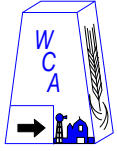


Saskatchewan

**AgriARM**  
Applied Research Management



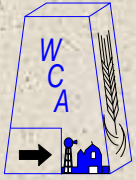
# Wheatland Conservation Area Inc

*Agri-ARM Research Update 2015*

*ADOPT Project  
“Forage Termination Strategies on  
Succeeding Annual Crops”*

8425

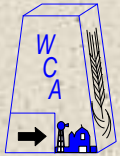
FLAMAN



# Presentation Outline

- Project introduction
- SMA literature summary
- 2013-14 Project findings
- Wrap up and acknowledgements



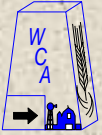


# Project Introduction (ADOPT #20130409)

## *“Forage Termination Strategies on Succeeding Annual Crops”*



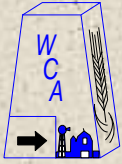
- The objective of this project is to promote and demonstrate effective forage termination strategies in preparation for succeeding annual crop production.
- Use this demonstration as a venue to promote and support current recommendations outlined by the SMA.



# Relevance to Producers

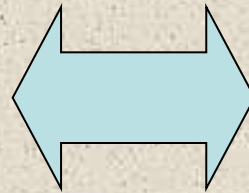
- Producers are taking forage acres out of production in lieu of annual crops for various reasons.
- High commodity prices for annual crops.
- Forages in rotation reaching the end of their term.
- Forage productivity reduced. (Terminated with the intent to re-establish forage stand).
- Three termination methods X three termination timings.





# 3 Termination Strategies

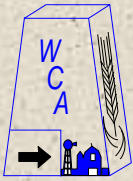
- Full Mechanical Tillage



- Zero Till Chemical Fallow



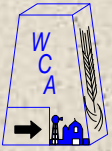
- Combination of the two systems  
(Minimum Tillage)



# Full Mechanical Tillage

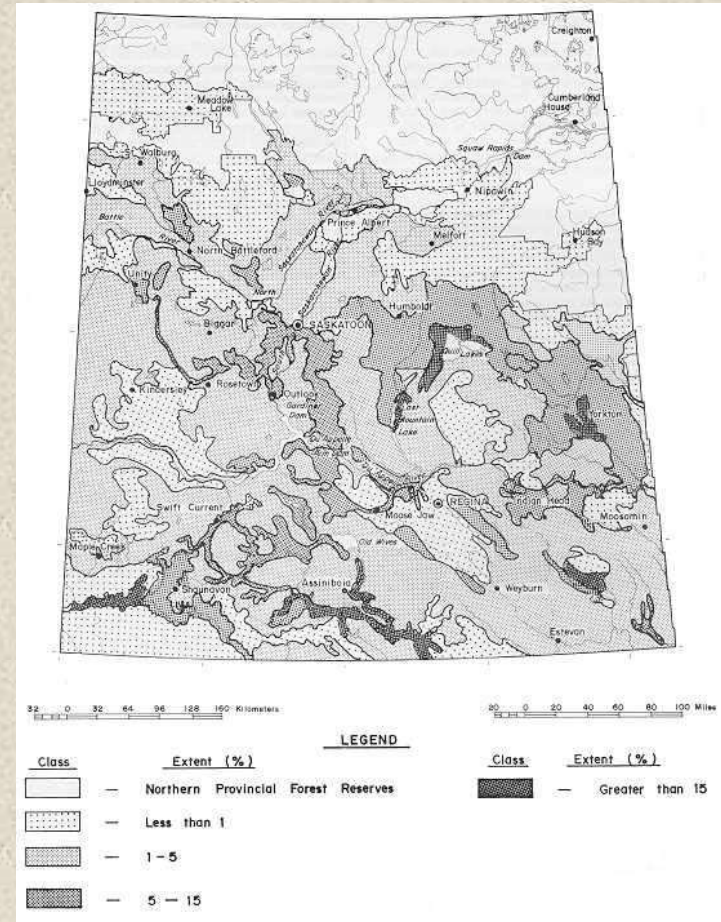


- Works good for seedbed preparation and levelling uneven seedbeds caused by moles, gophers, or badgers.
- Works good for controlling volunteers if worked enough times.
- May require 5 or 6 tillage operations to achieve the above (requires Hp, fuel, time).
- Intensive tillage can destroy soil aggregation and decrease water infiltration by destroying forage root channels by sealing them of close to the soil surface.
- Intensive tillage can dry the soil through increased evaporation and increases the risk of soil erosion.
- Tillage may promote hidden issues like soil salinity.



