



# WSU WILKE RESEARCH AND EXTENSION FARM OPERATION, PRODUCTION, AND ECONOMIC PERFORMANCE FOR 2016

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# WSU Wilke Research and Extension Farm Operation, Production, and Economic Performance for 2016

## Current Situation

The Washington State University (WSU) Wilke Research and Extension Farm is a 320-acre facility located on the eastern edge of Davenport, WA, and is split (north and south) by State Highway 2. WSU maintains and operates this facility. This annual technical bulletin is written for farmers and crop consultants in the intermediate cropping zone (12 to 17 inches of annual precipitation). It also provides documentation of the operations and production on the Wilke Farm to assist University faculty with small plot research experiments.

The predominant commercial cropping system practiced by farmers in this region is a 3-year rotation, which includes summer fallow, winter wheat, and spring cereals. Farmers are interested in intensifying rotations to reduce fallow years and increase crop diversity to improve long-term agronomic and economic stability.

The Wilke Farm remains in a direct-seed cropping system utilizing no-till fallow, and growing primarily winter wheat, spring cereals, and broadleaf crops. Broadleaf crops are used instead of spring and winter cereals when weed pressures and market prices create opportunities for profitable production.

The south side of the farm is divided into seven plots; three plots are in a more traditional 3-year crop rotation, and four plots are in an intensified 4-year crop rotation. The north side of the farm remains in an intensified rotation that forgoes summer fallow and is in continuous cereal grain production. In 2010 through 2013, cereal rye (feral rye) infestations caused cropping decisions to be altered on the Wilke Farm, especially in the no-till fallow-winter wheat portion of the rotations (these changes are noted in *red italic* in the data tables). In the fall of 2013, the no-till fallow-winter wheat portion of the rotation was seeded as planned without alteration due to cereal rye because each plot had an extended rotation without fallow-winter wheat.

Soil compaction and wireworm population data are collected each spring from GPS-recorded locations within each plot. Soil samples are also collected from these GPS locations prior to seeding, and fertilizer is applied according to soil sample results and WSU recommendations.

## Operations

Plot 1 and Plot 2 were lightly disked after the 2015 harvest to incorporate cereal rye seed on the soil surface, encouraging germination and improving long-term control. Winter wheat into fallow was seeded with Crop Production Services' Case IH direct-seed hoe drill with Anderson openers on 12-inch spacing. The spring crops were seeded with Kevin Klein's SeedMaster hoe drill on 12-inch spacing. The farm was harvested with the farm's John Deere 6622 combine from August 4 through August 25.

### ***Winter Wheat (3-year Plot 7; 4-year Plot 3)***

Plot 3 and Plot 7 were seeded to 'Crescent' soft white winter club wheat on September 12-13, 2015, at 70 lb/acre into no-till fallow. Seed was treated with 0.33 oz/cwt CruiserMaxx Vibrance Cereals. Liquid ammonium Thio-Sul, 12-0-0-26, ammonium polyphosphate, 10-34-0-0, and Power Up, 6-18-6-1, were applied at a rate of 10-14-1-12 with the seed. In Plot 3, anhydrous ammonia was applied below the seed at 85 lb N/acre, and only 45 lb N/acre in Plot 7. Post-emergence herbicide application was applied on April 13, 2016. This application included 24.0 oz/acre Bison, 9.2 oz/acre Topsin, 3.7 oz/acre Tilt, 27 oz/acre Micro 500 fertilizer, 2.14 gal/acre CoRoN fertilizer, and 1.0 qt/100 gal non-ionic surfactant. On May 25, an aerial application of 12.0 oz/acre Quilt Xcel, 0.8 oz/acre non-ionic surfactant, and 2.0 oz/acre Interlock was made for stripe rust control.

