Excellent WC and WW grain yields were achieved in 2012. Winter canola averaged 3720 lbs/acre and WW 105 bushels/acre. On August 15, 2012 the price offered at Reardan for WC was 29 cents/pound and, for soft white WW, $8.10/ bushel. Gross returns are, therefore, reported here as $1079/acre for WC versus $851/acre for WW.

Spring wheat grain yields in 2012 were significantly greater (57 versus 41 bu/acre) when the previous (i.e., 2011) crop was WW compared to WC (Fig. 1). What was the cause of these grain yield differences? There was 1.3 inches more soil water after the WC harvest compared to after WW harvest (Fig. 1). Similarly, at time of planting SW in April, the WC stubble had 1.4 inches greater soil water than WW stubble (Fig. 1). The difference in SW grain yields was likely due to soil water use by volunteer WC in SW. The late-spring broadleaf weed herbicide application in SW stunted, but did not completely kill the volunteer WC. Volunteer WC did not produce additional biomass, but plants stayed green throughout the growing season. In 2011, we had the opposite situation in regards to soil water with WC stubble having 1.1 inch less water in the 6-ft profile compared to WW stubble at time of SW planting. Yet, 2011 SW grain yield was significantly greater following WC compared to WW (64 versus 52 bushels/acre) (Fig. 1) with excellent weed control. There were no visual differences in SW foliar or root disease expression in either 2011 or 2012.

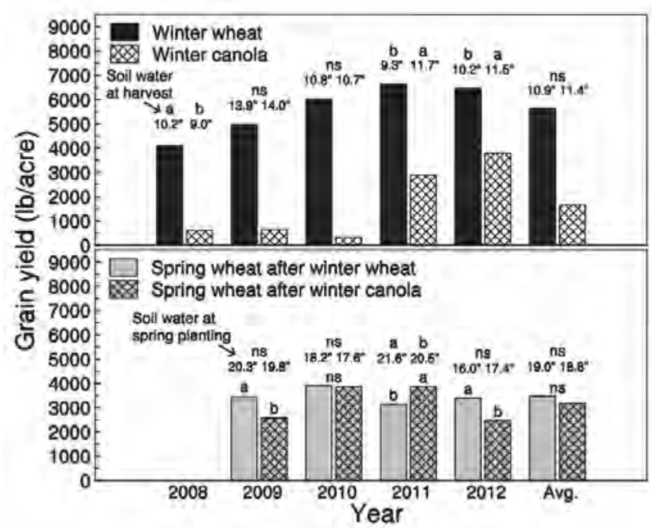

Fig. 1. Top: Winter wheat and winter canola grain yields from 2008 to 2012 and the 5-year average. Bottom: Spring wheat grain yields as affected by previous crop (either WW or WC) from 2009 to 2012 and the 4-year average. Numerical values above bars are total water content in the 6-foot soil profile. Within-year soil water values with different letters indicate significant differences at the 5% probability level. Letters above spring wheat grain yield bars indicate significant differences at the 5% probability level. ns = no significant differences.

Averaged over five years, there are no significant differences in soil water use of WC compared to WW (Fig. 1). Similarly, there are no significant differences in soil water content in April on WC versus WW stubble (Fig. 1). The 4-year average SW grain yield following WC and WW is 53 and 58 bushels/acre, respectively (Fig. 1), which is not statistically different at the 5% probability level. In summary, our data (to date) indicate that, on average: (i) WC and WW use the same amount of soil water, (ii) over-winter soil water recharge is about the same on WC and WW stubble, and (iii) subsequent SW grain yield will be about the same following WC and WW.

Economic Returns to Canola Rotations in Eastern Washington

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Inclusion of canola into cropping systems may offer agronomic benefits to farms that translate into improved overall farm profitability over time. Research and grower experience suggests that canola can help improve weed and disease control, soil structure, moisture penetration, and nutrient availability, which may contribute to increases in wheat yields observed following canola in a rotation. Favorable current prices for canola and potential demand in regional food, feed, and biofuel markets may also make canola a profitable alternative crop in Washington.