# Salinity Estimates

- Agri-Food Canada estimates approximately 5.52 million acres (approximately 11.2 per cent) of agricultural land in Saskatchewan are at moderate to high risk of salinization.
- Saskatchewan Assessment estimates that 600,000 of these acres have zero production. (You only see the “Tip of the Iceberg”)



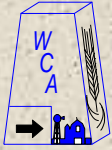


# Zero Till (Chemical Termination)

- Minimal soil disturbance.
- No interference with soil aggregation, root channels remain intact to promote infiltration, and soil moisture conservation is maximized.
- Reduces Hp, fuel, and time requirement.
- Re-growth can be an issue.
- Timing is most critical.
- Will require a disk or narrow knife seeding tool.





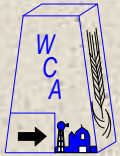


# Minimum Tillage Termination

Best of both worlds or worst of both worlds???

- Replace one or more tillage operations with a herbicide application.
- Somewhere in between full tillage and chemical termination with respect to soil disturbance, soil moisture conservation, achieving a good level seedbed, re-growth issues, and requirements for Hp, fuel, and time.

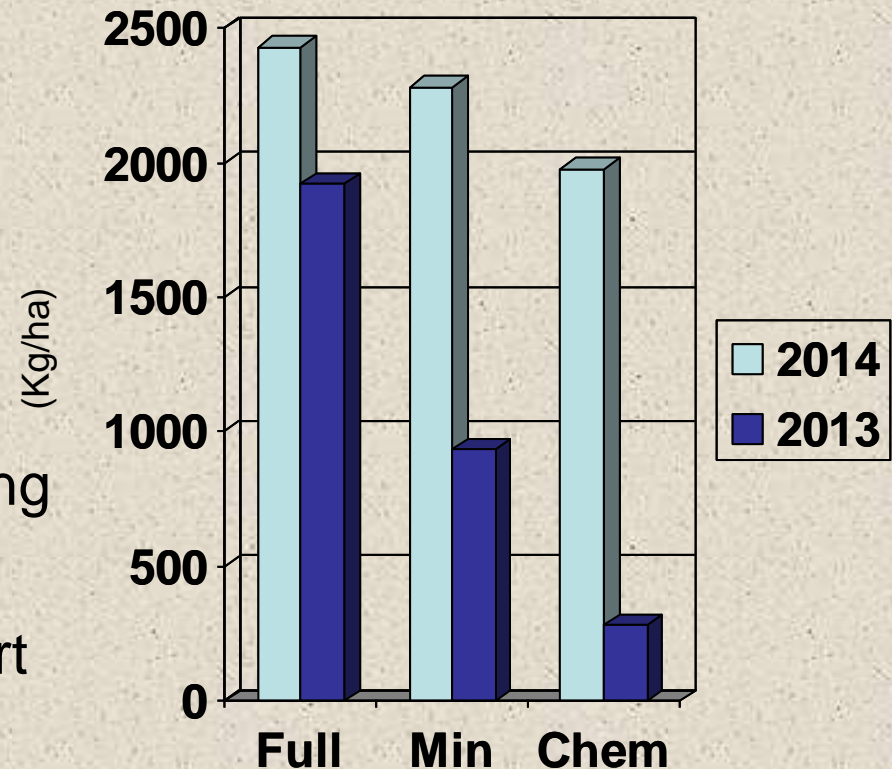


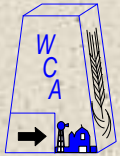


# Termination Timing – Key Points

- Terminating forages is best done in the summer or fall prior to seeding annual crops regardless of the method used. Most evident with Chemical Termination.
- The three basic termination timing strategies are:
  - Spring termination- before seeding an annual crop.
  - Summer termination- utilizing part or all of one growing season.
  - Fall termination- not losing a production season.