### ***Spring Wheat (3-year Plot 2; 4-year Plot 4)***

Plot 2 was seeded to 'Glee' hard red spring wheat into winter wheat residue on April 21 at 75 lb/acre. It was treated with 1.33 oz/cwt CruiserMaxx Vibrance Cereals. Liquid UAN-32, 11-37, 9-0-0-10, and NACHURS imPulse were applied at a rate of 8-6-1-3 with the seed. Anhydrous ammonia rate was varied across three different zones to account for field variability and yield potential and averaged 82 lb N/acre. Overall 22% of the plot received 90 lb N/acre, 47% received 86 lb N/acre and 31% received only 70 lb N/acre. Three weeks prior to seeding 32.0 oz/acre Roundup RT3 and 1.5 qt/100 gal Aduro were applied. Prior to seeding an additional 16.0 oz/acre RT3 and 1.5 qt/100 gal Aduro were applied because of additional green-up due to the light disking.

Post-emergence weed control was applied on May 28. This application included 0.6 oz/acre Affinity BroadSpec, 16.0 oz/acre D-638 (acid based 2,4-D), 4.0 oz/acre Tilt, 1.0 gal/acre 25-0-0-3 fertilizer, and 1.5 qt/100 gal Activate.

Plot 4 was seeded to 'Glee' hard red spring wheat into spring canola residue on April 21 at 75 lb/acre. It was treated with 1.33 oz/cwt CruiserMaxx Vibrance Cereals. Liquid UAN-32, 11-37, 9-0-0-10, and NACHURS imPulse were applied at a rate of 8-6-1-3 with the seed. Anhydrous ammonium rate was varied across three different zones to account for field variability and yield potential and averaged 80 lb N/acre. Overall 41% of the plot received 90 lb N/acre, 48% received 80 lb N/acre, and 11% received only 45 lb N/acre. Three weeks prior to seeding 32.0 oz/acre RT3 and 1.5 qt/100 gal Aduro were applied. Post-emergence weed control was applied on May 28. This application included 0.6 oz/acre Affinity BroadSpec, 16.0 oz/acre D-638 (acid based 2,4-D), 4.0 oz/acre Tilt, 1.0 gal/acre 25-0-0-3 fertilizer, and 1.5 qt/100 gal Activate Plus.

### ***Oriental Mustard (4-year Plot 6)***

'Pacific Gold' oriental mustard was seeded and fertilized in one pass on April 22 into spring wheat residue at 5.0 lb/acre. Liquid UAN-32, 11-37, 9-0-0-10, and NACHURS imPulse were applied at a rate of 8-6-1-3 with the seed. Anhydrous ammonium rate was varied across three different zones to account for field variability and yield potential and averaged 47 lb N/acre. Overall 40% of the plot received 55 lb N/acre, 37% received 45 lb N/acre, and 23% received only 35 lb N/acre. Prior to seeding on April 1, 32.0 oz/acre RT3 and 1.5 qt/100 gal Aduro were applied. Post-emergence weed control included 6.0 oz/acre Tide Clethodim 2EC, 12.0 oz/acre WL Hiload 60-40 crop oil, and 1 gal/ac 25-0-0-3 fertilizer on May 27 for grassy weed control only. No broadleaf weed control was applied.

### ***No-till Fallow (3-year Plot 5; 4-year Plot 1)***

Both plots of no-till fallow were maintained relatively weed free. Plot 1 had increased weed pressure due to the light disking in the fall of 2015 to help flush cereal rye seed and an additional application was required. In Plot 1, the first application was applied on April 1 at 32.0 oz/acre RT3 and 1.5 qt/100 gal Aduro. The second application was on May 18 and was 32.0 oz/acre RT3, 1.0 oz/acre Sharpen, and 1.5 qt/100 gal Aduro. The third application was on June 27 at 32.0 oz/acre RT3, 3.0 oz/acre AirLink, and 1.5 qt/100 gal. The fourth application was 48 oz/acre Gramoxone and 1.0 qt/100 gal

Activate on August 8. The fifth and final application was 32.0 oz/acre RT3 and 1.5 qt/100 gal Aduro applied on September 7. In Plot 5, the first and second applications were 32.0 oz/acre RT3 and 1.5 qt/100 gal Aduro applied on April 1 and May 31. The third application was on July 16 at 32.0 oz/acre RT3, 3.0 oz/acre AirLink, and 1.5 qt/100 gal. The fourth application and final application was 48 oz/acre Gramoxone SL 2.0 and 1.0 qt/100 gal Activate Plus on September 7.

