Sustaining the Pacific Northwest

Food, Farm, & Natural Resource Systems

Summer 2007 Volume 5, No. 2

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High Residue Farming Under Irrigation - Why Wait?

Andy McGuire, WSU Lauzier Agriculture Systems Educator

In 1962, a Kentucky farmer named Harry Young Jr. put together the tools available to him at that time and planted the first successful no-till corn field. He used a new herbicide called atrazine to spray out the legume pasture and mounted barrels of water on top of his two-row planter to force it into the firm, untilled soil. Since then, many farmers across this nation and around the world have also figured out how to successfully produce crops without tillage. "No-till" management encompasses 222 million acres worldwide, including 64 million acres in the US.

Why have so many farmers adopted a system which is radically different from conventional farming? And why have farmers in the irrigated Columbia Basin of Washington recently started to adopt similar systems under their sprinklers? Farmers do this for the same reasons they have always changed their methods: to survive economically. When it makes economic sense in the farming economy, they also adopt new methods to be good stewards of the land.

Most popularly referred to in the US as "no-till", there are other more appropriate names and types of systems which vary in their intensity and frequency of soil disturbance (Table 1). Most names for these systems are associated with the tillage practice used or not used (no-till). However, just reducing or eliminating tillage is not an effective strategy. In addition to soil management, due consideration must be given to crop rotation, variety selection, residue management, soil fertility, pest management, and the equipment needed to carry out chosen practices. The term "high residue farming" includes these other considerations and emphasizes the crop residues covering the soil which impart many of the benefits of this farming system. High residue farming aims to produce profitable yields while maintaining as much residue on the soil as practically possible.

When compared to tilled, bare soils, soils covered with crop residues and not regularly tilled improve over time. Increased organic matter increases at the surface provides food for soil organisms which helps form water stable aggregates. This builds soil structure and increases the soil's pore space. Resulting benefits include increased water infiltration and drainage, increased water and nutrient holding capacities, and increased resistance to compaction.

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Center for Sustaining Agriculture & Natural Resources

Washington State University Extension

Small Farms Team

Sustaining the Pacific Northwest
Food, Farm, & Natural Resource Systems

This quarterly newsletter provides a discussion forum for people working towards community-based sustainable food, farm, and natural resource systems using interdisciplinary oriented research and practitioner knowledge.

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Table 1: Tillage Continuum

Conventional Tillage	Moldboard plow	↓ Decreasing intensity and frequency of soil disturbance ↓	↓ Increasing residues covering soil ↓
	Heavy Offset Disk		
Non-Conservation Tillage	Reduced tillage (<30% soil covered by residues)		
High residue farming (Conservation tillage)	Reduced tillage (>30% soil covered by residues)		
	Ridge tillage		
	Tined tillage (chisel plow)		
	Strip tillage		
	Direct seeding no-till		

Compaction is often a concern when farmers consider reducing their tillage. However, high residue farming can eliminate the compaction-tillage cycle of clean-till systems. The cycle starts with soil tillage which leaves the soil loose. Tractors or other equipment driven over the loose soil gradually compact the loose particles and reduce pore space. Tillage is used to loosen and break up the compacted soil and the cycle begins again. High residue farming breaks the cycle by building soil structure without tillage. Driving tractors and other equipment over firm structured soils minimizes compaction. Of course, in wet conditions, untilled soils can be compacted, but they resist compaction better than tilled soils.

A significant number of farmers in the Midwest and other areas adopted high residue farming primarily motivated by improved soil and water conservation, one of the greatest benefits of high residue farming. This may explain why Western irrigated regions, where conservation problems are generally less severe, have been slow to adopt these systems. Nevertheless, conservation of soil and water can also be an important benefit in irrigated agriculture.

Covering the soil with crop residues reduces water and wind erosion in several different ways. Residues protect the soil from the impact of water droplets, whether from rain or from sprinklers. This protection, combined with the increase of water-stable aggregates and better soil structure, help prevent crusting, increase infiltration, and reduce runoff and water erosion. If runoff does occur, residues form physical barriers to water movement, thus promoting increased infiltration. Runoff also gets directed down earthworm burrows and earthworms (and other organisms) thrive with the elimination of tillage. In irrigated agriculture, less runoff can promote more uniform water application. Decreased runoff can also improve application uniformity of fertilizers and pesticides when applied through the water.

Columbia Basin farmers use high residue farming to control wind

Continued on next page

erosion control. Farmers are often forced to irrigate bare soils during spring wind events to keep their newly planted crop from "blowing out." This incurs increased pumping costs, often results in over-irrigation of the crop, and occasionally requires expensive replanting. However, crop residues provide a direct barrier between the wind and soil. In addition, increased aggregation and enhanced soil structure resulting from surface residues improve the soil's coherence and make it more difficult for wind to detach individual particles.

While water conservation is one of the main reasons for using high residue farming systems in rainfed agriculture, research shows irrigated systems save an even greater amount of water because the soil surface is wet more often under irrigation. Crop residues block solar radiation from reaching the water at the soil surface thus reducing evaporation. Residues also reduce the exchange of dry air for humid air near the soil surface. Research demonstrates seasonal savings of three to six inches of water under high residue farming systems compared to clean-tilled systems. This can be significant where water and pumping costs are high.

In addition to saving soil and water, high residue farming systems save labor, machinery and fuel costs. For every tillage pass eliminated, the farmer saves hours of labor and gallons of diesel fuel. When hiring labor, this represents a direct monetary savings. Otherwise, the farmer saves his own time for other uses. Depending on the crop, local estimates of time saved range from seven to 24 minutes per acre, while fuel savings range from 1.2 to four gallons per acre. Finally, by doing away with primary tillage operations, farmers using high residue farming find they can often manage with far less equipment and less wear and tear than before.

While the savings remain small individually, combined savings convinced many farmers worldwide to first consider, and then adopt high residue farming systems. In the Columbia Basin, farmers now use these systems to produce sweet corn, grain corn, green peas, dry beans, and wheat. Even onions, a high value, small seeded crop, can be found planted into high residue conditions. Basin farmers are adapting Midwestern systems designed for simple rotations to their more complex rotations. They direct-seed into residues of alfalfa, bluegrass, corn, peas, mint, timothy, wheat, and various cover crops. By using research, investigation, ingenuity, and trial and error, they are making these systems work.

Strip-till planting of corn into an alfalfa stand

However, high residue farming systems do present some challenges. The Columbia Basin's sandy soils lack the silt and clay particles necessary for good soil structure, making it more difficult to improve the structure of these soils, many of which are over 70% sand. Furthermore, some sandy soils compact when completely dry as well as when wet and they are particularly prone to wind erosion. However, farmers with these soils have found that by tilling a strip of ground six to 10" wide in front of the planter and perpendicular to prevailing winds, they can leave residues and untilled soil between the rows and thereby reduce compaction while still controlling wind erosion.

Processed vegetable production also poses some problems. First, the best quality green peas or sweet corn must all arrive at the desired maturity at the same time which necessitates these crops all emerge at the same time and requires uniform germination conditions across the field. Achieving uniformity in high residue systems is possible, but it takes diligence, starting with residue management in the preceding crop and continuing through planting. Crop residues either have to be uniformly spread at or after harvest, or planter attachments, such as row cleaners, must remove or redistribute residue at planting.

Potatoes, onions, and carrots present another challenge since they are harvested by a tillage operation. While continuous "no-till" is being recommended in the Midwest, it is not an option for many Columbia Basin farmers that produce these high-value crops. Whether soil improvements resulting from high residue farming systems can be maintained while producing these crops remains to be seen, but the needed tools may already be at hand. Improved soil quality from green manures grown before these crops may balance out any tillage done in their production. Current research is investigating opportunities to reduce tillage and increase residues in the production of potatoes.