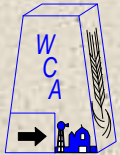
Wheat Yields from the Year of Termination vs. Yields from the Year Prior to Termination





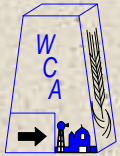
## Termination Timing – Spring Prior to Seeding

- Full Tillage - rough lumpy dry seedbed, poor seed to soil contact, incomplete termination, and increased competition from volunteers. Multiple passes required in a short time.
- Chemical Termination – Waiting for forages to be actively growing with sufficient plant material will significantly delay seeding >3 wks, herbicides are less effective at that time on forages and perennial weeds. Re-cropping options are limited to wheat, barley, or rye if 2,4-D is used. Will require a disk or narrow knife seeding tool.
- Minimum Tillage – Glyphosate should be applied a minimum of 5 days prior to tillage (will further delay seeding).
- As mentioned, terminating forages is best done in the summer or fall year prior to seeding annual crops.



## Termination Timing – Summer termination

- Full Tillage – should be initiated when the plants energy status is low. Either early spring when winter dormancy is broken (losing a full year of production), or after forage is cut or grazed the plant starts to rely on soil reserves (gain one cut of production). Multiple passes required.
- Chemical Termination – should be initiated when the plants energy is being translocated to the root. Either pre-harvest glyphosate 3-7 days prior to final cut (late bud to early bloom), or post-harvest when re-growth reaches early bud. Will require follow up applications if volunteers appear. Will require a disk or narrow knife seeding tool.
- Minimum Tillage – a combination of the above and may involve a pre-harvest glyphosate 3-7 days prior to final cut followed up with tillage after harvest once the herbicide is translocated into the roots. Further tillage may be required to prepare a good seedbed as well as a fall herbicide application to control re-growth.



## Termination Timing – Fall termination

Takes advantage of harvesting multiple cuts later in the season

- Full Tillage – Multiple passes are required before seeding therefore, one or two passes in the fall will likely need to be followed up with multiple passes in the spring in order to break up lumps to insure good seed to soil contact.
- Chemical Termination – Can be a most effective termination strategy provided the plants are actively growing and the herbicide is not compromised by cold temperatures below 15 degrees Celsius, or frost. Should wait 3 days after a frost to apply glyphosate. May require a pre-seed application in spring. Will require a disk or narrow seed opener.
- Minimum Tillage – a combination of the above and may involve post-harvest glyphosate after plants are actively re-growing followed up with tillage once the herbicide is translocated into the roots (may take longer than normal if cool). Further tillage will be required to prepare a good seedbed as well as a spring herbicide application to control re-growth.

# Cost of Terminating a Forage Stand (SMA website)

## Assumptions:

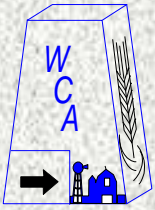
\*540 gram active ingredient per litre glyphosate formulation

\*\*2,4-D 700 Ester

\*\*\*Herbicide costs based on February 1, 2012 retail price (\$4.20 per litre and \$9.70 per litre for glyphosate and 2,4-D respectively). Custom sprayer rates based on informal survey (April 2012) of custom operators. Custom rates for tillage and harrowing were based on values in Saskatchewan Agriculture's 2010-11 Farm Machinery Custom and Rental Rate Guide.

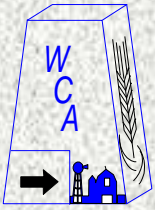
Please refer to the latest version of Saskatchewan Agriculture's Guide to Crop Protection for grazing, haying and re-cropping restrictions and lists of registered tank mixes.