### ***Spring Barley (Continuous North)***

'Lenetah' spring barley was seeded into winter wheat residue on April 22 at 65 lb/acre. It was treated with Albaugh Gold 1.0 oz/cwt plus 0.33 oz/cwt Imidacloprid. Liquid UAN-32, 11-37, 9-0-0-10, and NACHURS imPulse were applied at a rate of 8-6-1-3 with the seed. Anhydrous ammonium rate was varied across three different zones and averaged 49 lb N/acre. Overall 13% of the plot received 70 lb N/acre, 61% received 50 lb N/acre, and 26% received only 35 lb N/acre. Three weeks prior to seeding, 32.0 oz/acre RT3 and 1.5 qt/100 gal Aduro were applied. Prior to seeding, an additional 16.0 oz/acre RT3 and 1.5 qt/100 gal Aduro were applied across 1/2 of the field because of additional green-up related to the previous crop. Post-emergence weed control was applied on May 28. This application included 0.6 oz/acre Affinity BroadSpec, 16.4 oz/ac Axial Star, 16.0 oz/acre Maestro MA, and 1.0 gal/acre 25-0-0-3 fertilizer.

## **Soil Compaction**

Soil compaction data are collected with a Spectrum Soil Compaction meter. Data are collected within each plot in the spring of the year prior to seeding to monitor compaction levels over time within a given crop rotation and to assist in potential management decisions. Unfortunately, 2016 compaction data was lost because of technical issues with the meter.

## **Wireworm Populations**

Wireworm population data are collected within each plot in the spring of the year prior to seeding using the modified solar bait trap method (Washington State University Publication FS059E). This is done to monitor populations over time and better match seed-applied insecticide with wireworm populations. Plot 4 had the least amount of wireworms averaging 1.4/trap, and Plot 6 had the greatest population, averaging 2.6/trap. Plots 1, 2, 5, and North averaged 2.0, 2.0, 2.4, and 2.4/trap, respectively.

## Soil Samples

All soil samples were collected prior to seeding. No-till fallow plots are soil sampled at the same time as those plots being spring cropped. Soil samples are used to help determine yield

potential and nutrient requirements for the crops each year (Tables 1–8). They are also used as a historical reference for changing soil conditions over time. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Table 1. Winter wheat 3-year Plot 7 soil sample data for 2016 crop year. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Soil pH	5.6				Phosphorus	18 mg/kg
Organic Matter	2.1% (41 lb/acre N)				Ammonium N	6 lb/acre
	Soil Depth (in)					
	<u>0-12</u>	<u>12-24</u>	<u>24-36</u>	<u>36-48</u>	<u>Total</u>	
Nitrate-N (lb/acre)	69	19	33	25	146	
Sulfate-S (mg/kg)	9	4	5	--	17	
Moisture (in)	2.3	1.8	1.7	1.7	7.5	

### Sum of Tested N: 193 lb/acre N

Table 2. Winter wheat 4-year Plot 3 soil sample data for 2016 crop year. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Soil pH	5.8				Phosphorus	18 mg/kg
Organic Matter	2.0% (40 lb/acre N)				Ammonium N	6 lb/acre
	Soil Depth (in)					
	<u>0-12</u>	<u>12-24</u>	<u>24-36</u>	<u>36-48</u>	<u>Total</u>	
Nitrate-N (lb/acre)	47	15	19	15	96	
Sulfate-S (mg/kg)	8	5	5	--	19	
Moisture (in)	2.1	1.9	1.7	1.7	7.3	

### Sum of Tested N: 142 lb/acre N

Table 3. Spring barley Plot Continuous North soil sample data for 2016 crop year. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Soil pH	6.1				Phosphorus	18 mg/kg
Organic Matter	2.5% (51 lb/acre N)				Ammonium N	8 lb/acre
	Soil Depth (in)					
	<u>0-12</u>	<u>12-24</u>	<u>24-36</u>	<u>36-48</u>	<u>Total</u>	
Nitrate-N (lb/acre)	10	7	12	24	53	
Sulfate-S (mg/kg)	6	5	11	--	22	
Moisture (in)	2.9	2.6	2.2	2.2	9.9	

