



#### Impacts of Chemical Fallow Practices in Conservation Tillage Management Systems on Runoff and Erosion in the Pacific Northwest

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# Issues Facing Agricultural Management on the Palouse



## **Conventional Tillage Fallow**



Photo: Jeff Ullman

## **Chemical Fallow**

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Photo: Jeff Ullman

http://www.stevensfarm.com/images/farm2.1.jpg

CHI

## **Single Pass Direct Seed Technology**

#### **Fertilizer Tube**

## Seed Tube

## **Seed Drill**

The Palouse has always had a problem with erosion, due to its steep slopes, heavy winter precipitation, strong winds, and conventional tillage practices. Estimated rate of soil loss: 200 tons acre<sup>-1</sup>

# April 9, 1959 Photo: F.A. Mark, Steptoe, WA http://www.nrcs.usda.gov/Technical/ECS/agronomy/photos.html

## **November 4, 2010**

Photo: Jeff Ullman

# Demonstration and Experimentation

#### 2009: intensity of 1.5 in hr $^{-1}$

CHALLENGER

#### 2010: intensity of 0.7 in hr $^{-1}$



#### Runoff With Time (2009)



#### Runoff With Time (2009)



#### Sediment Loss With Time (2009)



Runoff with Time (2010)



Minutes

#### 2009

Parameters	Time to 1 <sup>st</sup> Runoff	Total Runoff	Total Sediment Loss
Chemical Fallow, 1% Slope	19 Minutes	3.1 Liters	2.20 grams
Conventional Fallow, 2% Slope	15 Minutes	4.0 Liters	25.8 grams
1 <sup>st</sup> Pass of 2-Pass System, 7% Slope	11 Minutes	6.6 Liters	88.0 grams

- Chemical and conventional tillage fallow plots exhibited a minimal gradient difference and were located within 6 m of one another.
- The chemical fallow plot exhibited a nearly 12 and 44 fold reduction in amount of soil lost compared to the other two plots, respectively.
- The chemical fallow plot experienced the longest time to first noticeable runoff.

#### 2010

Parameters	Time to 1 <sup>st</sup> Runoff	Total Runoff	Total Sediment Loss
Conventional Fallow, 20.5% Slope	2 Min, 45 Sec	6.61 Liters	0.45 grams
Chemical Fallow, 13% Slope	6 Min, 30 Sec	6.37 Liters	0.51 grams
Chemical Fallow, 31% Slope	2 Minutes	4.45 Liters	1.33 grams
Chemical Fallow, 31.5% Slope	2 Min, 30 Sec	5.57 Liters	0.96 grams

Initial demonstration plots did not reveal distinctive trends.

- The tillage fallow (20.5% slope) yielded the greatest amount of total runoff, but generated the lowest sediment loss.
- The chemical fallow plot with the smallest gradient (13% slope) exhibited the greatest total runoff of each of the chemical fallow plots, but generated relatively low sediment loss compared to the steeper chemical fallow fields.

#### 2010

Parameters	Time to 1 <sup>st</sup> Runoff	Total Runoff	Total Sediment Loss
Conventional Fallow, 0% Slope	5 Minutes	4.22 Liters	1.56 grams
Chemical Fallow, 0% Slope	10 Minutes	0.96 Liters	0.44 grams
*Conventional Fallow, 28% Slope	2.5 Minutes	9.58 Liters	3.33 grams
Chemical Fallow, 28% Slope	5 Minutes	6.52 Liters	0.64 grams

- In both comparisons the chemical fallow plot outperformed the tillage fallow plot in all aspects measured, with significant reductions in sediment loss and considerably less runoff.
- A direct comparison between equally paired sites clearly demonstrates the potential benefits of chemical fallow.

# Conclusions

- Implementation of chemical fallow practices in conjunction with direct seed tillage systems may serve as a beneficial conservation method to reduce runoff and soil erosion from cropland.
- Early comparisons for the demonstration plots were inconclusive, warranting further comparison and study of equally paired (slope) plots.
- When paired plots were considered, chemical fallow outperformed conventional tillage fallow in all aspects measured.
- The influence of slope on runoff and sediment loss was evident and must be considered when developing fallow management plans.

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http://kimmib.files.wordpress.com/2008/03/palouse.jpg