Termination Strategy	Cost per acre***	Your Cost per acre
<b>Tillage alone</b>		
Four tillage operations	$\$5.66 \times 4 = \$22.64$	
One harrow operation	<u><math>= \\$ 2.55</math></u>	
Total	<b>\$25.19</b>	
<b>Tillage + Herbicides</b>		
Spray glyphosate* at 1.34 litres per acre pre-harvest (late June-early July) and cut hay	$\$6.00 + \$5.63 = \$11.63$	
Two tillage operations	$\$5.66 \times 2 = \$11.32$	
Pre-seed glyphosate burn-off at 0.67 litres per acre	$\$6.00 + 2.81 = \$ 8.81$	
Total	<b>\$31.76</b>	
<b>Herbicides alone</b>		
Spray glyphosate at 1.34 litres per acre + 0.5 L per acre 2,4-D** on regrowth (late August-early September)	$\$6.00 + \$5.63 + \$4.85 = \$16.48$	
Pre-seed glyphosate burn-off at 0.67 litres per acre	$\$6.00 + 2.81 = \$ 8.81$	
Total	<b>\$25.29</b>	



## Forage Termination Strategies on Succeeding Annual Crops 2014 Treatment List

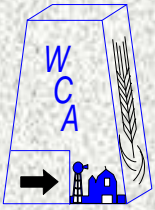
- 1. Forage (terminated by Full Tillage) - pea - [wheat](#)
- 2. Forage (terminated by Full Tillage) - oat - [wheat](#)
- 3. Forage (terminated by Full Tillage) - canola - [wheat](#)
- 4. Forage (terminated by Full Tillage) - wheat - [wheat](#)
- 5. Forage (terminated by Full Tillage) - Full Tillage fallow - [wheat](#)
- 6. Forage (terminated by Chemical Tillage) - pea - [wheat](#)
- 7. Forage (terminated by Chemical Tillage) - oat - [wheat](#)
- 8. Forage (terminated by Chemical Tillage) - canola - [wheat](#)
- 9. Forage (terminated by Chemical Tillage) - wheat - [wheat](#)
- 10. Forage (terminated by Chemical Tillage) - Chemical fallow - [wheat](#)
- 11. Forage (terminated by Min Tillage) - pea - [wheat](#)
- 12. Forage (terminated by Min Tillage) - oat - [wheat](#)
- 13. Forage (terminated by Min Tillage) - canola - [wheat](#)
- 14. Forage (terminated by Min Tillage) - wheat - [wheat](#)
- 15. Forage (terminated by Min Tillage) - Min Tillage fallow - [wheat](#)



# Forage Termination Strategies on Succeeding Annual Crops 2014 Treatment List

- The following plot operations were performed:
- In 2013
- May 2 - Tandem disked mechanical tillage system (3 times)
- - Tandem disked minimum tillage system (1 time)
- May 7 - Roundup Transorb @ 1 l/ac on chemical termination system
- - Roundup Transorb @ 1 l/ac on minimum tillage system
- May 21 - Roundup Transorb @ 1 l/ac on chemical termination system
- - Roundup Transorb @ 1 l/ac on minimum tillage system
- May 27 - Seeded all annual crops (sidebanded 80 N on cereals, 100 N on canola, and 50 P on peas).
- June 16 - Spring plant emergence counts
- Aug 16 - Plant stand establishment ratings
- Aug 8 - Tandem disked mechanical tillage system (additional demo plot)
- - Roundup Transorb @ 1 l/ac + Heat @ 28.4 g/acre + Merge on chemical termination system (additional demo plot)
- Sept 16 -Harvest (no pre-harvest tillage or chemical application done)





# Forage Termination Strategies on Succeeding Annual Crops 2014 Treatment List

- The following plot operations were performed:
- In 2014
- June 2 - Roundup Transorb @ 1 l/ac on chemical termination
  - Roundup Transorb @ 1 l/ac on minimum tillage system
  - Tandem disked mechanical tillage system
  - Tandem disked minimum tillage system
- June 5 - Seeded Unity VB at 90 lbs/ac with 70N-35P-0K-14S sidebanded.
- June24- Sprayed in-crop with Horizon NG (376 ml/ac) and Thumper (0.4 l/ac).