### Sum of Tested N: 111 lb/acre N

Table 4. Spring wheat 3-year Plot 2 soil sample data for 2016 crop year. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Soil pH	6.0				Phosphorus	17 mg/kg
Organic Matter	2.3% (46 lb/acre N)				Ammonium N	9 lb/acre
	Soil Depth (in)					
	<u>0-12</u>	<u>12-24</u>	<u>24-36</u>	<u>36-48</u>	<u>Total</u>	
Nitrate-N (lb/acre)	8	6	13	15	43	
Sulfate-S (mg/kg)	5	4	6	--	15	
Moisture (in)	3.0	2.8	2.4	2.1	10.3	

**Sum of Tested N: 98 lb/acre N**

Table 5. Spring wheat 4-year Plot 4 soil sample data for 2016 crop year. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Soil pH	6.1				Phosphorus	16 mg/kg
Organic Matter	2.2% (44 lb/acre N)				Ammonium N	9 lb/acre
	Soil Depth (in)					
	<u>0-12</u>	<u>12-24</u>	<u>24-36</u>	<u>36-48</u>	<u>Total</u>	
Nitrate-N (lb/acre)	11	9	19	15	54	
Sulfate-S (mg/kg)	6	28	36	--	71	
Moisture (in)	2.9	2.8	2.6	2.1	10	

**Sum of Tested N: 108 lb/acre N**

Table 6. Oriental mustard 4-year Plot 6 soil sample data for 2016 crop year. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Soil pH	6.1				Phosphorus	28 mg/kg
Organic Matter	2.2% (44 lb/acre N)				Ammonium N	9 lb/acre
	Soil Depth (in)					
	<u>0-12</u>	<u>12-24</u>	<u>24-36</u>	<u>36-48</u>	<u>Total</u>	
Nitrate-N (lb/acre)	8	7	8	13	36	
Sulfate-S (mg/kg)	6	4	8	--	19	
Moisture (in)	3.1	2.7	2.4	2.2	10.4	

**Sum of Tested N: 88 lb/acre N**

Table 7. No-till fallow 3-year Plot 5 soil sample data for 2016 crop year. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Soil pH	5.7				Phosphorus	19 mg/kg
Organic Matter	2.2% (43 lb/acre N)				Ammonium N	19 lb/acre
	Soil Depth (in)					
	0-12	13-24	25-36	37-48	Total	
Nitrate-N (lb/acre)	11	6	11	27	55	
Sulfate-S (mg/kg)	6	3	4	--	13	
Moisture (in)	2.9	2.7	2.4	2.4	10.5	

**Sum of Tested N: 117 lb/acre N**

Table 8. No-till fallow 4-year Plot 1 soil sample data for 2016 crop year. Soil pH, organic matter, phosphorus, and ammonium nitrogen is collected from the top 12 inches of soil only.

Soil pH	5.8				Phosphorus	18 mg/kg
Organic Matter	2.5% (50 lb/acre N)				Ammonium N	11 lb/acre
	Soil Depth (in)					
	0-12	12-24	24-36	36-48	Total	
Nitrate-N (lb/acre)	14	8	20	28	70	
Sulfate-S (mg/kg)	7	5	5	--	17	
Moisture (in)	3.2	2.7	2.3	2.0	10.2	

**Sum of Tested N: 131 lb/acre N**

Table 9. 2016 Nitrogen Use Efficiency.

	Plot 3	Plot 7	Plot 2	Plot 4
Soil Test Nitrogen (lb/acre)†	125	176	77	102
Applied Nitrogen (lb/acre)	101	59	92	90
Total Nitrogen (lb/acre)	226	235	169	192
Grain Yield (bu/acre)	94.5	84.2	49.0	48.9
Grain Protein	9.3%	9.1%	14.0%	14.1%
Lb N/bu	2.4	2.8	3.5	3.9
<b>Nitrogen Use Efficiency</b>	<b>58%</b>	<b>49%</b>	<b>53%</b>	<b>47%</b>

†Soil test nitrogen is calculated using soil test results in combination with the WSU Dryland Wheat Nitrogen Fertilizer Calculator.

