adapted from rotation and sequence studies at Melfort, Aylsham, Scott and Swift Current

Crops Yield More When Grown on Stubble of Another Crop Type : Manitoba Crop Insurance

Yield as % of yield when grown on their own stubble

<u>Stubble Type</u>	<u>Cereal</u>	<u>Oilseed</u>	<u>Pulse</u>
Cereal	100	113-124	93-102*
Oilseed	108-127	100	79-93*
Pulse	105-123	108-137	*

* no data for pulse on pulse stubble so values are relative to overall average

Canola Yield on Varying Stubble Types

Stubble Type	Yield (% canola) On canola stubble
Canola	100
Winter wheat	113
Spring wheat	119
Barley	118
Oat	116
Flax	118
Pea	125
Soybean	101

Values are averages for 1994 – 2007

Crop Yield on Canola Stubble

Crop	Yield (% overall) Average yield	% Yield Gain on canola stubble vs. own stubble
Winter wheat	104	+37
Spring wheat	105	+16
Barley	105	+19
Oat	106	+25
Flax	91	na
Pea	91	na
Soybean	99	na

Values are averages for 1994 – 2007



Seeding Canola after Forages?

Considerations For Seeding Canola after Forages



- #1 Is the forage is fully controlled**
- #2 Consider seedbed conditions**
- #3 Moisture conditions**
- #4 Method of termination**
- #5 Type of forage**

Forage Re-growth....

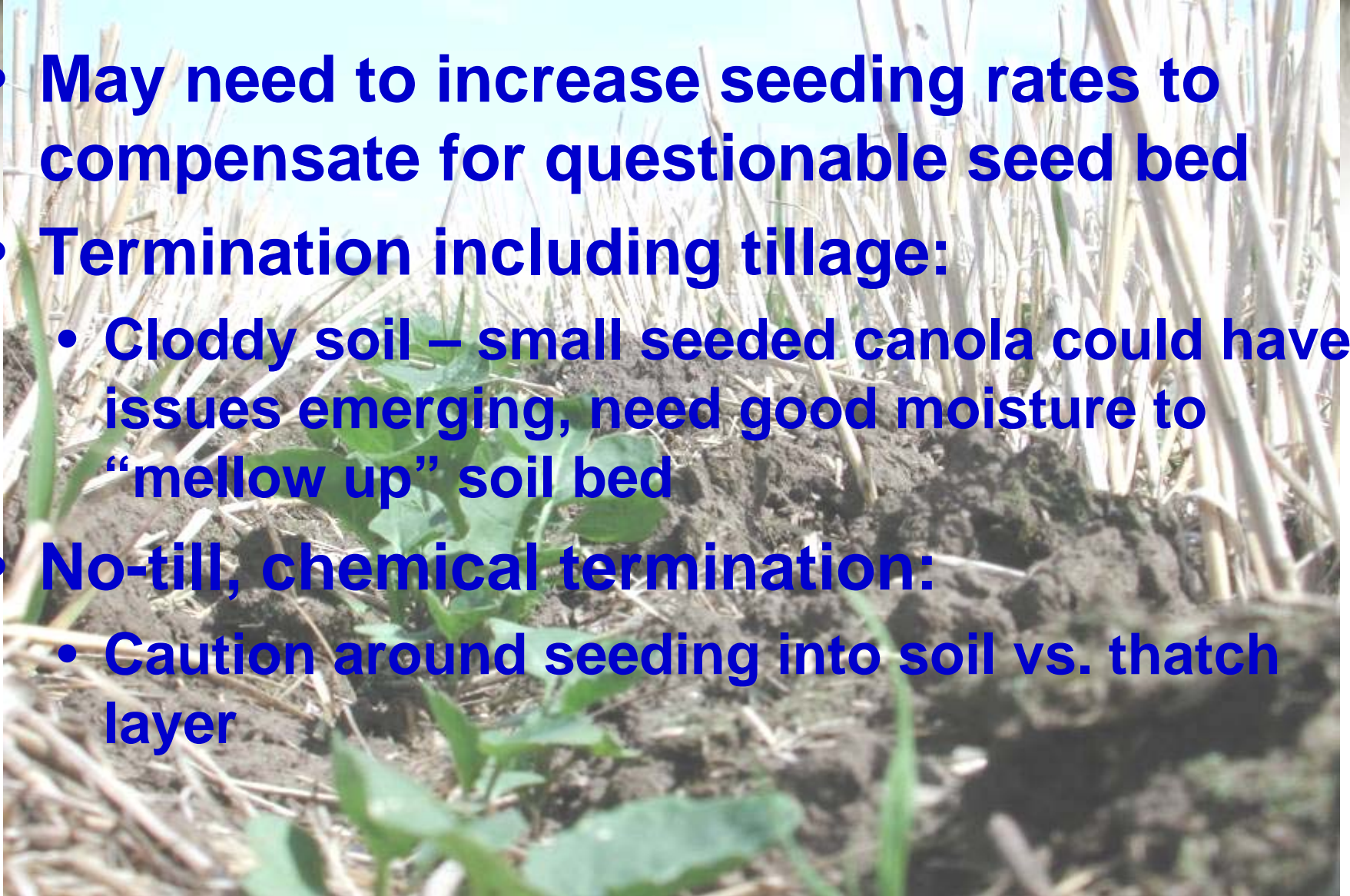
- **Can reduce yield by 50%**
- **Can inflate herbicide costs, cost yield**
- **Can interfere with harvest**