We compare economic returns of cropping systems that incorporate canola with the returns to traditional cropping systems for three distinct growing regions in eastern Washington: 1) high-intermediate rainfall, 2) low rainfall, and 3) deep-well irrigated. We consider both conventional and reduced tillage systems in the low rainfall region. Returns are estimated using typical yields for each cropping region and costs of production and output prices for 2012. Sensitivity analysis was performed for yields and output prices.

All rotation systems considered resulted in positive returns, although the inclusion of canola raised input costs. In scenarios where average or low canola yields were considered, rotations with canola had positive returns but sometimes second to traditional cropping systems using average 2012 prices. However, when rotational impacts from canola were considered, rotations with canola provided the highest returns. For example, Table 1 compares the net returns from a traditional winter wheat – fallow rotation to net returns from a rotation with winter canola grown every other cycle, where the second scenario includes a boost in wheat yield.

Table 1. <17" Rainfall Region: Winter Canola every other WW-Fallow cycle Reduced Tillage, Yield Impact Scenarios

ROTATION/Scenario	Returns over Total Costs ($/ac/yr)	Returns over Variable Costs ($/ac/yr)
Baseline – SWWW (50 bu/ac), WC (1500 lb/ac)		
CF, WW, CF, WW	**$28**	**$117**
CF, WW, CF, WC	$25	$114
Rotational impact on wheat yield (+20% WW)		
CF, WW, CF, WW	$28	$117
CF, WW, CF, WC	**$45**	**$134**

Double-Cropping Dual Purpose Irrigated Biennial Canola with Green Pea

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Growers are reluctant to convert cropland to sole biofuel feedstock such as canola due to the low oil yield and economic return compared to other higher value crops such as wheat. However, when planted as a biodiesel crop, canola can play a significant role in curbing the foreign import of petroleum-based fuel and can contribute to a reduction in greenhouse gas emissions. Double cropping dual purpose canola with green pea may justify the expansion of canola in Pacific Northwest. The green pea-biennial canola- double-crop system can provide new opportunities for growers in the region through i) providing additional annual farm income with the production of green pea and canola forage, ii) protecting the soil from wind erosion through vulnerable periods (late summer through spring) with crop coverage, iii) producing canola seed in the subsequent year for oil (biofuel or food) and high-protein meal (animal feed), and (iv) preventing the decline of soil health while enhancing soil and water quality. The objectives of the current study were to assess the feasibility and estimate the overall profitability of the double-crop dual purpose canola, quantify the N contribution from green pea to succeeding canola, and assess potential soil and water quality impacts of the double-crop system. The study was initiated in USDA-ARS research site located near Paterson, WA in spring 2012. The experiment was conducted in a split-plot design with 4 replications. Main plots were stand management (simulated canola grazing or no grazing) treatments. Subplots were 3 x 3 factorial combinations of N (0, 50, 100, and 200 lbs/ac) and S (0, 30, and 60 lbs/ac) fertilizer rates. The subplots were 20 ft x 50 ft. The project is in its first year of implementation, and data collection is in progress. However, preliminary results showed that average green pea (shelled) yield was 6.5 ton/A; uniform across replicates. Sixteen-percent moisture adjusted canola dry matter yield cut at rosette growth stage 29 was 1900 lbs/A. The inorganic N in the soil prior to pea planting was 2 lbs/A, much lower than what was documented before canola planting (22 lbs/A). Average crude protein of canola forage harvested at growth stage 19 (BBCH scale) was 30% with average digestible neutral detergent fiber of 29%. Total digestible nutrients constituted about 75% of dry matter. Producers will be able to use the information generated from this project and incorporate the green pea–biennial canola double-crop system into the traditional one crop-per-year system. In the intermediate-term, growers will adopt the double-crop system and customize it to their situation. The N contribution from the green pea to the biennial canola crop would result in fertilizer savings for the grower.