Direct-seeding has been studied and used in the dryland regions of Eastern Washington for many years while most irrigated farms continued using clean-till systems. Four factors indicate this may be due to change in the Columbia Basin. First, the trend of increased fuel prices due to unstable oil exporting nations and the difficulty of discovering new, conventional oil sources will likely continue. Second, emerging carbon markets in the US intended to address climate change will continue to expand. Some farmers, such as those in the Pacific Northwest Direct Seed Association http://www.directseed.org/, have organized to take advantage of these markets by

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receiving payments for carbon stored in soils under high residue farming systems. Third, the issues surrounding hydroelectric power generation, salmon recovery, and urban growth will continue pressuring farmers to increase irrigation efficiency. Finally, a healthier farm economy, driven primarily by increased commodity prices resulting from corn-ethanol demand, provides farmers an opportunity to invest in equipment necessary to make the change.

Dry edible beans direct seeded into alfalfa

Farmers who adopt high residue farming now will realize fuel savings and be better prepared for further fuel cost increases. By the time carbon credits become more widely available, these farmers will have had time to work out the kinks in their system. By proactively adopting more efficient water use practices, they potentially diffuse arguments to take away water due to inefficient use. Lastly, farmers who change now may still have willing buyers of tillage equipment which can be sold to offset the cost of upgrading to newer equipment required for high residue farming.

Harry Young Jr. planted his corn field over 45 years ago with the tools available to him. Today's tools are planters and drills designed to handle high amounts of residue; modern combines spread residue uniformly; and pre-emergent and post emergent herbicides, herbicide tolerant crops, seed treatments, and modern varieties produce yields Harry Young could only dream of in 1962. With new organic burn-down herbicides and specialized equipment for rolling down cover crops, even organic farmers can begin to consider these systems. The question today is not whether we have the tools to produce successful crops with high residue farming systems, the question is, "Why wait?"

WSU Extension and the Center for Sustaining Agriculture and Natural Resources have started a high residue farming program in the Grant-Adams area of the Columbia Basin. Visit their website for more information on production practices, pest management considerations, and educational activities.

Effect of Mustard Seed Meal on Early Weed Emergence in Peppermint and Potato

Rick Boydston, USDA-ARS-Prosser, WA, **Andy McGuire**, WSU, Ephrata, WA, **Steve Vaughn**, USDA-ARS- Peoria, IL, and **Harold Collins**, USDA-ARS, Prosser, WA

Some of the pesticides discussed in this article were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to $7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.

Seed meal is the by-product remaining after pressing or crushing mustard seed to remove the majority of the oil. While not widely available, it may become more available if biodiesel production increases and the economics of growing mustard improve in Washington.

Trials to evaluate weed suppression were conducted at several locations on peppermint and potatoes using seed meal obtained from a test crush of mustard seed, Sinapis alba, variety Ida Gold. Seed meal was donated by McKay Seed in Moses Lake, WA. Seed meal is typically in the form of irregular sized flakes and was run through a hammer mill to obtain a more uniform and spreadable granular material for these trials. ***Mustard seed meal is not an organically approved material for weed control.***

Peppermint

WSU Prosser site. Peppermint rhizomes/roots were dug and planted two to three inches deep in rows spaced 30 inches apart in a Warden sandy loam soil (1% O.M., pH 7.9) at WSU-IAREC August 10, 2006. Plots measured five feet by 10 feet with two rows of peppermint planted in each plot. Mustard seed meal was spread evenly over the entire soil surface by hand at 0.5, 1, and 2 ton/acre rates. Field pennycress (Thlaspi arvense) seed meal was also tested at the same three rates. Each treatment was replicated four times in a randomized complete block (RCB) design and was compared to an untreated weedy check and a terbacil (Sinbar) treated standard.

Seed meal treatments applied in field plots prior to planting potatoes.

White mustard seed meal reduced broadleaf and grass weeds at two weeks after transplanting but the two ton/acre rate provided the greatest weed control (Table 1). The number of weeds in the 0.5 and 1 ton/acre mustard meal treatments were similar to the untreated checks four weeks after transplanting, although the

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Table 1: Broadleaf Weed and Grass Density in Newly Planted Peppermint After Application of Two Seed Meals or Terbacil (Prosser, WA, 2006)

	Treatment	Rate (tons/acre)	Brdlf Weed Counts (no/plot)	Grass Weed Counts (no/plot)	Total Weed Counts (no/plot)	Brdlf Weed Counts (no/plot)	Grass Weed Counts (no/plot)	Total Weed Control (no/plot)	Brdlf Weed Control	Grass Weed Control	Peppermint Height (inches)
1	Nontreated Check		26.3 a	20.3 b	46.5 a	110 a	96.3 b	206.3 a	0 c	43.8 c	9.13 a
2	White Mustard Seed Meal	0.5	8.5 b	3.8 c	12.3 b	93.5 ab	101.8 b	195.3 a	32.5 c	58.8 b	9.13 a
3	White Mustard Seed Meal	1	6.8 b	2.8 cd	9.5 b	71.5 abc	63.3 bc	134.8 a	70 b	65 b	8.88 a
4	White Mustard Seed Meal	2	1.5 b	1.3 d	2.8 c	19.3 bc	27.5 c	46.8 b	71.3 b	73.8 b	10.13 a
5	Pennycress Seed Meal	0.5	13.8 ab	25.8 ab	39.5 a	82.5 ab	176 a	258.5 a	23.8 c	5 d	8.13 a
6	Pennycress Seed Meal	1	17.3 ab	45.5 a	62.3 a	71.5 abc	173.3 a	244.8 a	32.5 c	5 d	8.75 a
7	Pennycress Seed Meal	2	14.8 ab	61 a	75.8 a	77 abc	173.3 a	250.3 a	25 c	0 d	9.5 a
8	Sinbar (lb ai/acre)	0.5	0 b	0 c	0 d	0 c	0 d	0 b	100 a	99.8 a	8.38 a

1) Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

2) Grass counts and grass control data were transformed to meet homogeneity of variance requirements before performing ANOVA.

3) Broadleaf weeds consisted of common lambsquarters, henbit, common mallow, and pigweed. Grass weeds consisted of barnyardgrass and green foxtail.

4) White mustard seed meal obtained from McKay Seed in Moses Lake, WA. Field pennycress seed meal obtained from USDA-ARS lab in Peoria, IL.

weeds were smaller in the mustard meal treated plots. Plots treated with mustard meal at two ton/acre demonstrated significantly lower weed counts than the untreated check plots at four weeks after transplanting (Table 1). Phytotoxicity (chlorotic leaves) observed on several early emerged peppermint plants in two plots treated at two ton/acre of white mustard seed meal was short-lived and the peppermint grew normally thereafter.

Field pennycress seed meal applied at 0.5, 1, and 2 ton/acre did not reduce total weed emergence at two weeks after transplanting and tended to increase the number of grass weeds (Table 1). Grass weed counts at four weeks after transplanting were significantly greater in the plots treated with field pennycress seed meal compared to the untreated checks (Table 1). No peppermint injury was observed with field pennycress seed meal at any treatment rate. Field pennycress seed meal contains primarily glucosinolates that yield allyl isothiocyanate upon hydrolysis. This glucosinolate is very volatile and may be more effective in suppressing weeds when shallowly incorporated into the soil.

Weed control attained with the 1-ton rate of mustard meal in peppermint field plots.

Terbacil controlled nearly all weeds and only slightly injured peppermint (Table 1).