- **Consider delaying canola for a year**
- **RR may be better than LL and others likely don't fit**



Managing Seeding Conditions

- **May need to increase seeding rates to compensate for questionable seed bed**
- **Termination including tillage:**
 - **Cloddy soil – small seeded canola could have issues emerging, need good moisture to “mellow up” soil bed**
- **No-till, chemical termination:**
 - **Caution around seeding into soil vs. thatch layer**



Moisture Conditions & Recharge

- Earlier termination increases moisture
- Better forage control reduces moisture use
- No till reduces moisture loss

- Recharge but don't overfill soil profile
- Excess moisture leaches N from rooting zone
AND increases denitrification
- Recharge quicker in parkland vs. dry prairie
- Clays more moisture > loams > sandy soils

Termination method

Tillage hastens N release from forage residues

- Incorporated residues release N about twice as fast as residues on surface.
- Most N released in second year, possibly third with tillage

Chemical followed by tillage sometimes best compromise

- 2 strategies for control better than 1
- Tillage hastens decomposition
- Chemicals only in dry climates



Type of forage

- Pure alfalfa stands have more N and release it more quickly
- Mixed, weedy or grass only will likely require more fertilizer N
- Important to soil test and provide field history

When to Seed Canola ?

May want to consider wheat, oat or flax first

- After perennial grasses
- If terminated late, no tillage
- Lower nutrient requirements of oat, flax; protein response of wheat to N late in season
- Larger seeded wheat, oat if seedbed has poor structure

Canola fits as second crop;

- More N fits with high N use of canola
- Moisture recharge may be better
- More time to get control of volunteer forage
- Better seedbed



Thinking of Intensifying Canola Rotations?