# Forage Termination Strategies on Succeeding Annual Crops 2014

- Seedbed after seeding wheat in year 2

- Full Tillage



- Chemical Termination

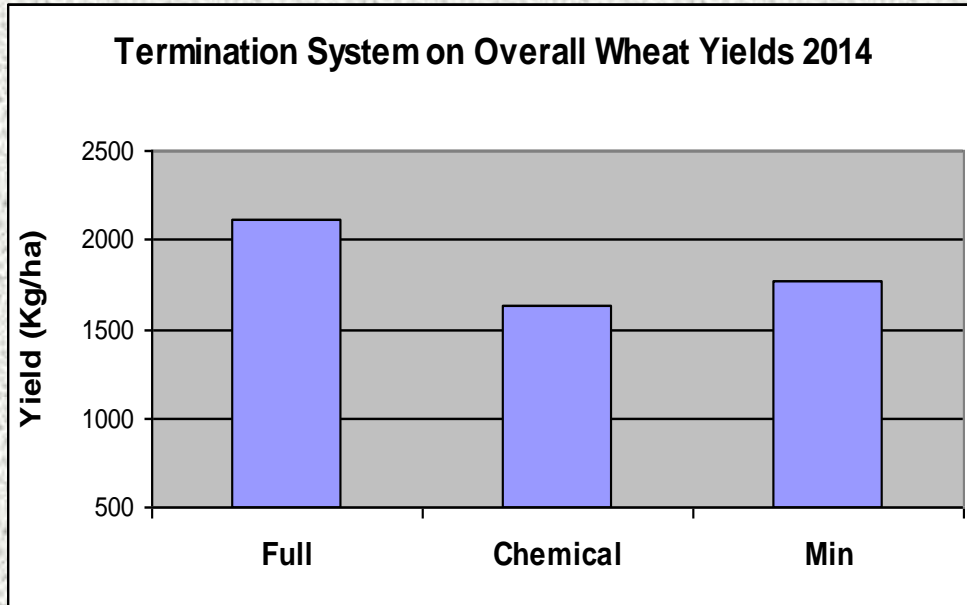


- Minimum Tillage





# 2014 Wheat Yields from 3 Termination Systems



- Abundant rainfall in 2014 eliminated many of the negative affects of tillage.
- Seed openers favoured tillage.
- Less re-growth under full tillage.