WSU Ephrata site. Peppermint rhizomes/roots were dug and broadcast planted on two certified organic commercial fields on March 16 and April 14 of 2006. Stolons were planted approximately one to two inches deep. Plots were 1.5 feet by 10 feet and mustard seed meal was spread evenly over the entire soil surface by hand at 0.5, 1, 1.5, and 2 ton/acre rates. In the first trial, mustard meal was applied March 16 and weeds counted April 17, 2006. In the second trial, seed meal was applied May 5th after flaming and weed seedlings were counted May 16, 2006. Each treatment was replicated six times in a RCB design and an untreated check was included for comparison. The weeds in untreated plots were mainly pigweed, whereas common lambsquarters were the dominant weed in the treated plots. No grass weeds were present in these trials.

In the first trial, white mustard seed meal reduced the number of weed seedlings by 65% at the 0.5 ton/acre treatment rate and over 90% when treated with one ton/acre or higher of seed meal (Table 2). In the second trial, all rates of seed meal reduced early weed counts by 74% or more (Table 2). Phytotoxicity (chlorotic leaves) observed on peppermint plants that emerged through white mustard seed meal was short-lived and the peppermint grew normally thereafter.

Potato

Umatilla potatoes were planted near Paterson, WA March 31, 2006, on a Quincy sandy soil containing 0.4% organic matter. After dragging the tops of the hills with a rod weeder on April 24, Mustard seed meal was applied the next day in a 12 inch band on the potato hill at 0.5, one,

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Table 2: Broadleaf Weed Density in Newly Planted Peppermint After Application of Mustard Seed Meal (Ephrata, WA, 2006)

	Treatment	Rate (tons/ acre)	Trial 1 Brdlf Weed Counts (4/17/06)	Trial 2 Brdlf Weed Counts (5/16/06)
1	Nontreated Check		20.5 a	11.4 a
2	White Mustard Seed Meal	0.5	7.3	3 b
3	White Mustard Seed Meal	1	1.8 c	1.4 b
4	White Mustard Seed Meal	1.5	1.1 c	0.4 b
5	White Mustard Seed Meal	2	1.1 c	0 b

1) Means followed by same letter do not significantly differ (P=.05, LSD test)
2) Broadleaf weeds consisted of pigweed and common lambsquarters.
3) White mustard seed meal obtained from McKay Seed in Moses Lake, WA.

and two tons/acre (in the treated band area). Dried distillers grain (DDGS), a by-product of ethanol produced from corn, was also tested at one ton/acre and a untreated check was included. Plots were two rows by 20 feet and treatments were replicated four times. Small emerging weeds in the furrows were controlled by dammer diking on May 18 after potatoes had emerged. The main weeds present included hairy nightshade, large crabgrass, and lesser amounts of redroot pigweed. Weeds were counted from four, 1.1 ft^2 areas in the hills of each plot on May 16, three weeks after transplanting. Final weed counts and dry weights were taken on August 21. Potato tubers were dug with a one-row harvester and size graded on August 29.

Mustard seed meal at 0.5 ton/acre did not reduce the number of weeds compared to the untreated check, but rates of one and two ton/acre significantly reduced counts of large crabgrass and total weed emergence (Table 3). Dried distillers grains applied at one ton/acre increased hairy nightshade counts and total weed counts at three weeks after transplanting (Table 3). Plots treated with mustard seed meal at two tons/acre reduced final weed density (five weeds per square meter) when compared to 48 and 50 weeds per square meter in untreated checks and plots treated with distillers grain, respectively. Final weed dry weight was similar among all treatments, except the two tons/acre mustard meal treatment, which reached only 13% of the untreated checks.

Potato tuber yield or specific gravity were not statistically significantly different among treatments, but untreated checks and plots treated with dried distillers grain, averaged the lowest yields (Table 3).

Table 3. Total Weed Counts Following Mustard Seed Meal or Dried Distillers Grain Application (Paterson, WA ,2006)

	Treatment	Rate (lbs/ acre)	Hairy Nightshade 5/16/06	Large Crabgrass 5/16/06	Total Weed Count 5/16/06	Potato Yield 9/11/06	Potato Specific Gravity 9/11/06
1	Nontreated Check		17.8 abc	14.8 b	38.5 b	26.9 a	1.08 a
2	White Mustard Seed Meal	0.5	24.5 ab	8.5 bc	37 b	30.9 a	1.09 a
3	White Mustard Seed Meal	1	7.8 bc	3.8 c	15 c	31.8 a	1.08 a
4	White Mustard Seed Meal	2	2.8 c	1.8 c	5 d	29 a	1.08 a
5	Dried Distillers Grain	1	45 a	24.3 a	78.3 a	25.6 a	1.09 a

1) Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls).
2) Weeds consisted of hairy nightshade, redroot pigweed, large crabgrass, and common lambsquarters.
3) White mustard seed meal came from McKay Seed in Moses Lake, WA. Dried distillers grain came from Big River Resources, LLC, 15210 103rd St., West Burlington, IA 52655.

Discussion

Mustard seed meal formed a crust on the soil surface when sprinkler irrigated 0.25 inches soon after application. High winds or heavy irrigation immediately after treatment application could redistribute granules and leave unprotected areas. A reliable method of spreading seed meal uniformly in the field is necessary to obtain consistent weed control. Weed control appears to be short-lived, lasting between two to four weeks after application. If timed properly, it could be used in conjunction with other weed control practices (e.g., flaming, cultivation, hand-weeding) or timed so that the crop could shade out later emerging weeds.

White mustard seed meal appears most effective for suppression of small-seeded annual weeds when applied preemergence at rates of one ton or more to the soil surface. The high cost of material and spreading likely limits practical uses of mustard seed meal for weed control to high value or organically grown crops. In greenhouse trials, mustard seed meal inhibits emergence of redroot pigweed and kills many emerged small seedlings in the cotyledon stage. In other trials, mustard seed meal applied to surface of perennial potted ornamentals appears promising for annual weed control in ornamentals. If this material is marketed or recommended for the purpose of controlling weeds, it would first have to be registered with EPA as pesticide.

Nutritional Value of Winter and Spring Wheat: A Comparison of Historic and Modern Varieties

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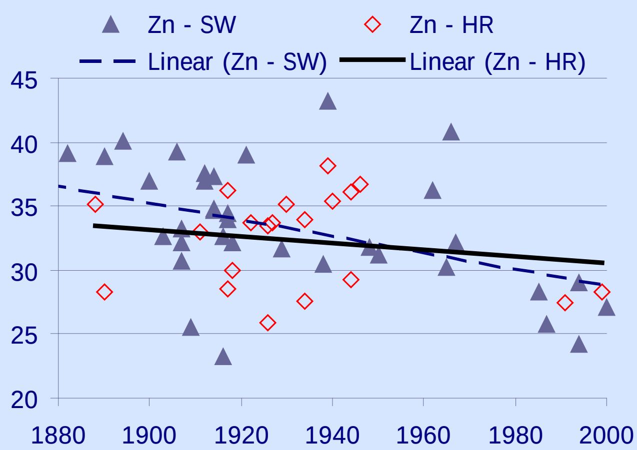
For the past 100 years, plant breeders around the world prioritized increasing grain yield in cereal crops, often with spectacular success. Improved genetics have more than doubled wheat yields in the past 50 years in most U.S. regions. However, as vital as yield is in achieving global food security, it is important to ask whether any valuable traits have been lost along the way in this single-minded quest for improving yield.

Until recently, breeders largely ignored one important component: the nutritional content of wheat varieties. At the Washington State University (WSU) Spillman Agronomy Farm in Pullman, Washington, we tested 63 spring wheat varieties (commonly grown from 1842 to 2000) for grain yield and mineral concentration. Mineral nutrients tested included Calcium (Ca), Copper (Cu), Iron (Fe), Magnesium (Mg), Manganese (Mn), Phosphorus (P), Selenium (Se) and Zinc (Zn). The results revealed that grain mineral concentration decreased substantially over time in all eight nutrients tested, as exemplified by Zn in Figure 1. This research suggests that despite the higher yields of modern varieties, farmers are growing wheat with significantly lower nutritional values. Fortunately, this trend can be reversed quickly and efficiently by selecting for both high yields and high mineral content simultaneously.

