PROJECT NO: BJKV30, BJKV31

TITLE: Production Systems for Dryland Grain

PERSONNEL: Dr. Juliet Marshall, Ext. Crop Mgmt. Specialist (SC and E Idaho)
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JUSTIFICATION: Direct seeding of wheat and barley is a standard production practice in many of the dryland grain areas of southeast Idaho. In some cases, the lack of market and production options have lead to over twenty years of continuous wheat in no-till systems. Continuous wheat production has resulted in yield declines from a buildup of disease and insect pests, especially wireworm and barley mealy bug. These declines have been exacerbated by below average summer rains. Input costs have soared, and some growers have reduced fertilizer inputs, potentially resulting in reduced yield, protein and end-use quality. Growers are seeking options to improve the economics of dryland production, including taking ground out of no-till systems. However, this risks losing the benefits of improved soil moisture, soil structure, organic matter, and erosion control. The next several years will be critical in the development and maintenance of sustainable cropping systems from agronomic, environmental, and economic perspectives.

While both 2009 and 2010 were exceptionally wet years, precipitation in the last ten years has declined below the 30-year average, raising the possibility of returning to a summer fallow production system. Indeed, precipitation during the 2012 season was very low and subsoil moisture (up to three feet deep) was extremely low. Surprisngly, the 2014 seaon was also dry, but with subsoil moisture higher than usual, the overall production was higher than expected after the very dry summer. Late season rains destroyed much of the 2014 grain crop, but provided another opportunity for recharge of subsoil moisture in expectation of the 2015 season. Other than crop fallow, additional production options include the use of composted manures and leguminous cover crops that provide multiple benefits of disease suppression and nitrogen fixation. We propose to continue looking at some of these production alternatives, assess the economics and determine variety performance under four different production schemes.

HYPOTHESIS & OBJECTIVES: The maintenance of no-till production is critical for the success of dryland production systems. Plowing, while reducing disease, will result in excess soil moisture loss and yield reduction. Manures (composted manure, raw manure and "green manure") and cover crops have the potential to improve soil microbial activity, reduce disease pressure and improve economics. The specific objectives include:

1. Evaluate the agronomic performance and economics of wheat under four different production systems: 1) chem fallow, 2) continuous conventional no-till, 3) composted manure application, and 4) plowing. These are detailed below:

    a) Chem fallow treatment will have the weeds controlled the first summer with Roundup, and the second year will be planted into spring wheat.
    b) The continuous conventional no-till treatment will be under the standard production system that the producer (Gordon Gallup) utilizes.
    c) Composted cow manure will be applied to improve tilth and fertility. The compost will be applied yearly prior to planting. Green manure crops will be planted every fourth or third year.
    d) Plowing to bury residue and reduce disease and insect pressure in the spring. Wheat will be planted every year.

2. Develop and compare detailed cost of production estimates for each of the four production systems, looking at cost per acre and per bushel for operating, ownership and total costs.

3. Monitor soil moisture, pH, organic matter, nutrients, nematode populations, and disease.

4. Improve recommendations for production practices under dryland grain production systems.

PROCEDURES: Thirty acres under no-till dryland grain production is available for large plot (production equipment size) trials in the Swan Valley area above Ririe, ID. This ground has been in no-till wheat production for more than twenty years. Six replications of main plot (production system) have been established in 45-foot wide strips in a randomized complete block design. The grower (Gordon Gallup) will be responsible for plowing, fallowing, applying herbicides, and planting. Measurements will be taken on agronomic characteristics (yield, test weight, protein and plump) and soil characteristics (soil moisture, pH, organic matter, nutrients, nematode populations, and disease). Records will be kept for economic assessment (Patterson). Long-term maintenance of the plots is required to understand the economic impact.

DURATION: Multiple. This would be the second set of four years, the second of four years.