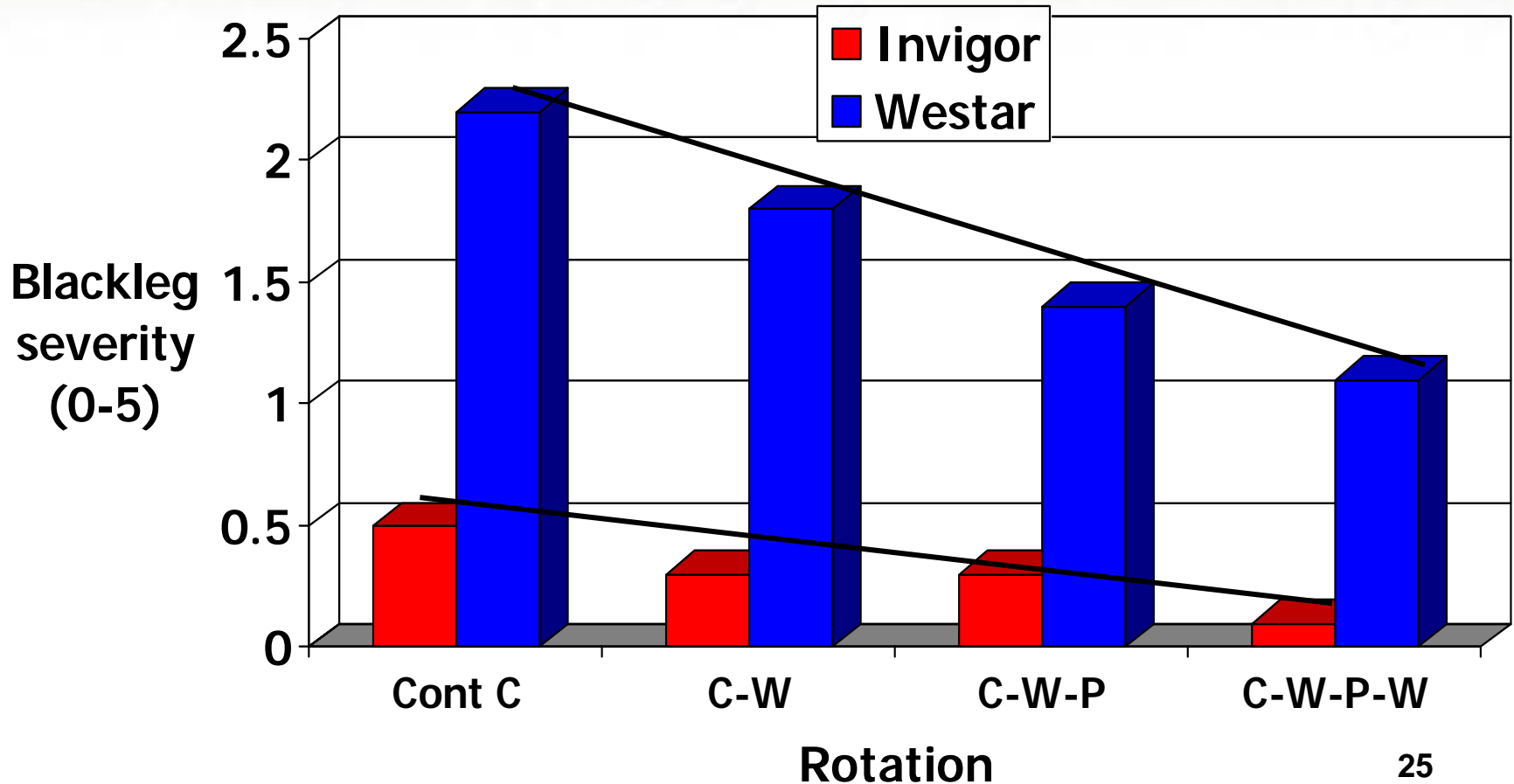
Canola Pea Rotation Study

- Continuous canola
- Canola – wheat
- Canola – wheat-pea
- Canola - wheat - pea - wheat