# Production and Economic Performance

Nitrogen use efficiency across the farm was near or above 50% across all crops in 2016 (Table 9). This implies the farm nitrogen fertilizer program across all crops was adequate and an average amount of nitrogen should be available in the soil for next year’s production.

The WSU Wilke Farm grain marketing plan begins once the crop has emerged using forward contracts and post-harvest selling. All grain is marketed by November 15 in the same year as harvest. The average marketing window for winter wheat is 13 months, and only 7 months for spring crops. Forward contract values do not exceed the crop revenue insurance coverage value. The potential for a forward contract is evaluated monthly and is based on a targeted rate of return on investment based on estimated expenses. Market grades for each crop are provided as these also impact final market price. Oriental mustard is marketed through a contract with McKay Seed Company, Almira, WA.

Average input costs per year at the WSU Wilke Farm for 2016 were down 19.6% over the last 3--year average and the lowest since 2010 (Appendix A). Economic returns over input costs were up 56.9% over the previous 3--year average and were the highest since 2013. This is caused primarily by very poor returns over input cost in 2015 and above average yields and lower commodity prices in 2016. Tables 10–15 summarize the rotation, production, and economic performance of the 3--year rotation, 4--year rotation, and continuous cropping system at the Wilke Farm in 2015.

The 3--year crop rotation returns above input costs averaged \$152/acre (Table 11), 34% more than the 3--year average. The 4--year crop rotation returns above input costs averaged \$170/acre (Table 13), 94% more than the previous 3-year average. The continuous cropping system returns above input costs averaged \$80/acre (Table 15), 29% more than the previous 3--year average. The WSU Wilke Farm is enrolled in the farm program and crop insurance is purchased each year, but any revenue and/or costs associated with this is not included in the plot summaries to maintain consistency over years and results based specifically on crop production only.

Table 10. 3-year cropping rotation sequence at the Wilke Farm from 2012–2017.

<b>Year</b>	<b>Plot 2</b>	<b>Plot 5</b>	<b>Plot 7</b>
2012	<i>HWSW</i> (46.4 bu/acre)	DNS Wheat (45.7 bu/acre)	No-till Fallow
2013	DNS Wheat (60.9 bu/acre)	No-till Fallow	Winter Wheat (85.5 bu/acre)
2014	No-till Fallow	Winter Wheat (51.7 bu/acre)	HWSW (19.8 bu/acre)
2015	Winter Wheat (51.5 bu/acre)	DNS Wheat (24.5 bu/acre)	No-till Fallow
<b>2016</b>	<b>DNS Wheat</b>	<b>No-till Fallow</b>	<b>Winter Wheat</b>
2017	No-till Fallow	Winter Wheat	Spring Cereal

*Red italicized* crops are those that have been altered for cereal rye management.

Table 11. 3-year crop rotation acreage and crop details, production, and economic return over input costs at the Wilke Farm, 2016.

	<b>Plot 2</b>	<b>Plot 5</b>	<b>Plot 7</b>
<b>Cropping Specifics</b>			
Acreage	27.5	15.3	34.1
Crop	'Chet' DNS wheat	No-till Fallow	'Crescent' SWWW club
<b>Crop Production</b>			
Yield	49.0 bu/acre	--	84.2 bu/acre
Mkt Grade	#1 DNS 63.9 0.2% 14.00% 285 FLN	--	#1 WHC 63.0 0.4% 336 FLN
<b>Gross Economic Return†</b>			
Mkt Price	\$5.03/bu	--	\$4.20/bu
Gross Return	\$246.50/acre	--	\$354.01/acre
<b>Input Costs</b>			
Disking	\$10.00/acre	--	--
Seed	\$20.88/acre	--	\$17.94/acre
Fertilizer	\$49.62/acre	--	\$38.05/acre
Herbicides	\$19.22/acre	\$29.39/acre	\$23.27/acre
Fungicide	\$2.81/acre	--	\$35.33/acre
Total	\$102.53/acre	\$29.39/acre	\$114.60/acre
<b>Summary</b>			
Return over Costs	\$143.97/acre	-\$29.39/acre	\$239.41/acre
<b>3-Year Crop Rotation Return over Input Costs‡</b>		<b>\$151.80/acre</b>	

†Revenue does not include crop insurance revenue.