COOPERATION: County Extension Educators, and grower cooperators (Gordon Gallup, Clark Hamilton)

ANTICIPATED BENEFITS/EXPECTED OUTCOMES/INFORMATION TRANSFER: Idaho grain producers will receive the most recent information on effectiveness of no-till production systems to improve production efficiency, increase economic returns, and maintain competitiveness. Results from the trial will be communicated to growers in cereal schools as well as news releases, progress reports, bulletins, newsletters, internet websites, and mass media. At this location, we hold the annual direct seed field day, which has given the IWC and UI an excellent format to discuss direct seeding practices, successes, and issues.

LITERATURE REVIEW:

The adoption of no-till or minimum tillage practices over the past twenty-to-thirty years has been considered a revolution by some (Anon, 2011, Triplet, 2008). No-till and minimum-till farming have been critical practices in both low and high-rainfall areas of the Pacific Northwest and other grain production areas to conserve moisture, reduce run-off, conserve soil from water and wind erosion, and to improve soil microbial activity and soil tilth by maximizing build up of organic matter and soil structure (Papindick, 2004, DeVayast and Halvorson, 2006, Peiretti, 2007). With continuous grain cropping, however, disease and insect issues can increase to very damaging levels. In our high elevation areas of dryland production, there are limited choices of crops available due to short growing seasons, limited moisture, and lack of markets. Adoption of new techniques to reduce soil moisture loss and pest pressure contribute to production sustainability that also results in enhanced grower profitiblity (Janosky, 2004, Schillinger and Papindick, 2008).

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DeVayast, Eric A. and Ardell D. Halvorson. 2006. Economics of annual cropping versus crop-fallow in the northern great plains as influenced by tillage and nitrogen. Agron. J. 96:148-153 (204).

Janosky, Jeffrey S., Douglas L. Young and William F. Schillinger. 2004. Economics of conservation tillage in a wheat-fallow rotation. Agron. J. 94:527-531 (202).

Papendick, R.I. 2004. Farming with the Wind II. Wind Erosion and Air Quality Control on the Columbia Plateau and Columbia Basin. College of Agricultural, Human, and Natural Resource Sciences Special Report XB1042 by the Columbia Plateau PM_{10} Project. University Publishing, Washington State University. 96 pages.

Triplet, Jr., G.B. and Dick, W.A. 2008. No-Tillage Crop Production: A Revolution in Agriculture. *In* Celebrate the Centennial. Agron. J. 100:S-153 - S-165.

Schillinger, W.F. and Papendick, R.I. 2008. Then and Now: 125 Years of Dryland Wheat Farming in the Inland Pacific Northwest. *In* Celebrate the Centennial. Agron. J. 100:S-166 - S-182.

IDAHO WHEAT COMMISSION - BUDGET FORM

Allocated by	Idaho Wheat Commission	during FY 2014	$	9,746
Allocated by	Idaho Wheat Commission	during FY 2015	$	9,781

REQUESTED FY 2016 SUPPORT:

	Salary	Temporary Help	Fringe	Travel	OE	Grad Fees	TOTALS
Idaho Wheat Commission	$ -	$ 4,927	$ 2,435	$ 769	$ 1,650	$ -	$ 9,781

OTHER RESOURCES (not considered cost sharing or match):

	$	15,650
TOTAL OTHER RESOURCES	$	15,650

TOTAL PROJECT ESTIMATE FOR FY 2016:	$ 9,781 *(Requested)*	$ 15,650 *(Other)*	$	25,431 *(Total)*

BREAKDOWN FOR MULTIPLE SUB-BUDGETS:

	Marshall	*Patterson*	*Walsh*	*(PI name)*
Salary	$ -	$ -	$ -	$ -
Temporary Help	$ 4,327	$ 600	$ -	$ -
Fringe Benefits	$ 2,250	$ 185	$ -	$ -
Travel	$ 769	$ -	$ -	$ -
Operating Expenses	$ 1,400	$ 250	$ -	$ -
Graduate Student Fees	$ -	$ -	$ -	$ -
TOTALS	$ 8,746	$ 1,035	$ -	$ -

Total Sub-budgets	$	9,781

10.24.2014 - Version