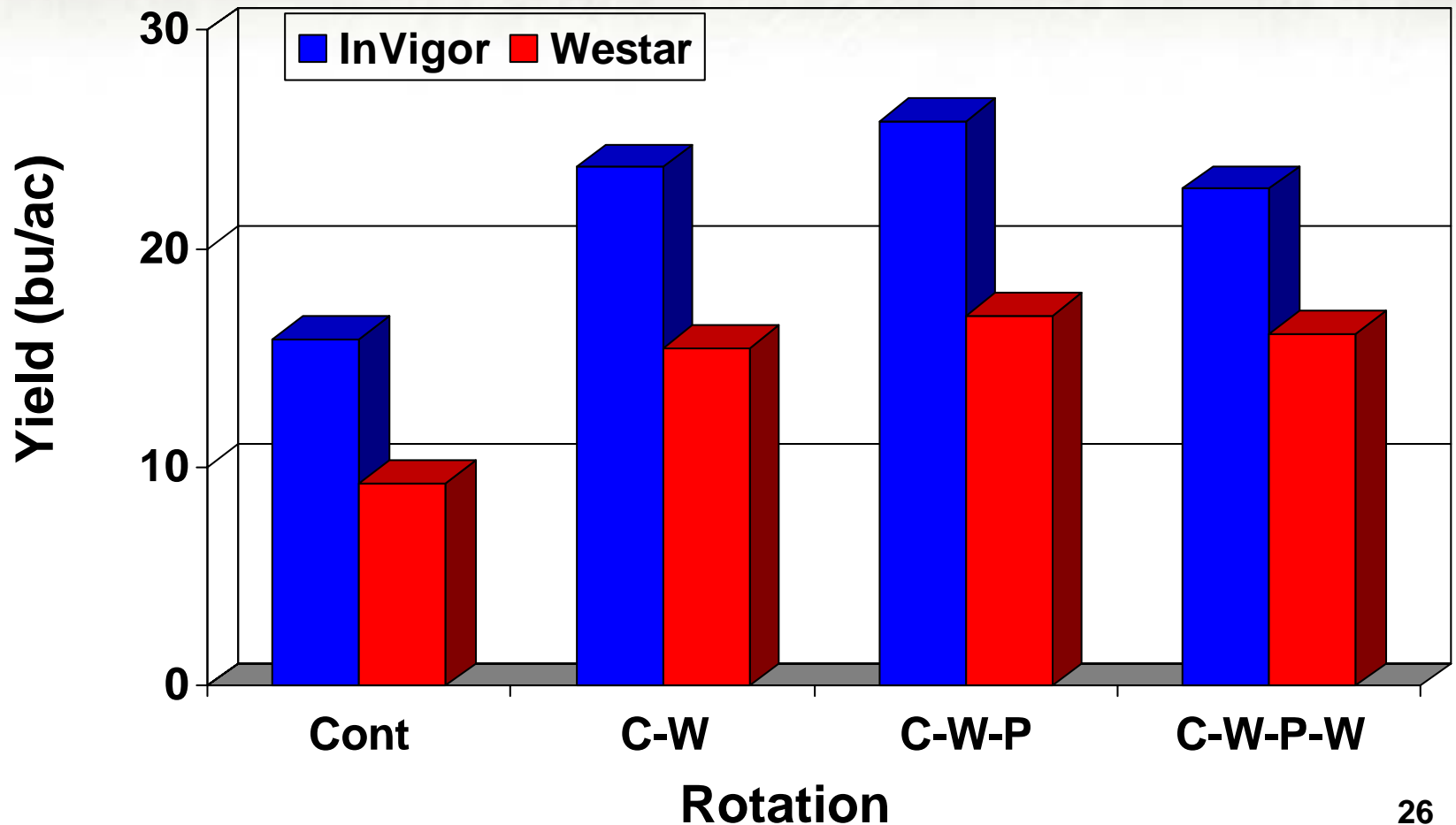
Canola Pea Rotation Study

- Continuous canola
- Canola – wheat
- Canola – wheat-pea
- Canola - wheat - pea – wheat
 - Duplicate rotations with conventional OP blackleg susceptible variety and a HT hybrid with very good blackleg resistance.
 - Plots split to accommodate fungicides on each crop
 - Locations at Melfort and Scott SK

Influence of rotation length on blackleg [14 site-years at Scott and Melfort, 2000-07]