Farmers earn about the same for a bushel of wheat today as they did 50 years ago. Although high-yielding varieties and chemical-intensive farming systems produce more bushels per acre, equipment and land requirements have increased dramatically as well. In non-wheat-belt regions, wheat is often grown in farming rotations as a low-value commodity crop designed to suppress weeds or interrupt disease cycles. However, the development, production, and marketing of value-added wheat varieties provide farmers the opportunity to reach a high-value market.

Figure 1: Zinc (Zn) Concentration in Wheat Grain (63 spring wheat cultivars)



Zn-HR and Zn-SW denotes varieties in the hard red and soft white market classes respectively.

For farmers, consumers, and researchers concerned with the nutritional content of the wheat products we feed our family and the grain we feed our livestock, knowledge of the relative nutritional concentration of different varieties is important. Wheat varieties have varying nutritional value. Table 1 lists 26 historical and modern spring wheat varieties that will allow farmers to choose the varieties that best fit their cropping system and marketing opportunities. For example, 'Cadet', 'Ceres' and 'Hard Federation' possess high levels of multiple nutrients, while other varieties, such as Scarlet', 'Thatcher' and 'Hope', have low levels of nutrients tested.

Varietal mixes provide a good solution to obtain the best nutrition combined with high yields. Of the varieties listed in Table 1, 'Cadet' (high in all minerals except calcium, iron and selenium) grown with 'Canus' (high in calcium and iron) and 'Spinkota' (high in iron and selenium) would be an example of a relatively high yielding mixture with enhanced levels of mineral nutrients. Another good combination would be 'Hard Federation' (high in all minerals except calcium, phosphorus, and selenium) and 'White Marquis' (high in phosphorus and selenium with an adequate level of calcium). Varietal mixes demonstrate other potential benefits, including increased genetic diversity in a field, which can buffer disease pressures and environmental fluctuations, such as drought and temperature extremes. Using Table 1, farmers can select specific varieties and create blends unique to their farming and marketing systems.

While the increased yield of modern varieties potentially increases mineral content per acre of grain production, the mineral content per seed or loaf of bread is reduced. This reduction in per loaf mineral content necessitates an increased consumption of bread made from modern wheat varieties to reach the same nutritional level of mineral content in bread made from historical wheat varieties with high mineral nutrient content. It should be noted that many historical varieties also have low levels of certain minerals ('Marquis', 'Red Bobs' and 'Thatcher'), while some modern varieties have high levels of certain minerals (i.e., Cu in 'Westbred Express').

What dietary impact do these varieties with increased levels of minerals have on human nutrition? To explore this question, we compared seven modern varieties with seven historical varieties that contain high levels of each mineral. For all eight minerals, more bread is required to meet the Recommended Dietary Allowance in modern varieties than in the nutritionally dense historical varieties for each age/gender group (see Figure 2). For example, females aged 19 to 30 would have to eat 10.6

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Table 1: Yield & Mineral Nutrient Content of Spring Wheat Varieties

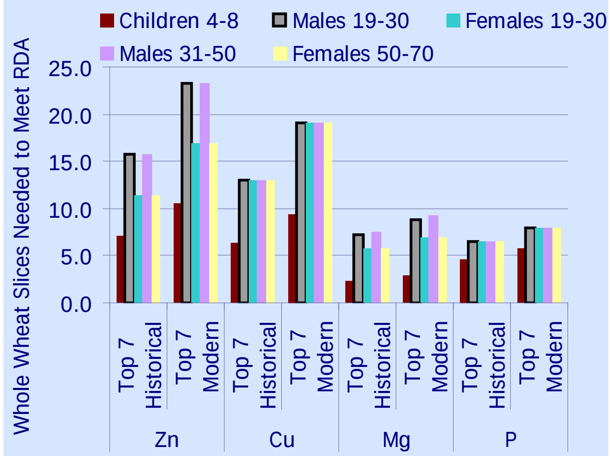
Variety	Market Class	Intro Year	Grain Yield (bu/ac)	Ca	Cu	Fe	Mg	Mn	P	Se	Zn
Cadet	HR	1946	***25***	341	***5.1***	34.1	***1531***	***55***	***4026***	15	***37***
Canadian Red	HW	1919	24	371	4.2	***36.4***	1280	50	3421	13	33
Canus	HR	1934	***29***	***471***	4.3	***36.5***	1358	51	3804	15	34
Ceres	HR	1926	15	453	***5.1***	28.8	1430	***60***	***3989***	***20***	33
Comet	HR	1940	19	413	4.3	***36.1***	1366	***54***	3738	13	35
Flomar	HW	1933	20	414	3.9	34.6	1355	49	3613	14	32
Hard	HW	1915	18	358	***4.9***	***35.8***	***1462***	***56***	3725	12	***36***
Henry	HR	1944	16	366	4.7	31.9	1353	44	3840	12	***36***
Hope	HR	1927	23	349	4.3	32.7	1351	51	3588	11	34
Hybrid 123	SR	1907	6	***515***	4.5	34.9	1279	47	3780	***19***	31
Komar	HR	1930	16	***471***	4.4	30.3	1386	48	3806	14	35
Ladoga	HR	1888	21	385	4.4	38.4	1368	49	***3935***	15	35
Marquis	HR	1911	18	380	3.9	28.7	1271	44	3748	10	33
Red Bobs	HR	1918	21	298	3.5	31.4	1145	43	3206	13	30
Red Fife	SR	1842	5	398	4.5	***35.5***	***1435***	50	***4041***	11	34
Reliance	HR	1926	22	387	3.6	31.4	1177	39	3315	14	26
Reward	HR	1917	18	371	4.7	35.8	1271	52	3895	13	***36***
Rival	HR	1939	15	401	***5.3***	32.4	***1426***	51	3868	***19***	***38***
Ruby	HR	1917	24	338	3.8	33.5	1161	39	3243	14	29
Scarlet	HR	1999	24	387	4	34	1295	46	3527	12	28
Sea Island	HR	1890	16	***490***	4.2	29.7	1237	47	3532	16	28
Spinkota	HR	1944	***30***	288	3.4	***40.5***	1277	45	3437	***21***	29
Supreme	HR	1922	18	346	3.8	33.8	1275	49	3593	9	34
Thatcher	HR	1934	21	396	4.4	27.1	1301	47	3789	12	28
Westbred Express	HR	1991	***26***	414	***4.9***	33.8	1336	51	3545	13	27
White Marquis	HW	1923	2	441	4.3	30.9	1314	4	***4052***	***19***	33

Values in bold italics represent the top ranked varieties for yield and mineral content.

HR = hard red; SR = soft red; HW = hard white spring wheat varieties.

Note: These varieties were grown with very low levels of Nitrogen and this is reflected in the low yields; increasing Nitrogen will likely greatly increase the yields.

Figure 2: Estimated Bread Slices* Required to Meet the Recommended Dietary Allowance (RDA) Zn, Cu, Mg, and



* Each slice is equivalent to 50g whole wheat flour.

slices of whole wheat bread made with flour from historical varieties high in Zn to reach the RDA, but would require 15.2 slices of bread made with flour from modern varieties to achieve the same RDA. Males aged 31 to 50 would need 13 slices of bread made from historical varieties high in Cu and 19.1 slices of bread made from modern varieties to reach the RDA. Figure 2 shows the differences between modern and historical varieties for slices of bread required to meet the RDA for Zn, Cu, Mg and P.