‡Costs do not include fixed costs associated with the farm.



Figure 1. Cropping systems research at Wilke Farm.



Figure 2. Chet Wheat.

Table 12. 4-year cropping rotation sequence at the Wilke Farm from 2012–2017.

<b>Year</b>	<b>Plot 1</b>	<b>Plot 3</b>	<b>Plot 4</b>	<b>Plot 6</b>
2012	<i>Spring Canola</i> (1,542 lb/acre)	<i>HWSW</i> (53.1 bu/acre)	Spring Barley (1.45 ton/acre)	DNS Wheat (38.4 bu/acre)
2013	<i>SWSW</i> (65.7 bu/acre)	Spring Canola (1,748 lb/acre)	No-till Fallow	DNS Wheat (50.4 lb/acre)
2014	Spring Canola (701 lb/acre)	SWSW (23 bu/acre)	Winter Wheat (55.9 bu/acre)	No-till Fallow
2015	DNS Wheat (23.0 bu/acre)	No-till Fallow	Spring Canola (479 lb/acre)	Winter Wheat (50.1 bu/acre)
2016	<b>No-till Fallow</b>	<b>Winter Wheat</b> <b>(94.5 bu/acre)</b>	<b>DNS Wheat</b> <b>(48.9 lb/acre)</b>	<b>Oriental Mustard</b> <b>(1,325 lb/ac)</b>
2017	Winter Wheat	Broadleaf	No-till Fallow	Spring Cereal

*Red italicized* crops are those that have been altered for cereal rye management.



Figure 3. Harvest at Wilke Farm.



Figure 4. Harvesting Winter Peas.

Table 13. 4-year crop rotation acreage and crop details, production, and economic return over input costs at the Wilke Farm, 2016.

	<b>Plot 1</b>	<b>Plot 3</b>	<b>Plot 4</b>	<b>Plot 6</b>
<b>Cropping Specifics</b>				
Acreage	29.2	25.0	26.2	26.6
Crop	No-till Fallow SWWW club	'Crescent'	'Chet' DNS wheat	'Pacific Gold' Oriental Mustard
<b>Crop Production</b>				
Yield	--	94.5 bu/acre	48.9 bu/acre	1325 lb/acre
Mkt Grade	--	#1 SWC 63.3 0.4% 375 FLN	#1 DNS 63.8 0.2% 14.10% 317 FLN	#1 Mustard 3.7%
<b>Gross Economic Return†</b>				
Mkt Price	--	\$4.22/bu	\$5.61/bu	\$0.28/lb
Gross Return	--	\$398.48/acre	\$274.53/acre	\$371.00/acre
<b>Input Costs</b>				
Disking	10.00/acre	--	--	--
Seed	--	\$17.94	\$20.88/acre	\$13.75/acre
Fertilizer	--	\$59.03/acre	\$48.78/acre	\$38.16/acre
Herbicides	\$40.36/acre	\$23.27/acre	\$15.88/acre	\$11.77/acre
Fungicide	--	\$35.33/acre	\$2.81/acre	--
Insecticide	--	--	--	--
Pod Sealant	--	--	--	--
Total	\$50.36/acre	\$135.58/acre	\$88.45/acre	\$63.68/acre
<b>Summary</b>				
Return over Costs	-\$50.36/acre	\$262.90/acre	\$186.08/acre	\$310.70/acre
<b>4-Year Crop Rotation Return over Input Costs‡</b>			<b>\$170.49/acre</b>	

†Revenue does not include crop insurance revenue.

‡Costs do not include fixed costs associated with the farm.



Figure 5. Mustard at the Wilke Farm.



Figure 6. Wilke Field Day.

Table 14. Continuous crop rotation sequence at the Wilke Farm from 2012–2017.

<b>Year</b>	<b>North Side</b>
2012	<i>Spring Wheat</i> (41.7 bu/acre)
2013	Spring Barley (1.73 ton/acre)
2014	DNS Wheat (21.0 bu/acre)
2015	HR Winter Wheat (24.4 bu/acre)
<b>2016</b>	<b>Spring Barley</b> <b>(1.68 ton/acre)</b>
2017	Spring Wheat

*Red italicized* crops are those that have been altered for cereal rye management.