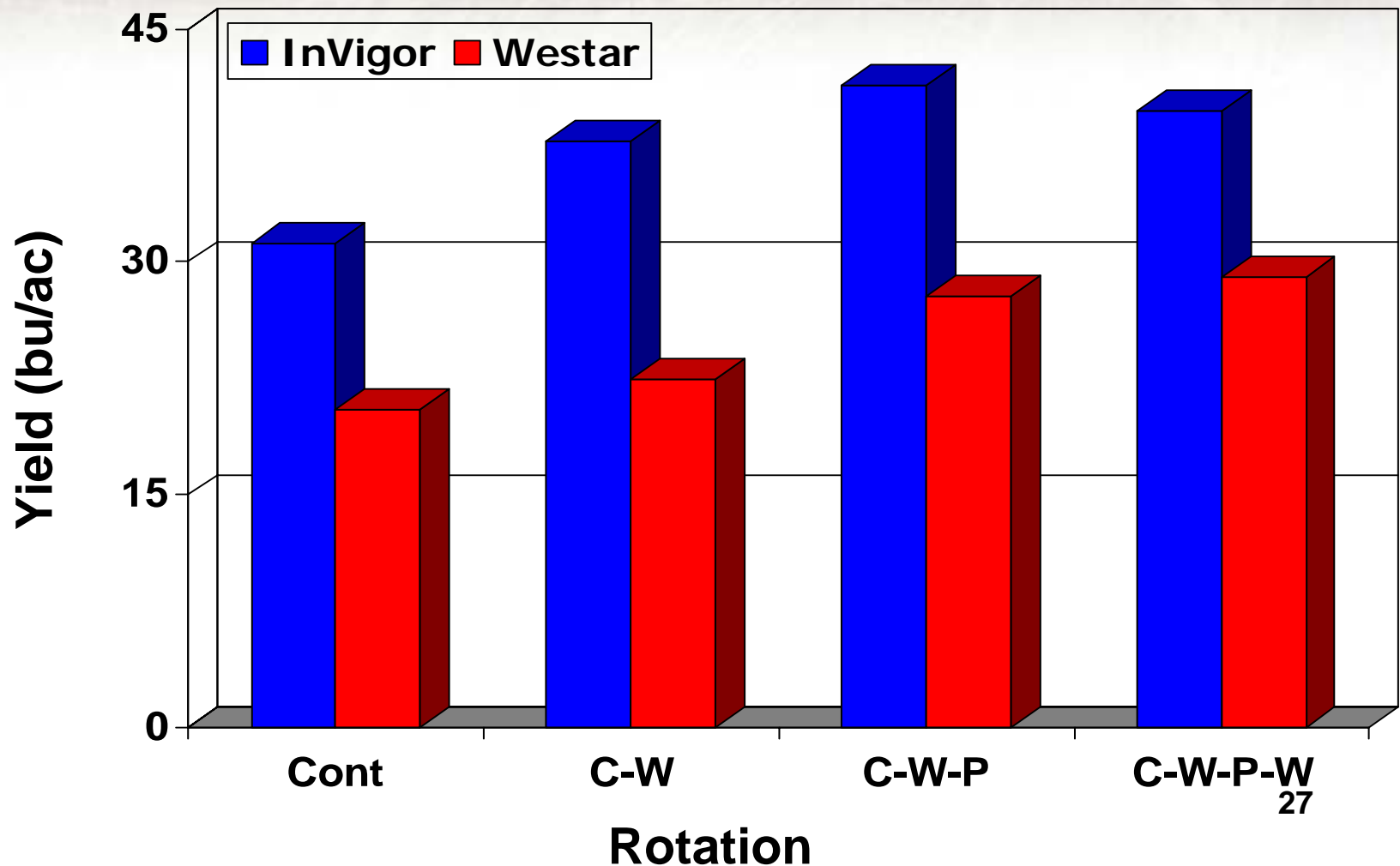


Influence of rotation on canola yield; [Scott and Melfort 2000-2003, dry conditions]



