Inclusion of canola into crop rotations may offer agronomic benefits to farms that translate into improved overall farm profitability over time. Our research finds favorable economic returns of selected crop rotations that incorporate canola as compared to returns of traditional crop rotations when rotational impacts are considered, under some alternate price and production scenarios.

Table 1. Summary of Returns by Crop ($/acre) Over a Two-Year Period*

Adjust costs on the individual crop budgets in tabs numbered 1-5 and totals will update here on the Summary tab.

Budget:	By Crop**:	Unit	Yield per acre	Price per unit	Revenue per acre ($/acre)	Variable Costs (VC) ($/acre)	Fixed Costs (FC) ($/acre)	Total Cost (TC) of Operation ($/acre)	Returns over VC ($/acre)	Returns over TC ($/acre)	Crop & Cost Share*** Cost ($/acre)	Percentage Share Owner Share	Percentage Share Operator Share
	Canola Rotation: Fallow - WC - Fallow - WW												
1	Winter Canola (WC)	lb	1500	$0.22	$330	$219	$122	$341	**$111**	**-$11**	$69	33%	67%
2	Soft White Winter Wheat (SWWW)	bu	50	$6.42	$321	$186	$119	$305	**$135**	**$16**	$71	33%	67%
3	Hard Red Winter Wheat (HRWW)	bu	45	$7.65	$344	$198	$124	$322	**$147**	**$22**	$75	33%	67%
	Wheat Rotation: Fallow - WW - Fallow - WW												
4	Soft White Winter Wheat (SWWW)	bu	50	$6.42	$321	$189	$121	$310	**$132**	**$11**	$72	33%	67%
5	Hard Red Winter Wheat (HRWW)	bu	45	$7.65	$344	$203	$128	$330	**$141**	**$14**	$76	33%	67%

*For average annual costs or returns, divide by two.
**Crop budgets include costs of preceding summer fallow. Individual crop costs and returns are for a two-year period.
***In a crop- and cost-share arrangement, the landowner and the farm manager split the crop and the specified costs, typically fertilizer, chemicals, and crop insurance.

Table 2. Summary of Returns by Rotation ($/acre) over Two-Year Period*

Click on the rotations below (**red text**) to select and compare alternative rotations from the drop down menu.

Select the Rotation: (Click on these cells to select other rotations from drop-down menu)	Budget(s):	Revenue per acre ($/acre)	Variable Costs (VC) ($/acre)	Fixed Costs (FC) ($/acre)	Total Cost (TC) of Operation ($/acre)	Returns over VC ($/acre)	Returns over TC ($/acre)	Crop-Share Land Cost ($/acre)
F-SWWW-F-SWWW	4	$321	$189	$121	$310	**$132**	**$11**	$72
F-WC-F-SWWW	1 and 2	$326	$202	$120	$323	**$123**	**$3**	$70

*For average annual costs or returns, divide by two.

Extension and Outreach: Getting Oilseed Information in the Hands of Stakeholders

WOCS WASHINGTON OILSEED CROPPING SYSTEMS Part of the Washington State Biofuels Initiative

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As evidenced by the numerous reports in this section of the abstracts, the Washington Oilseed Cropping Systems (WOCS) project continues to crank out a wide range of research results annually. The WOCS team's top priorities is to conduct research to answer production questions from growers, to improve production, and to be applicable in a range of precipitation zones in eastern Washington and the Pacific Northwest. Just as important as the research is finding effective ways to disseminate the data and findings to growers, crop consultants, and other stakeholders. We have found that a variety of formats of outreach is key to effective communication. Methods we use throughout the year are online via the WOCS website (www.css.wsu.edu/biofuels), email updates and notifications, five field days during the growing season, individual farm visits, on-farm trials, Extension publications, presentations at university and industry events, and finally, our annual oilseed production workshops and/or conference. In 2015, 1335 people attended all WOCS events. Ten Farmer Technology breakfast meetings were held in Colfax and Lewiston, all of which had an oilseed component.