Small quantities of historical varieties are available from the National Germplasm Resources Information Network for on-farm evaluations. Yield and mineral nutrient concentration depend on the soil, climatic conditions, and farming systems where they are grown. Varieties should be tested on a small scale for yield, nutritional content, and disease resistance before they are planted to large acreages. For a complete list of the mineral nutrient concentration in 63 spring wheat varieties, contact Kevin Murphy. Nutritional results of winter wheat varieties grown in different regions of the Pacific Northwest will be available in the fall of 2008.

Harvesting wheat plots.

High Tunnels: Improving Crop Quality, Extending the Season, and Increasing Farm Profitability

Carol Miles, Vegetable Extension Specialist, WSU Mount Vernon NWREC

Farmers throughout Asia, Europe, and the U.S. have found that high tunnels can be a profitable investment when matched with the right crops. High value crops, such as tomatoes, peppers, eggplant, salad mix, basil, sweet cherries, strawberries, blueberries, raspberries, and many species of fresh and dry flowers, show improved growth, yield, and quality under high tunnels. Temperature modification improves crop growth and yield, while primary reasons for improved quality are protection from rain and wind, and reduced disease pressure. High tunnels provide a protected environment not only for crops, but also for farm labor and u-pick customers.

High tunnels are passive solar structures that can be modified to include heat and automated venting. High tunnel frames are tubular steel hoops set into the ground in the field and covered with plastic that can be raised or lowered depending on temperatures and winds. There are several manufacturers of high tunnels, but perhaps the best known throughout the U.S. is Haygrove, while in Washington, Wilson Orchard and Vinyard Supply in Yakima also manufactures high tunnels*.

Some high tunnels, such as Haygrove and Wilson, are designed for season extension and do not sustain heavy snow loads or high winds. These three-season structures are commonly multi-bay and may require a minimum of three bays; bays can be added to cover several acres. Single bay structures are also available from both these manufacturers. Some high tunnel structures are suited for year-round production and these are often referred to as hoop houses. Four-season high tunnels are commonly single bay and have more complex anchoring systems.

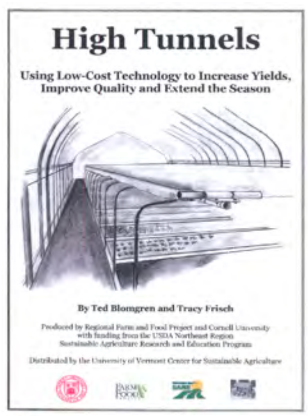
The hoops of high tunnels come in two shapes – Quonset or Gothic. Quonset is rounded from the ground up and a primary outcome is that the beds close to the edge can be difficult to work due to the low side. Gothic has straight legs extending up from the ground with a peaked hoop bolted onto these legs. Depending on the height of the legs, some high tunnels are suited to tractor work while others are not. The Gothic shape is better suited for winter structures because it sheds snow more easily.

High Tunnel Manual

Print or save a copy from the University of Vermont website or send a $15 check made out to "UVM" to:

High Tunnels Manual
UVM Center for Sustaining Agriculture
63 Carrigan Drive
Burlington, Vermont 05405

The hard copy includes a DVD.



High tunnels are less capital intensive than greenhouses, and are generally classified as a temporary structure for property tax purposes. The typical cost of a three-season high tunnel is $0.75 to $1.25 per square foot while the cost of a four-season high tunnel is about $2 to $3 per square foot (Blomgren and Frisch, 2007). While price shopping, pay particular attention to the gauge of the hoop and load capacity, as these will greatly impact the structures ability to withstand heavy rains, wind and snow. While the initial cost of some structures may be greater, growers' experiences from around the country demonstrate that less expensive structures require more management and stabilization during common weather events, thereby making them more expensive even in the short term.

High tunnels require intensive management, especially in areas receiving high winds. For this reason, high tunnels should be located in easily accessible areas. Other considerations also determine the best location for a high tunnel: direction of prevailing wind, southern exposure, capacity of the soil to support the structure, agricultural capacity of the soil, adequate drainage year round, access to irrigation, and the potential for future expansion. High winds pose perhaps the greatest challenge to using high tunnels in Washington. In windy areas, orient the high tunnel so that the end faces the direction of the prevailing wind. It may be a good idea to plant a windbreak, as long as it does not impact sun exposure.

In general, most crops will perform better under high tunnels than in open fields. The key to crop selection for a high tunnel is determining which crops will provide a high return for the investment. Determine which crops are under high demand in your area and bring a good price. Also determine if earlier harvests will help you attract more customers or

Late strawberries under high tunnels at Sakuma Brothers Farm near Mount Vernon, Washington.

Continued on next page

** This reference is designed to help readers find high tunnel structures. It is not meant to endorse any of these businesses or detract from any businesses not listed.*

charge a higher price. In general, harvest under high tunnels can be two to four weeks earlier than in the open field. Vegetable crops well suited to high tunnel production include tomatoes, watermelon, peppers, eggplant, salad mix, edamame, and basil. Fruit crops well suited to high tunnel production include sweet cherries (dwarf types), strawberries, blueberries, and raspberries. Many species of fresh and dry flowers are also well suited to high tunnel production although demand may be regionally specific. For more information on cut flowers well suited to high tunnels, see the new high tunnel manual (see box) for a case study of a cut flower farm. Growing for Market, a newsletter for market growers, also provides good information regarding high tunnel cut flower production.

Resources

Blomgren, Ted, and Tracy Frisch. 2007. High Tunnels: Using low-cost technology to increase yields, improve quality and extend the season. University of Vermont Center for Sustaining Agriculture. 74 pages. www.uvm.edu/sustainableagriculture/hightunnels.php.

Byczynki, Lynn. 2003. The hoophouse handbook: growing produce and flowers in hoophouses and high tunnels. Growing for Market. Fairplain Publications, Inc., Lawrence, Kansas. www.growingformarket.com.

Miles, Carol and Pat Labine. 1997. Portable field hoophouse. Washington State University, Extension Bulletin, EB1825. http://cru.cahe.wsu.edu/CEPublications/eb1825/eb1825.html.

Plasticulture web page, Washington State University, Department of Horticulture and Landscape Architecture, http://www.hortla.wsu.edu/links/plasticulture.html.

25x'25 is the Path to a Secure and Clean Energy Future

J. Read Smith

Our nation and the world are searching for new energy solutions due to increasing demands on limited energy supplies and growing reliance on imports of oil from unstable regions of the world. As energy demands increase both here and abroad, we will need to come up with additional energy supplies that are sustainable. One strategy is to produce more energy here at home using America's agriculture and forestry lands for fuel as well as food, feed, and fiber. I have the privilege of being part of this movement by serving as a co-chair of the 25x'25 Steering Committee, which is committed to promoting energy security, enhancing our environment, and boosting our nation's economy. Along with my wife and son, I manage our families' farming interests consisting of nearly 10,000 acres in Whitman County, Washington. Our principal crops are soft white and hard red winter wheat, hard red spring wheat, barley, soft and hard white spring wheat, canola, mustard, safflower, millet, alfalfa hay, and other minor crops. We also manage a cow/calf operation.

25x'25

As an outgrowth of work of the Washington, D.C.-based Energy Future Coalition, an Agricultural Energy Work Group gathered in 2004 and spent six months exploring several questions:

How could a broad-based alliance be established to support a common renewable energy goal for the country?

What role can the farm and forestry sectors play in producing energy?

How large of a contribution can these sectors make?

What will it take for agriculture and forestry to become major producers of energy?

