to 160 lb N/acre with 15 lb S/acre). Fall-spring split applications of N, and select N fertilizer treatments with no added S are also included.

Residual inorganic soil N was low at both locations in 2011, 73 lb N/acre at the Wilke Farm and 103 lb N/acre at PCFS. Spring canola grain yields at PCFS were higher than in previous years, and therefore more responsive to N fertilizer additions (see graph). No consistent yield responses to S additions were observed. The economically optimum N rate (at $0.22/lb canola and $0.56/lb N as urea) at the Wilke Farm was 69 lb N/acre, while at PCFS it was determined that no N fertilizer added under these yield response and price scenarios paid for itself.

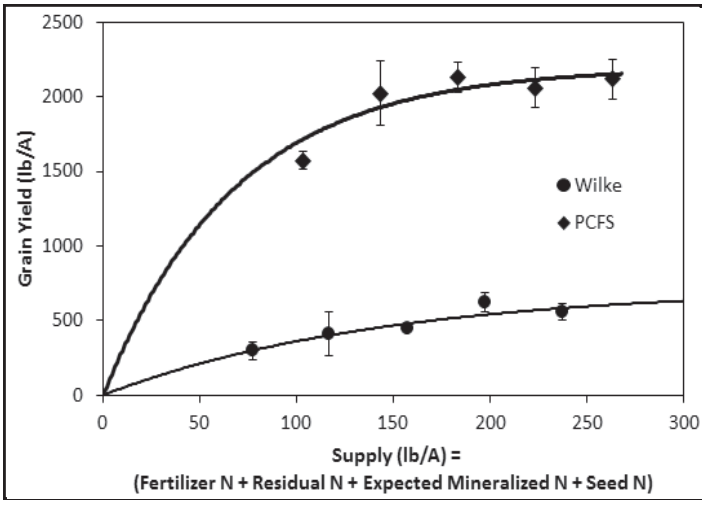

Fig. 1. Canola seed yield response to N supply at Pullman (PCFS) and Davenport (Wilke). The left-most plotted point on each response curve represents 0 N fertilizer applied.

The four year N x S fertility experiment indicates that accurate estimation of soil N supply and canola yield potential is critical in determining proper N fertilization rates. In recognition that canola can aggressively utilize residual soil N supplies if available, N fertilizer rates should be reduced when residual soil N is present. In addition, canola returns significant crop residue N to the soil following harvest. Thus, we have expanded the study in 2012 to follow the carryover N from canola residues and its effects on subsequent legumes and wheat grown in rotation. This research is leading towards a modification of existing regional guidelines for canola fertility management with a goal of maximizing yield and oil productivity.

Establishing Switchgrass for Biofuel in the North Columbia Basin

STEVE FRANSEN, WSU-PROSSER IAREC

Switchgrass biofuel research started at WSU in 2002 in Prosser after observing irrigated circles of switchgrass seed produced by Rainier Seed Company in 2001. This project was initiated to investigate new 'windows' for successful establishment of switchgrass in the Columbia Basin and to evaluate long term storage of switchgrass hay for bioenergy conversion. Cellulosic biorefineries will operate daily for about eleven months per year. Crops cannot be harvested continuously over this time so the feedstock will require storage.

Date of planting studies were conducted at WSU-Othello in 2008 and 2009 and a study evaluating long-term storage as dry or high moisture hay was initiated at Othello in 2008 intending for two complete grass hay harvests in 2009, 2010 and 2011. These are the first hay results from a lowland switchgrass (Kanlow) or Eastern Gamagrass (Nemaha) from as far north as WSU-Othello (46° N). Results confirm that warm season grass hay can be consistently produced in the northern Columbia Basin region.

This study will conclude after the post-storage hay bales are processed and NIRS scanning completed on cored samples. Our studies will provide four years of data that can be used in developing guidelines for long term storage. Results from the date of planting studies have been incorporated into a switchgrass production Extension bulletin that is expected to be published in 2012.

Extension and Outreach Activities

KAREN SOWERS, DENNIS ROE, BILL PAN, AND DEB MARSH; DEPT. OF CROP AND SOIL SCIENCES, WSU

The Washington State Biofuels Cropping Systems Research and Extension Project (WBCS) has been funded since 2007, and has included 15-20 projects, 18 principal investigators, 12 collaborators, and nearly 50 agency and university affiliates, technicians, and graduate students. Written and online publications; a dedicated website; and presentations at workshops, field days, and

professional meetings are utilized to disseminate information. Oilseed crop production workshops were held in 2011 and 2012 with almost 250 people attending each year. Oilseed acreage is increasing in some areas of WA as results from WSU and USDA-ARS on-farm research, along with testimonies from experienced oilseed producers, are convincing more producers to try oilseeds in their crop rotations.

Outreach and extension efforts directly reached over 1845 people at 25 events in 2011. We are working closely with the Washington Canola and Rapeseed Commission to increase awareness of their role in furthering oilseed production in the state. A website for the WBCS was created in 2008, and usage has increased dramatically since then. There were 2000 hits last year, two-thirds of which came from 47 cities in WA. The first set of case studies about oilseed producers in the four production regions of Washington was published as an Extension manual last year and the remaining three sets are being edited for publication in 2012. The WBCS research team published a fact sheet about canola growth, development and fertility last year, and several refereed journal articles and Extension fact sheets and bulletins about canola, camelina, and switchgrass production in the PNW will be published in 2012.




A Decade of Direct-seed Canola in Rotation at the WSU Cook Agronomy Farm

DAVID HUGGINS, USDA-ARS, PULLMAN; KATE PAINTER, U OF I

Spring canola production can diversify cropping systems within dryland cropping zones of the Pacific Northwest. No-tillage systems may be particularly well-suited to spring canola as crop residues promote seed-zone moisture conservation near the soil surface that could benefit the establishment of the small, shallow-seeded crop. Spring canola varieties that are resistant to herbicides (e.g. Roundup) can also provide useful alternatives for managing weeds such as annual grasses that are problematic in other rotational crops.

In 2001, three-year rotations including a crop rotation with spring canola were initiated at the WSU Cook Agronomy Farm. Roundup Ready spring canola was no-till planted using a Great Plains double-disk drill into spring barley (first year only) or hard red winter wheat residue (8 years). Seeded and harvested strips were approximately five acres. Planting dates ranged from as early as March 26 to as late as May 12 and were dependent on spring weather and soil conditions. Seeding rates were initially high (8-10 lbs/acre) but were reduced after the first three years to 6 lbs/acre.

The average yield of spring canola from 2001-2009 was 1880 lbs/acre. Yield of broadcast spring canola was similar to no-till, indicating the potential of early spring seeding into winter wheat residue. With the exception of one year (2005), spring canola