Figure 7. Spring barley at Wilke Farm.



Figure 8. Jasper Winter Wheat Research Plots.

Table 15. Continuous crop rotation acreage and crop details, production, and economic return over input costs at the Wilke Farm, 2016.

		<b>North Side</b>
<b>Cropping Specifics</b>		
Acreage		66.7
Crop		‘Lenetah’ Spring Barley
<b>Crop Production</b>		
Yield		1.68 ton/acre
Mkt Grade		#1 BRL 56.0 0.2%
<b>Gross Economic Return†</b>		
Mkt Price		\$101/ton
Gross Return		\$168.97/acre
<b>Input Costs</b>		
Seed		\$16.52/acre
Fertilizer		\$35.73/acre
Herbicides		\$36.82/acre
Fungicide		--
Total		\$89.07/acre
<b>Summary</b>		
<b>Continuous Crop Rotation Return over Input Costs‡</b>		<b>\$79.90/acre</b>

†Revenue does include any crop insurance revenue.

‡Costs do not include fixed costs associated with the farm.

# Summary

Overall the 2016 (Table 17) growing season was much wetter and cooler than the 2015 (Table 18) season, and yields and economic returns over costs were reflective of this weather pattern. A summary of WSU Wilke Research and Extension Farm economic returns over input costs using 3-year averages is shown in Figure 9. Over the last three years (2014 to 2016), the 3-year rotation, 4-year rotation, and continuous cropping have averaged returns above input costs of \$92, \$88, and \$42/acre, respectively. Over the last six years, the 3-year rotation and 4-year rotation have averaged returns above input costs of \$146 and \$150/acre, respectively. These are both significantly greater than \$105/acre return above cost of the continuous cropping system.

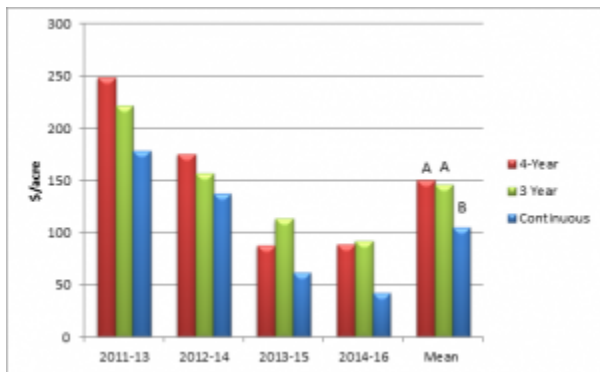


Figure 9. Three-year average economic return over input costs of 3-year, 4-year, and continuous cropping systems at the WSU Wilke Research and Extension Farm. Costs do not include fixed costs associated with the farm. Means within columns assigned different case letters are significantly different (P < 0.10).

Appendix A summarizes the historical costs per acre and economic returns over input costs averaged over all three rotations.

# Winter Pea Operations and Production at WSU Wilke Farm

‘Windham’ winter yellow peas were seeded on 25 acres of no-till fallow on the WSU Wilke Farm on August 25, 2015. They were seeded at 75 lb/acre and 1 gal/acre 7-23-3-0 fertilizer, 0.5 gal/acre 14% humic acid, 12 oz/acre 9% zinc, 16 oz/acre 10% boron, and 6.5 oz/acre Capture LFR insecticide was applied with the seed. Forty-five days after seeding, 6.0 oz/acre Assure II and 1.0 qt/100 gal Activate Plus were applied. A second post-emergence weed control application was applied on March 31 mostly for mustard control. This application included 4.0 oz/acre Raptor and 7 qt/100 gal Noble crop oil concentrate. Eight days prior to harvesting 32.0 oz/acre Gramoxone SL 2.0 and 1.5 qt/100 gal Activate Plus were applied to aid with harvest. An additional 48 oz Gramoxone SL 2.0, 1.0 qt/100 gal Activate Plus and 3.0 oz/acre Interlock were applied to remove weed regrowth a month after harvest.