In March 2006, the work group reconstituted as the 25x'25 Alliance and crafted a vision for a new energy future called 25x'25: by the year 2025, America's farms, ranches, and forests will provide 25% of the total energy consumed in the United States while continuing to produce safe, abundant, and affordable food, feed, and fiber

The alliance has grown to more than 500 agriculture, forestry, environmental, energy, business, and labor groups, representing a diverse collection of partners who endorse the 25x'25 vision. This alliance ranges from the American Farm Bureau Federation and the National Farmers Union to the Natural Resources Defense Council and Environmental Defense to the "Big 3" US automobile manufacturers and the John Deere Corporation. Bipartisan support is growing for a concurrent resolution now making its way through both houses of Congress to establish 25x'25 as national energy policy. (As of June 2007, there were 33 Senators co-sponsoring S. Con. Res. 3 and 65 Representatives signed on to H. Con. Res. 25.) Nineteen current and six former governors and ten state legislatures also support the concept, numbers expected to significantly grow in 2007.

Ethanol storage tanks.

A 25x'25 energy future will generate increased farm income, stimulate rural development, and help improve air, water, and soil quality. It will also result in improvements in wildlife habitat and conservation on cropland, range, and pasturelands. Last year, the 25x'25 Alliance commissioned a major analysis conducted by a team of researchers from the Department of Agricultural Economics at the University of Tennessee's Institute of Agriculture. The researchers were asked to determine the ability of America's farms, forest, and ranches to provide 25% of U.S. total energy needs by 2025, and to assess the economic

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impacts of the 25x'25 goal on the agricultural sector and the overall economy.

The analysis revealed America's farms, forests, and ranches can play not only a significant role in meeting the country's renewable energy needs, but also do so without compromising the ability of the agricultural sector to reliably produce food, feed, and fiber at reasonable prices. The analysis showed reaching the goal would generate in excess of $700 billion annually in new economic activity and create 5.1 million new jobs, primarily in rural areas. By reaching 25x'25, net farm income could increase $37 billion over the next 18 years while higher market prices could provide cumulative savings estimated at $15 billion dollars, not including potential savings in fixed/direct or Conservation Reserve Program (CRP) payments.

A key finding from the University of Tennessee study showed that continued improvements in traditional crop yields would enable the production of enough biomass to meet the 25x'25 goal using cropland already in production, excluding CRP lands. This can be attained at prices resulting in ethanol at $1.60 per gallon and biodiesel at $2.74 per gallon.

The 25x'25 Alliance recognizes our partners in animal agriculture are experiencing significant price increases in many of their primary feedstocks. For example, as the demand for ethanol has increased so has the price of corn. However, the corn yield curve has also increased at an accelerated rate, due to advances in biotechnology and improved cropping practices. There are strong indications that in the short-term, increased demand for corn due to ethanol production will shift some acreage to corn and away from other crops. In fact, USDA recently estimated 90.5 million US acres will be planted to corn in 2007, a 15% increase over 2006 and the largest corn crop since World War II. Corn prices immediately dropped with the news from the Agriculture Department, indicating market forces are at work and bringing some stability to feed costs. Still, the alliance will

Field of canola grown for biofuel.

continue to push for accelerated research and development needed to help address the concerns of the livestock sector, particularly relative to the use of distiller grains and other challenges.

An Action Plan

As a first step to put America on the path to a new energy future, the 25x'25 Alliance sent Congressional leadership their Action Plan: Charting America's Energy Future. Written by the 28 member 25x'25 Steering Committee and based on the consensus reviews and policy recommendations of the more than 500 organizations endorsing the 25x'25 vision, the Action Plan accelerates the transition to America's renewable energy future. With 35 specific actions, including an investment for renewable energy programs equal to about 5% of America's spending on imported oil in 2006, these proposed actions would correct energy market rules and prices to better achieve the economic development, national security, and environmental benefits provided by renewable energy.

The recommendations will increase energy efficiency, the first step in enhancing our energy future. They will also increase renewable energy production to almost 87 billion gallons per year in biofuels through: $800 million in new funding to expand research, development; and deployment; new incentives promoting the growth of dedicated energy crops for cellulosic biofuels production use; increased use of agricultural and forestry residues; and a new generation of refineries to convert those crops and feedstocks into fuels. The recommendations will produce 800 billion kilowatt hours of renewable electricity and boost renewable heating and cooling through $3.7 billion in new tax incentives.

The recommendations ensure renewable energy travels from rural areas to urban and suburban consumers by creating expanded pipeline networks, rail lines, ports, and other shipping facilities. New transmission lines would be built with $3 billion in new tax incentives and improved planning, while the availability of E85 fuel pumps would be expanded through $100 million in new incentives, targeted requirements, and analyzing infrastructure needs.

Markets would expand under the proposed "glide path play or pay" annual obligation for automakers, ensuring 50% of registered vehicles in 2012 are flex-fueled. Federal government purchases of renewable electricity would increase to 25% by 2025 and a new Renewable Energy Credit trading market would be created. Renewable heating, cooling, and other uses of renewable energy would be promoted using $995 million in new funding for government, small business, and residential systems.

Finally, Farm Bill provisions would be changed to include a new Residue Management Assistance Program to improve soil and water quality and wildlife habitat. Farm Bill and other conservation programs would be increased by $3.2 billion. Increasing funding by $1 billion for the Energy Title of the Farm Bill would enable more farmers and forest owners to adopt renewable energy and energy efficiency projects.

Going Forward

To gain congressional adoption of the 25x'25 resolution and the Action Plan we have created, we are in the process of forming state alliances in 21 states with another 12 states showing strong interest. A corporate component to the 25x'25 vision will be added to help carry our message. Additionally, we are launching a public awareness campaign in support of the 25x'25 mission. To learn more about the 25x'25 goal, see our website.

Tidbits

Wheat Head Army Worm – A New Grain Pest?

Diana Roberts, PhD, Agronomist,
WSU Spokane County Extension

Washington state grain graders recently informed the Davenport Union Warehouse that some of their wheat samples contained 2% broken kernels and would only gain Sample Grade. While initially thought to be grain borer or grasshopper damage, Kevin Reed of the McGregor Company in Davenport scouted affected fields and found pupae that are most likely from the Wheat Head Army Worm. WSU entomologists Dave Bragg and Rich Zack will maintain the pupae until moths emerge to confirm the insect is the wheat head army worm, Faronta diffusa.

If confirmed, this will be the first record of the wheat head army worm (WHAW) causing noticeable crop damage in Washington. According to reports from Kansas, Colorado, and Alberta, the wheat head army worm is a minor grain pest, but occasionally it does cause noticeable crop injury. Damage is usually detected at harvest and may be confused with damage from grain storage insects. According to Davenport and Odessa Unions, the infestation is localized and sporadic within a 10-mile radius of Davenport and appears to affect primarily winter wheat.

The wheat head army worm overwinters in the pupa stage with adults emerging in the spring when they lay eggs on many grass species, although wheat is the preferred host. Hatching larvae feed on maturing grain heads and chew directly into the developing kernels. They drop to the ground and pupate by harvest time. The pupae are about one inch long, dark brown, and shiny. They lie at the base of affected plants right where the crop residue layer meets the soil surface (about 1 inch deep).

Fortunately, up to one third of the pupae found near Davenport were parasitized by another insect, probably a wasp species. In Alberta, the wheat head army worm only completes one generation per year, but a second, fall flight of the moths may occur further south (e.g., Kansas and Colorado). Warm, dry weather favors the survival of the insect. It is possible that reduced tillage or direct seeding allows more of the pupae to survive and develop into moths.

Wheat head army worm pupae.
Photo by J. Burns.

Due to only infrequent infestations in other states, researchers have not developed economic thresholds and there are no insecticides labeled specifically for the wheat head army worm. Farmers applying pesticides for wheat head army worm close to harvest may have to delay harvest and risk yield loss to meet preharvest label requirements.