After partnering with the Pacific Northwest Direct Seed Association for a large conference in 2014 and 2015 and based on survey results, we returned to our original format of several smaller workshops dedicated specifically to oilseed production, marketing and processing information. The workshops were held in Odessa, Colfax and Dayton, and the response from growers and industry was overwhelmingly positive. Attendees placed the highest value on the presentations being geared toward the production region where each workshop was at, and the interactive format of the breakout sessions. We will be having workshops again in 2017 with the interactive format, potentially a more hands-on approach, and growers and industry involved in the planning.

Winter canola plans with growers and WOCS staff were challenged, and in many cases failed, last summer and fall with drought conditions. Additionally, there was a period of time during seeding time when bids were not available for canola and there was uncertainty about the future of a major processor where most growers take their crop. Those factors resulted in planted winter canola acres again being down from the recent high of 51,000 acres in 2014 to 37,000 for 2016 (USDA-NASS, Mar. 31, 2016). Despite the reduced prospective acres, the WOCS team is forging ahead with outreach to continue educating PNW growers and crop consultants about the latest research to improve production. Several fact sheets published to kick off a WOCS-branded Extension publication series.

With a grant from Viterra, the WOCS Extension team has planned on-farm spring canola variety trials that are now being planted at three locations in eastern Washington: Davenport (WSU Wilke Farm), St. John (Eriksen farm), and Fairfield (Emtman Farms). There are six varieties, including Roundup Ready, Liberty Link, Clearfield (including a high-oleic), non-GMO hybrid, and a *Brassica rapa*. We are using grower equipment for most field operations and will be hosting field days at the plots. Stand establishment, soil water and nitrogen use efficiency, weed control, and yield will be measured. Keep an eye on our website calendar for upcoming events!

Do our Subsoils Provide Wheat and Canola Roots with Ample Nutrients During Grain Filling?

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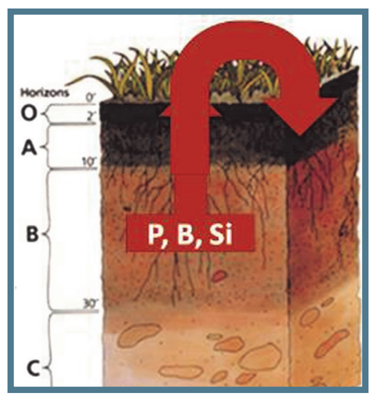
The inland Pacific Northwest (PNW) is blessed with deep soils capable of storing water and nutrients that crops can access throughout their life cycle. But 125 years of producing annual crops has extracted subsoil nutrients, and we now need to ask if there is a problem with subsoil deficiencies in soil-immobile nutrients. Are these deficiencies exacerbated by alkaline subsoil conditions? Typically, routine soil tests are only conducted on surface soil samples. This approach was developed for Midwestern and southern U.S., where summer rains replenish topsoil moisture, thereby sustaining shallow root uptake of topsoil nutrients. The PNW adopted the same approach, but does this make sense for us? Currently we only test for subsoil mobile nutrient forms (nitrate and sulfate), replenished with vertical infiltration of water that carry these anions during soil recharge. We decided to run soil tests on all root zone depths to begin assessment of subsoil fertility status. Here's what we found:



- Most annual dryland crops remove subsoil nutrients, and those that are not removed by grain harvest are returned to the soil surface.
- Many nutrients are not soluble enough to be carried back into the subsoil in high concentrations, and mainly remain in the surface soils that receive these nutrients. **Soil immobile nutrients include P, Zn, Mn, Fe, B.**
- Over years of crop extraction, these soil-immobile nutrients have reached very low levels, and high subsoil pHs render some of them rarer.
- But wheat and canola **root systems rely on subsoil water and nutrients** mid to late season as surface soils dry in our semi-arid climate.
- Topsoils dry out in our region and shallow roots become inactive. **Do our subsoils provide wheat and canola roots with ample nutrients during grain filling?**
- With our unique patterns of winter precipitation and dry summers, **improving subsoil fertility** may be crucial to achieving full soil productivity potential.
- What are ways to improve subsoil fertility? It will be tough. For example, deep phosphorus movement is only achieved when P fixation sites are saturated during P over-fertilization. However, organically bound nutrient forms are more mobile. Green cover crops, animal manures, biosolids, and perennial forages may all provide more organic compounds, such as organic acids, that solubilize soil-immobile nutrients.