Figure 10. Winter yellow pea emerging from deep seeding and crusting conditions (left) and good stand establishments (right) were observed a month after planting at WSU Wilke Farm.



Figure 11. Seeding Peas.

# Special Thanks



Figure 12. Truck Load of Oriental Mustard.



Figure 13. Harvesting Oriental Mustard.

Table 16. Winter pea crop details, production, and economic return over input costs at the Wilke Farm, 2016.

		<b>North Side</b>
<b>Cropping Specifics</b>		
Acreage		25.0
Crop		‘Windham’ Winter Yellow Pea
<b>Crop Production</b>		
Yield		1,295 lb/acre
Mkt Grade		--
<b>Gross Economic Return†</b>		
Mkt Price		\$0.108/lb
Gross Return		\$139.57/acre
<b>Input Costs</b>		
Seed		\$27.15/acre
Fertilizer/Insecticide		\$25.25/acre
Herbicides		\$57.19/acre
Fungicide		--
Total		\$109.59/acre
<b>Summary</b>		
<b>Winter Pea Return over Input Costs‡</b>		<b>\$29.98/acre</b>

†Revenue does include any crop insurance or farm program revenue.

‡Costs do not include fixed costs associated with the farm.

# Weather Data

The following tables provide weather data for Davenport, WA, in 2016 and 2015.

Table 17. Weather data for Davenport, WA, in 2016 (Crop Year Summary: 09/01/2015 to 08/31/2016).

Month	Temperature (°F)			Degree Days*	Precipitation (inches)	Rain Days
	High	Low	Mean			
9	69.8	43.3	56.9	737	0.96	3
10	63.5	41.9	51.8	641	0.85	9
11	40.5	26.1	40.5	121	1.06	9
12	34.2	24.4	29.4	64	3.12	12
1	32.7	25.3	29.1	21	3.33	18
2	44.1	29.7	36.1	166	0.63	8
3	50.4	32.2	40.7	288	3.45	16
4	65.1	39.5	52.5	609	0.41	4
5	68.6	44.7	57	763	0.58	8
6	77.1	48	63.9	917	1.00	4
7	80.4	51	66.9	1045	0.86	9
8	83.7	52.9	69.1	1126	0.17	3
<b>Total</b>				<b>6498</b>	<b>16.42</b>	<b>103</b>

\*Degree days calculated using 32°F base.

Table 18. Weather data for Davenport, WA, in 2015 (Crop Year Summary: 09/01/2014 to 08/31/2015).

Month	Temperature (°F)			Degree Days*	Precipitation (inches)	Rain Days
	High	Low	Mean			
9	75.0	47.0	61.0	870	0.05	2
10	62.1	41.1	51.2	608	1.25	13
11	40.8	26.3	33.0	160	1.29	10
12	36.9	26.9	31.5	91	1.43	11
1	33.8	26.1	29.7	39	1.56	9
2	46.9	31.2	38.2	200	1.34	8
3	55.3	34.1	44.3	394	1.86	7
4	58.7	32.9	46.7	414	0.41	3
5	71.5	45.7	59.0	825	1.43	7
6	84.5	53.9	70.8	1116	0.00	0
7	86.9	57.0	73.5	1239	0.05	2
8	85.0	55.2	70.8	1180	0.06	1
<b>Total</b>				<b>7136</b>	<b>10.73</b>	<b>73</b>

\*Degree days calculated using 32°F base.

# Appendix A

Appendix A. A historical summary of costs/acre and economic return over input costs averaged over all three rotations at the WSU Wilke Research and Extension Farm to look at trends over years.

<u>Year</u>	<u>Ave Costs (\$/acre)</u>	<u>Ave Economic Return over Input Costs† (\$/acre)</u>
2016	88	141
2015	98	25
2014	109	68
2013	120	176
2012	96	236
2011	124	261
2010	72	152



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[Wilke Farm website](#)

[Lincoln-Adams Extension website](#)

AGWEATHERNET STATION located at the Wilke Research and Extension Farm.

You can access Wilke weather data at <http://wilkefarm.wsu.edu/>. AgWeatherNet link on the widget takes you to a map of weather stations throughout the state.



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