Farmers in the affected areas should check for the worms next season starting about two weeks after grain anthesis. Since the larvae tend to hide during the heat of the day, it is best to look early in the morning. The heaviest infestations occur around field borders. Given the variable weather conditions and insect predators occurring naturally in the area, it is likely wheat head army worm populations sill remain below damaging levels, similar to other states.

For further information, contact Diana Roberts at 509-477-2167. For a slide show, see the on-line presentation.

Local Producers and Buyers Reap Tasty Rewards

Betsy Fradd, WSU Extension

Dan Carr was on a mission. As co-owner of Visconti's restaurants in Leavenworth and Wenatchee he was after the best tasting local products he could find to add to their seasonal menus at the first Farm to Table Regional Trade Meeting.

"I found people to supply arugula and three different suppliers of heirloom and tree ripened fruit," said Carr who estimates 650 people per day visit the eateries during the summer. "We want to support anything that has to do with food and the quality of life, he added."

Carr, along with over 100 producers and growers met face to face in Leavenworth March 19 to establish new trade relationships and learn how to meet the rising demand for healthy, local foods. Finding a local market for her 220 varieties of tree fruit was important to Kim Langston. As a third generation grower at Feil Pioneer Orchards, she is passionate about supporting the surrounding communities.

"Food is one of the things we all make decisions about every day. The effect of that decision -- how many miles it travels, production facility costs and packaging – all contribute to how we take care of our selves and our environment," said Langston whose orchard fruit stand is nearly a year-round endeavor.

Marcy Ostrom, Director of the Small Farms Program at Washington State University, knows the challenges growers and buyers face and sees increased interest in partnerships.

"Many restaurants, Bed and Breakfasts, and retailers have customers requesting more local foods but they're not sure when they can find them. Many farmers are currently selling their products to wholesalers or driving them over to Seattle. They would find it more profitable if they could develop stable, nearby markets," explained Ostrom.

Adding more local foods to the Sunshine Farm Market in Chelan was of major interest to Danielle Lovell. As the retail market manager she appreciated meeting nearby growers.

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Inna Kazulina, owner of Inna's Cuisine in Wenatchee, and her husband and manager Sergiy Kazulin, at the first Farm to Table meeting in Leavenworth.

"It's nice of have food with a face," said Lovell who discovered sheep's cheese from Alpine Lakes Farm in Leavenworth. "Sheep's cheese is pretty unusual and it's really tasty. We plan on sampling it and having it available for retail," added Lovell.

Supporting nearby growers is a priority to Josh Smith, a buyer at the Top Foods store in East Wenatchee. Smith says the store currently carries many local products including asparagus, jalapenos, pumpkins, tomatoes, and watermelons. "We need to support local growers. It's fresher and customers appreciate that," said Smith who found a Cashmere cider connection at the Farm to Table meeting and is now carrying high-end varieties of apple, pear, raspberry and spice cider.

The growing support of community-based food awareness and consumption was encouraging to Joan Qazi. As an organizer of EAT, a community food system group in North Central Washington that promotes local farmers and local consumers, Qazi sees changes ahead.

"Our region is in transition, away from just conventional tree-fruit production to value-added production, processing and more diversified vegetable production. This will help strengthen our local food economy so that people can buy more of their food from local sources, including restaurants and grocery stores," said Qazi.

First Year BIOAg Funding First Year BIOAg Funding Produces Valuable Results

Betsy Fradd, WSU Extension

The first direct legislative funding for WSU's Center for Sustaining Agriculture and Natural Resources (CSANR) provided $225,000 for 13 grant projects in six priority research areas: livestock, nutrient management, alternative crops/bioenergy and bioproducts, food quality, economics, and demonstration farms. The Legislature approved $400,000 for BIOAg in fiscal year 2007 and an additional $200,000 in fiscal year 2008.

A project exploring production and quality of winter grown organic vegetables evaluated 26 organic leafy green vegetables including lettuces, spinach and Asian greens in unheated and unlighted hoophouses. All varieties survived winter conditions but productivity varied with yields ranging from less than half an ounce to more than three ounces per plant. Asian greens were higher yielding than spinach, while lettuce varieties were the lowest yielding. According to WSU crop and soil scientist, Rich Koenig, nitrate levels, a critical component in the testing, varied. "The majority of varieties grown in Pullman had nitrate concentrations below the European standards (the U.S. has no standards for leafy green vegetables). Certain varieties grown in Vancouver had levels about the standard, but lower light intensity and higher soil nitrate levels at that site may explain the higher concentration," said Koenig. Additional studies in 2008 will further explore optimizing winter organic vegetable production.

Winter wheat and canola plots.

Dr. Lynne Carpenter-Boggs, WSU BIOAg Coordinator, explored possibilities for low-cost, immediate disposal, and low-odor solutions for livestock carcass composting. On-farm sites in Whitman, Grant, Skagit, Snohomish, Adams, Whatcom and Yakima counties used at least a two-foot thick layer of composting material consisting of woodchips, manure, sawdust and/or straw. Finished piles remain undisturbed for a minimum of two to six months, then turned with large equipment (e.g., a backhoe), and left to compost another two to six months before use. "This process minimizes biohazards since it can be done on a farm and does not involve transferring a carcass. It also recycles the nutrients from the carcass into usable soil amendment," explained Carpenter-Boggs.

A third project funded was a three-day training using the Land EKG ecological monitoring system for ranchers and range managers interested in evaluating the impact of livestock management practices on rangelands and pastures. The Land EKG process uses a set of score sheets to characterize the landscape, identify biological inhabitants and activities, and rate ecological functioning in water, nutrient, and energy cycling. "This provides a means to monitor and evaluate the ecosystem response to use of tools such as grazing, animal impact, rest, fire, and technology and to adjust management accordingly to stay on track to achieve the landscape goal," said Don Nelson, WSU Extension Beef Specialist

Another project is exploring using winter canola as a rotation crop in Eastern Washington. This project studies analyze the impacts of adding canola to the wheat-fallow cropping system and determine the potential for canola production. So far, some farmers have experienced substantial yield improvements in wheat crops planted after canola. "Winter canola is one of the few crops that can compete economically with winter

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wheat in the low-precipitation zone of the Inland Pacific Northwest," said WSU research agronomist Bill Schillinger.

The Legislature approved further funding to continue these and other projects: $400,000 for BIOAg in fiscal year 2007 and an additional $200,000 in fiscal year 2008 as part of College of Agriculture, Human, and Natural Resource Sciences' Unified Agriculture Initiative.

Urban Farms Transform Food Deserts

ATTRA. Inner cities are sometimes known as food insecure areas, or food deserts where fresh produce is unavailable and nutrition is poor. In These Times explores how several different urban agriculture programs across the country are transforming city neighborhoods with community and backyard gardens, as well as commercial farms that supply food for local markets. These and other fresh food programs are finding more political support nationally, but still face challenges in sustaining themselves financially and holding onto land resources.

Is Our Farmland Ready for the Challenge?

AFT. With temperatures on the rise, and hypoxic dead zones in rivers, gulfs, bays and oceans spreading rapidly, farmers are stepping up as good stewards of the environment.

AFT's innovative solution to protecting water and soil quality, the BMP (Best Management Practices) Challenge, makes it easier for farmers to reduce fertilizer use and utilize conservation tillage practices while being protected from potential loss of income. In 2005, a nutrient management and conservation tillage program on thousands of corn acres in Iowa, Illinois, Minnesota, Ohio and Wisconsin reduced greenhouse gas emissions by up to 69 percent and soil erosion by up to 78 percent. AFT is currently holding listening sessions with farmers, ranchers, policy makers and concerned citizens from all over the country on what eco-system services farms can provide. Stay tuned for more information on how agriculture can help keep your water clean, fight global warming and keep our planet healthy.