Full



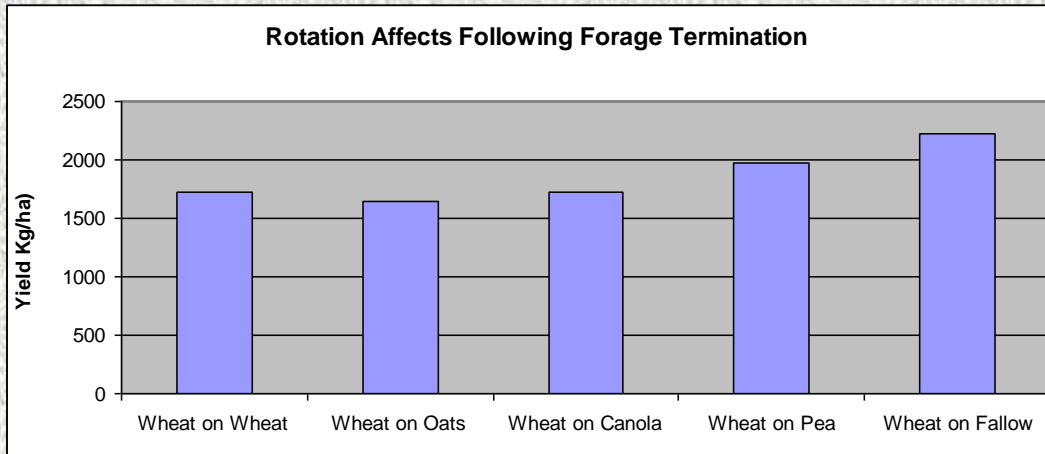
Min



Chem



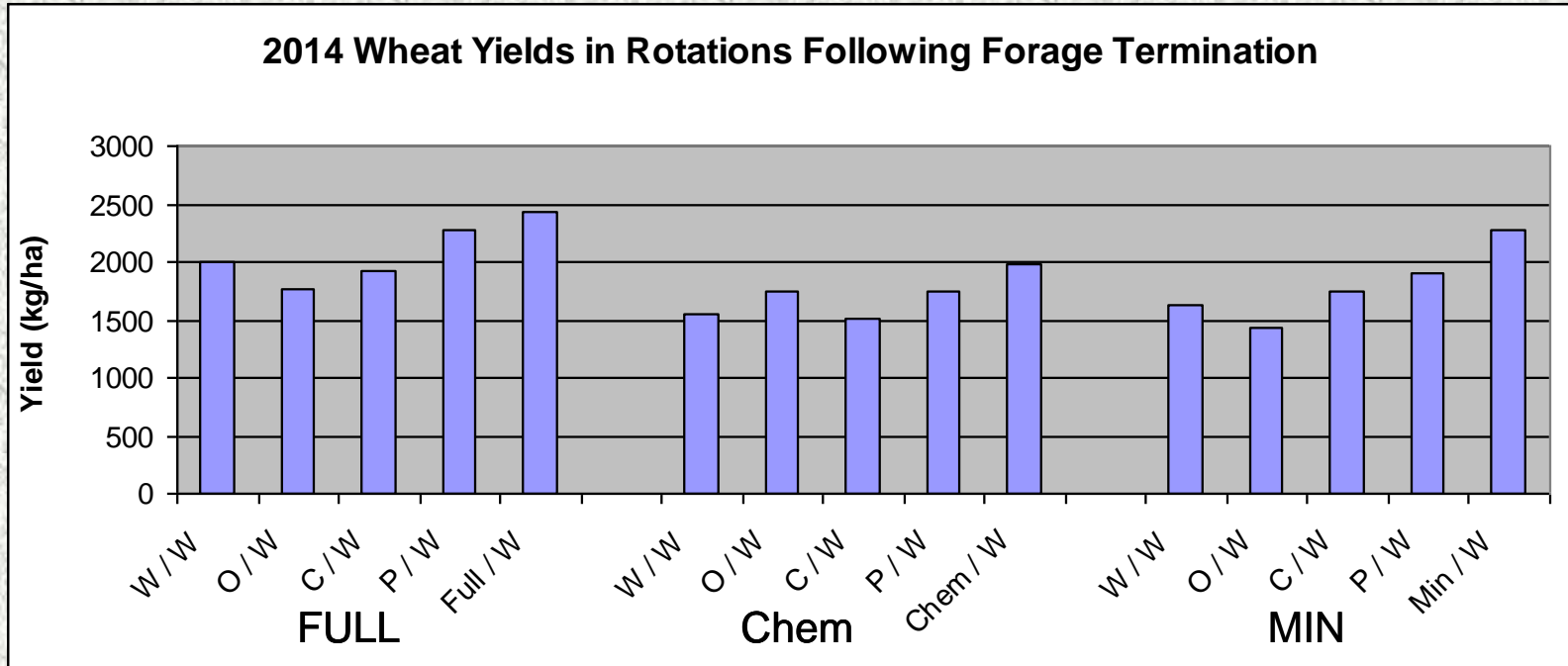
# 2014 Wheat Yields from 3 Termination Systems



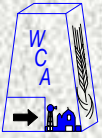
- Abundant rainfall in 2014 eliminated many of the negative affects of tillage.
- Less re-growth under full tillage.
- Pea may have contributed added N.