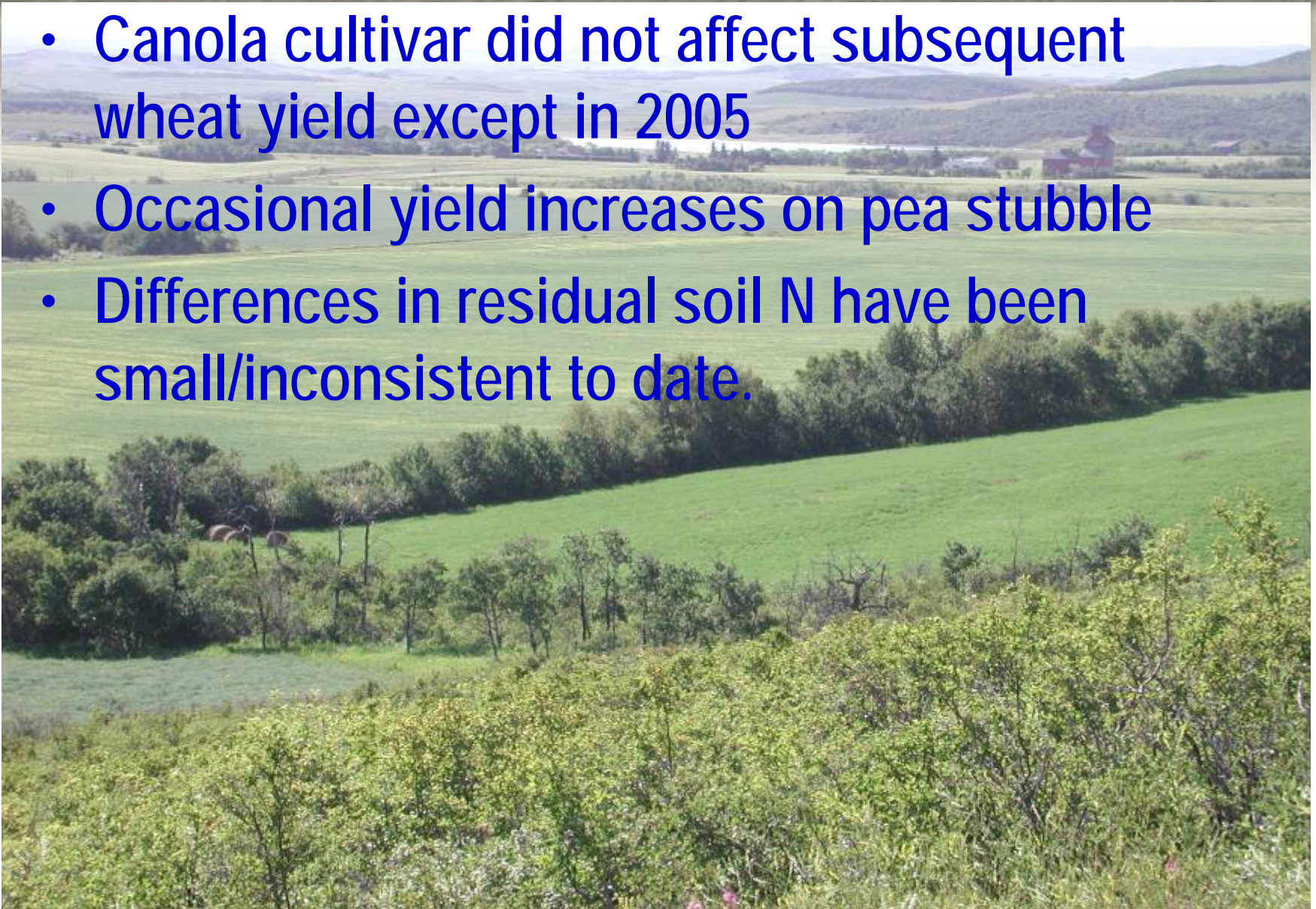
Influence of rotation on canola yield

[Scott and Melfort 2004-2006, normal moisture]



Other effects

- Canola cultivar did not affect subsequent wheat yield except in 2005
- Occasional yield increases on pea stubble
- Differences in residual soil N have been small/inconsistent to date.



Preliminary Economics : Intensifying Canola Rotations

Seed:

- Westar @ \$2.20/lb
- InVigor @ \$7.00/lb

Herbicide Cost = \$27.25/ac (SK Ag)

- Actual costs were less for InVigor, more for Westar

Fertilizer costs (SK Ag)

- Fertilizer costs less than speculated

Grain prices - 1997-2006 averages [SAF]

- Canola at \$312/t [\$7.10/bu]
- Pea at \$160/t [\$4.35/bu]
- Wheat at \$144/t [\$3.90/bu]

Economics – COSTS

Rotation	Variable costs [\$/ac]	
	Invigor	Westar
Continuous canola	151	125
Canola-wheat	136	123
Canola-wheat-pea	126	117
Canola-wheat-pea-wheat	125	118

Net Returns [\$ /ac]

Averages for Scott and Melfort

Rotation	2000-03 (dry)		2004-06 (norm)	
	InVigor	Westar	InVigor	Westar
Continuous canola	-38	-59	71	21
Canola-wheat	32	-13	132	37
Canola-wheat-pea	57	3	168	80
Canola-wheat-pea-wheat	37	-4	157	88

Intensive Canola Rotations

- Growing canola more frequently increases blackleg, even with resistant varieties
- Will intensive rotations increase risk that blackleg resistance will break down?
- Weed control is not a major constraint with HT canola
- Need better understanding of sclerotinia implications??



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Thank You!!

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