Pesticides Disrupt Nitrogen Fixing

Many farmers applying pesticides to boost crop yields may instead be contributing to growth problems, scientists report in a new study. According to years of research both in the test tube and, now, with real plants, a team of scientists reports that artificial chemicals in pesticides—through application or exposure to crops through runoff—disrupt natural nitrogen-fixing communications between crops and soil bacteria. The disruption results in lower yields or significantly delayed growth. "Agrichemicals are blocking the host plant's phytochemical recruitment signal," said the study's lead author, Jennifer E. Fox, a postdoctoral researcher in the Center for Ecology and Evolutionary Biology at the University of Oregon. "In essence, the agrichemicals are cutting the lines of communication between the host plant and symbiotic bacteria. This is the mechanism by which these chemicals reduce symbiosis and nitrogen fixation."

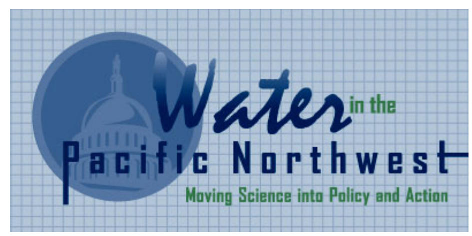
Study Details Economic Impacts of Organic Conversion

AFTA. This study shows that the potential regional economic impact of organic crop production exceeds that of conventional crop production. In work funded by the Leopold Center for Sustainable Agriculture, researchers assessed the potential region-wide economic impact of this major switch in production practices. The project affirms existing ISU research which demonstrates that operators who choose organic methods will receive greater economic returns than those who opt for conventional practices. Specifically, organic rotation farming produced 52 percent more gross sales revenue, 110 percent more value added, and 182 percent more labor income than from the same 1,000 acres farmed using conventional corn-soybean rotation practices, according to the ISU study. Read more by following the above link.

Events

Water in the Pacific Northwest

ATTRA. This regional conference merges water science and policy to promote collaboration between scientists and policy makes on water-policy decisions. It was developed in response to comments from previous water quality and groundwater conference participants who stressed the need to better integrate science and policy. November 7 - 9, Skamania Lodge.



Announcements

Dr. John C. Gardner Joins WSU

Dr. John C. Gardner joined Washington State University July 1 as the new vice president for economic development and extension and is based out of Seattle. For insights into how Dr. Gardner views the role of WSU and WSU Extension in economic development, see his blog.

Resources

AgWeatherNet

While covering mostly south central Washington, the AgWeatherNet (AWN) provides access to the raw data from the Washington State University PAWS & AWN weather network. The AWN includes 98 weather stations located mostly in the irrigated regions of eastern Washington State providing

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15 minute weather data update approximately once an hour. The AWN network is administered and managed by the AgWeatherNet Program located in Prosser, WA and has been available only by subscription until now. You must register to gain access to the AWN raw data. Once registered, you can log in at any time to view or download data.

US Atlas of Renewable Resources

Looking for information on solar, wind, geothermal in the US? Try looking at this on-line atlas.

National Livestock and Poultry Environmental Learning Center

Individuals involved in public policy issues, animal production, and delivery of technical services for confined animal systems will have on-demand access to the nation's best science-based resources that is responsive to priority and emerging environmental issues associated with animal agriculture.

Counties & Local Food Systems

ATTRA. The National Association of Counties recently published this best practices publication demonstrating four methods counties can use to bolster their local farm sectors and increase the availability of healthy food for constituents: food councils, farm to school programs, infrastructure for small and medium producers, and agricultural conservation easement programs.

Farm To Hospital Resource Now Available

ATTRA. The Center for Food and Justice and The Community Food Security Coalition recently released Farm to Hospital: Supporting Local Agriculture and Improving Health Care (PDF/219 KB). This brochure introduces interested farmers and hospital food service departments to the ins and outs of developing partnerships between hospitals and local farms. Included are examples of ways hospitals can improve the food they offer, issues for farmers

to consider if they are interested in selling products to area hospitals, and specific case studies of successful programs.

New Health Reference Available for Alternative Swine Production

ATTRA. A new publication, Managing for Herd Health in Alternative Swine Systems (PDF/703KB), serves as a guidebook for swine producers not raising their hogs in a "conventional" operation. This publication was developed through a collaborative effort between swine producers, field veterinarians, Iowa State scientists, and Practical Farmers of Iowa. The publication covers many areas of herd health and also has examples and producer profiles from experienced hog farmers.

Guide to Variety Trials for Organic Producers Available Online

ATTRA. As part of a 2007 focus on on-farm variety trials, Organic Seed Alliance has produced On-Farm Variety Trials: A Guide for Organic Vegetable, Herb, and Flower Producers. The 23-page publication is available free online (PDF/1.26MB). The guide discusses the benefits of conducting on-farm variety trials, covers methods for planning and carrying out trials, and aids in evaluation.

ORGANIC seed ALLIANCE

EPA Creates Rules Web Site

ATTRA. The California Farmer reports the U.S. Environmental Protection Agency (EPA) has launched a new web site that provides a lookup tool listing federal environmental regulations that could impact agriculture. The new EPA Agriculture Laws page lists the most important regulations that affect the agriculture community. It also has a new regulatory matrix titled, "Major Existing EPA Laws and Programs That Could Affect Agricultural Producers" (PDF/887KB) that provides a succinct, general description of EPA's requirements for both regulatory and voluntary programs.

Food Alliance Introduces National Pork Standard

ATTRA. The Food Alliance, a nonprofit organization that operates the most comprehensive third-party certification program in North America for sustainably produced food, has posted its new national standard for pork production. The 28-page Inspection Tool for Pork Production (PDF / 235K) may be downloaded, and includes both fixed and scored standards addressing issues such as humane treatment, manure management, and food safety.

The National Immigrant Farming Initiative

NIFI provides training, information sharing, networking opportunities, funding for projects through Heifer's project development process, and other resources to support immigrant farmers. NIFI advocates for immigrant farmers and works to build awareness about the unique challenges immigrant farmers face, while increasing the visibility of their important contributions to our communities and agriculture.

Organic Seed Production Manuals Available Online

The Organic Seed Alliance has produced three crop-specific seed production manuals to assist current and would-be seed growers in producing quality seed. The manuals were part of a two-year WSARE-funded, farmer-led education project that involved field days, workshops, and development of manuals on seed production. Three separate manuals are available online as PDF files, covering organic seed production for radishes, beans, and spinach.

Organic Farming Research Foundation

Read the latest bulletin or visit their web site.

Study Examines Taste of Cheese from Pastured Cows

ATTRA. Preliminary research from the University of Wisconsin Madison shows that cheese from the milk of pastured cows tastes significantly different from other cheese. A three-year study determined differences in taste and components between milk produced by cows on three different feeding regimens: pasture only, pasture and grain, and grain-based. A trained sensory panel noticed a significant grassy note affecting the flavor of the two pasture-based cheeses, while a consumer panel at North Carolina State gave highest taste ranking to the pasture and grain regimen cheeses.

The Future of Washington Forests

The Washington Department of Natural Resources (DNR) has published The Future of Washington Forests, a report to the State Legislature. It documents a new model for public policy development, created through a collaboration between DNR and the University of Washington's College of Forest Resources. DNR and the College brought together policy-grounded academic studies with stakeholder dialogue to form relevant proposals for public policy change. The report summarizes policy recommendations about protecting the working forest land base for its multiple benefits and for strengthening Washington's forest industry.

Forest Practices Illustrated

This book is designed to help forest owners, loggers, and others better understand the Forest Practices Rules and how they protect public resources, such as fish, water, wildlife, and state and municipal capital improvements. In it, you'll find commonly encountered rules, with photographs and illustrations that show what these operations look like.

No endorsement is intended of any businesses listed in this publication, nor is criticism of

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