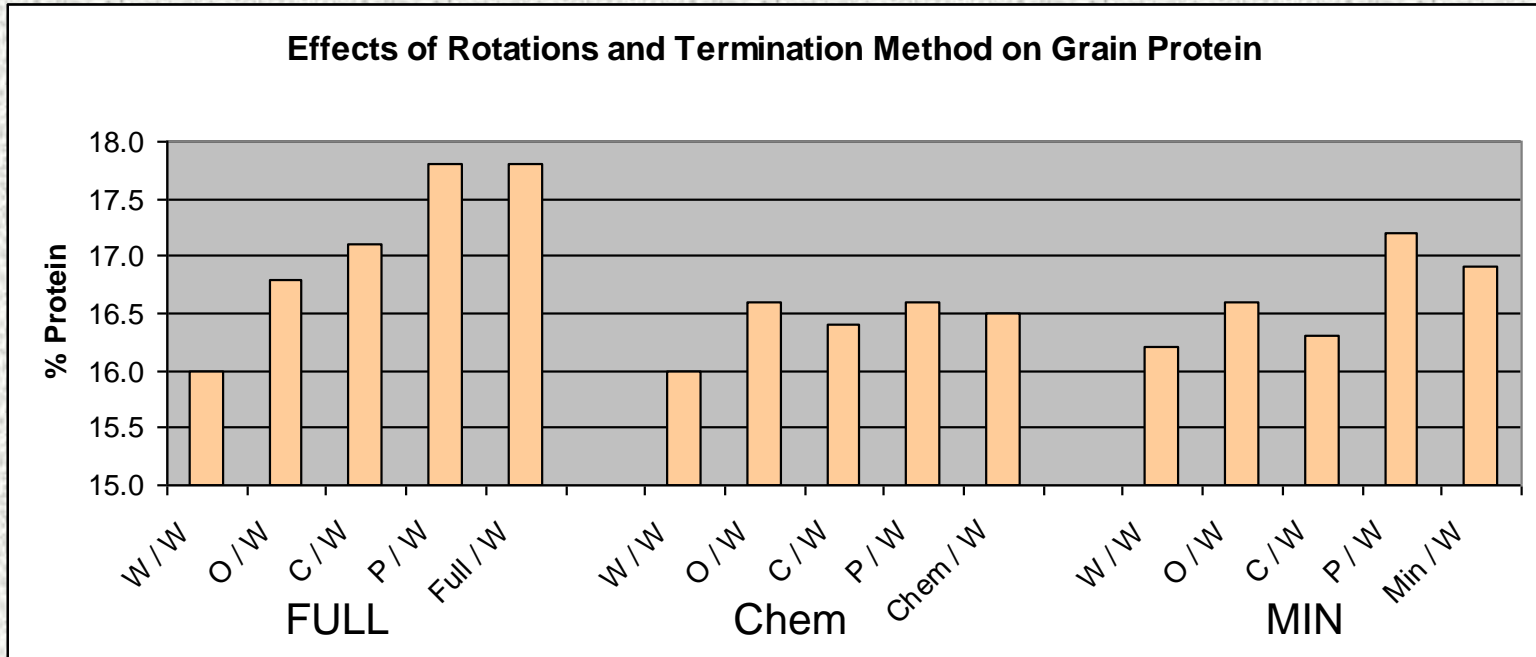
# 2014 Wheat Yields Following Forage Termination



- Wheat yields were best following forage termination in the year prior to seeding an annual crop, despite the method of termination.
- Crops grown in the same year of forage termination suffered from poor seedbed preparation and abundant forage re-growth despite in-crop herbicides competing with the crop in 2013, which carried over into 2014.
- Abundant rainfall in 2014 eliminated the negative affects of tillage.



# 2014 Wheat Proteins in Rotation Following Forage Termination



Wheat proteins appeared higher following peas and fallow and lowest when following wheat in the rotation. As well it appears there may be a slight protein boost from tillage, likely due to short term N mineralization.



# Summary

- The best time to initiate forage termination is the year prior to seeding an annual crop, whether by full tillage, min-tillage or Chemical termination.
- Direct seeding of annual crops into herbicide terminated forages is possible and can be cost effective if the following conditions are met:
  - Forage termination is initiated in the summer or fall of the previous year (apply herbicides three to seven days prior to last cut. Forages terminated with 2, 4-D should not be fed to livestock).
  - Effective forage kill and weed control are achieved at the time of termination through proper application timing and rate of herbicide.
  - Direct seeding machinery is used that can assure good seed to soil contact and accurate seed placement.
  - Additional nutrients and possibly more precise fertilizer placement will be needed when seeding directly into sod.
  - An effective in-crop weed management strategy is implemented in the subsequent crop for the control of volunteer forages (alfalfa, grasses) and other annual and perennial weeds.

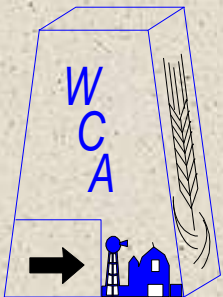
# Acknowledgement



- ADOPT & Sask. Ministry of Agriculture
- WCA Staff.



2015 Croportunities Conference , March 17  
2015 Wheatland Annual Tour in July  
[www.wheatlandconservation.ca](http://www.wheatlandconservation.ca)





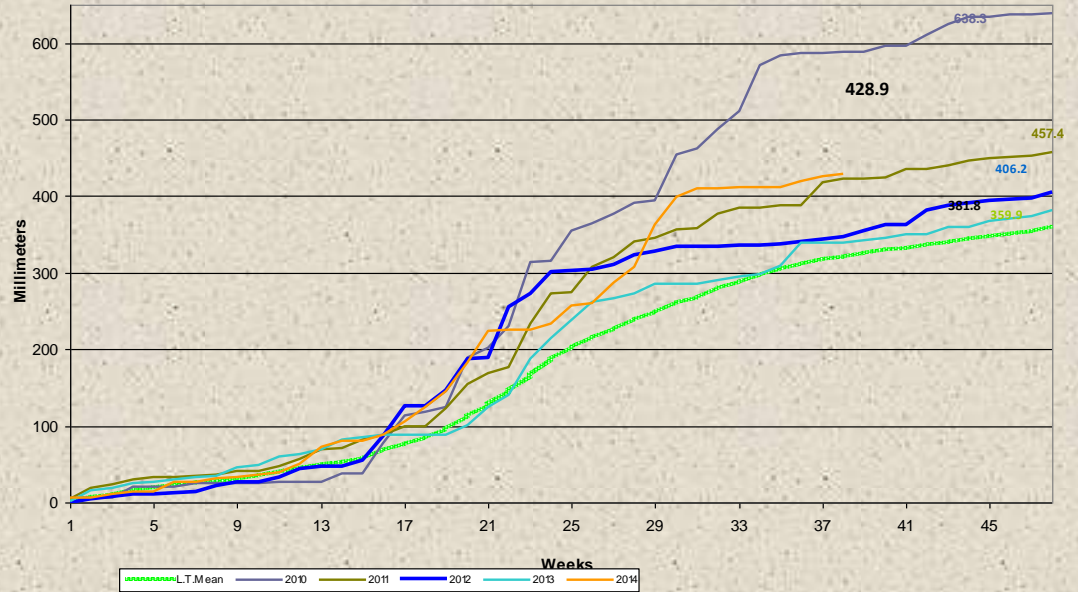
# Thank-you!



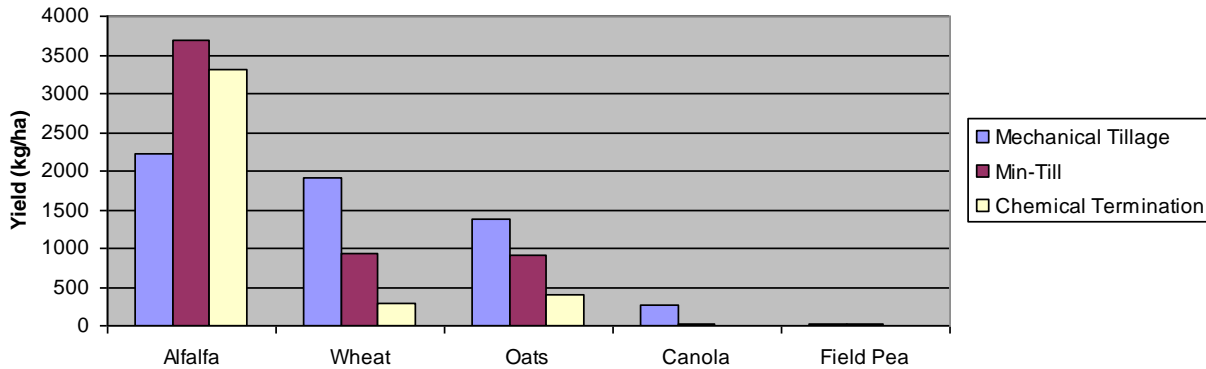
# For Reference Slide

## Weekly Precipitation

Accumulative Weekly Precipitation for Years 2010-2014



Methods of Terminating Long Term Forage Stands for Annual Crop Production



## Year One Yields