Sustaining the Pacific Northwest

Food, Farm, & Natural Resource Systems

December 2006 Volume 4, No. 4

Washington State University Extension
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In This Issue

Articles

Dairy Waste in the Horticultural Industry

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The anaerobic digestion (AD) of dairy waste has become a viable, environmentally-friendly waste management system. The closed system effectively ameliorates odor while reducing potential soil and water pollution and greenhouse gas emissions. AD also generates heat, biogas, and other valuable byproducts.

The capital expense required to install and maintain AD technology limits its use to larger dairy operations, especially in Washington State, where abundant and inexpensive hydroelectric power limits the economic return when the sale of biopower electricity is the only payback for the significant investment costs required to build a digester. Unlike other areas of the country which use AD technology more widely because electricity sales support the development costs, Washington dairy operators must rely on byproducts to recoup AD investment costs.

Sustained, moderate heat applied to dairy waste during the 25-day AD process promotes microbial activity which breaks down the dairy waste into several gaseous, liquid, and solid co-products. One co-product, methane, normally used to generate bioelectricity, can be cleaned, compressed, and then used as a substitute for natural gas or propane. The remaining mass after the AD process can be extracted and separated into nutrient-rich liquid and solid fraction co-products. The liquid fraction can be used as a fertilizer due to its readily available nutrients and the solid fraction's physical properties resemble horticultural peat moss.

The horticulture industry historically uses Sphagnum peat moss (SPM) as the primary component of soil-less plant media or potting soil. With its highly lignified and decay resistant organic matter content, SPM holds large amounts of water and nutrients which release slowly over time to plants. SPM's high cation exchange and water holding capacity, coupled with optimal air holding capacity and ease of handling, stimulated the advancement of containerized horticultural technology. Mechanization and sophisticated growing techniques further increased the industry demand for high quality, uniform, and consistent substrates.

Peat moss is mined from ecologically sensitive wetland bogs. Peat bogs, composed of submerged, partially decayed moss and other plant material, accumulate at a rate of 0.5 to 1.0 mm per year. These bogs support a unique ecosystem

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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.

This is a joint newsletter of the WSU *Center for Sustaining Agriculture & Natural Resources*, the *WSU Small Farms Team*, the *WSU Small Farms Program* and the *Water Quality Management Team*.

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and serve an important ecological function in purifying and holding water. Plant material preserved in bogs store the largest terrestrial carbon source. Mining peat moss requires bogs be drained which allows the preserved plant material to resume decomposition. This decomposition releases carbon into the atmosphere as carbon dioxide, the primary greenhouse gas contributing to global climate change.

In Europe, the depletion of peatlands has become a critical environmental concern. Increased public awareness of the ecological ramifications of bog destruction prompted new laws restricting the use of horticultural peat and stimulated consumer demand for peat-free plant substrate. In North America, where most horticultural grade peat moss comes from Canada, there is also an emerging consumer awareness and demand for sustainable horticultural resources. As in Europe, conservation efforts protecting wetland ecosystems result in restricted use and increased peat prices. Driven by consumer demand for green products, a major United States-based horticulture company introduced a sustainable product line in North America. This led to a search for alternatives to peat-based plant growth media.

Possible alternatives for peat in soil-less media include sustainable resources such as biosolid waste or other waste byproducts. These have not been widely adopted due to inconsistent quality and the presence of heavy metals, salts, and other phytotoxic properties. In Europe, where horticultural peat moss is not readily available or its use is regulated, the horticulture industry substitutes coir, a coconut waste byproduct from fiber and rope production. Primarily imported from Sri Lanka, coir's physical and chemical properties meet the high standards of the European horticulture industry.

Over half of the United States' $5.36 billion floriculture industry and Washington's $111 million floriculture industry originates from the sale of bedding and garden plants. The continued growth of this industry is reflected in an eight-year, 25% increase in greenhouse space. The scope of the American green industry creates significant demand for high-quality and economical soil-less container media. Washington's dairy industry may be able to tap into this market with their renewable and economical resources for alternative soil-less media.

While composted dairy manure has long been identified as a sustainable resource in agriculture and horticulture, its inconsistent quality and handling difficulties has limited its use within the horticulture industry. AD fiber, however, is easily handled and our studies indicate that plants can develop as well in anaerobically digested dairy solids (fiber) with post-digestion treatment as they do in peat-based soil-less media.

A 2005 horticulture industry survey conducted in Washington State showed 96% of the respondents were interested in peat moss alternatives. The majority of growers also indicated air-filled porosity was the most important characteristic for soil-less media, followed by water-holding capacity, nutrient level, and pH.

A 2002 market assessment, funded by the Port of Bellingham, found the potential market values for unamended AD fiber were in agricultural use with 650,000 yards at $5/cubic yard and in the nursery industry, with 80,000 cubic yards at $12/cubic yard. When amended and bagged for horticultural retail markets, the potential is substantial at $12 to $190/cubic yard.

Initial horticultural fiber studies examined physical and chemical properties and their suitability for plant growth. Visually, AD fiber closely resembles peat moss in color and texture. Bulk density, water retention, and air space measurements were similar for both substrates, although at full container water holding capacity, peat mix retained slightly more water than the fiber mix (Graph 1). Based on chemical analyses, fiber contains higher amounts of

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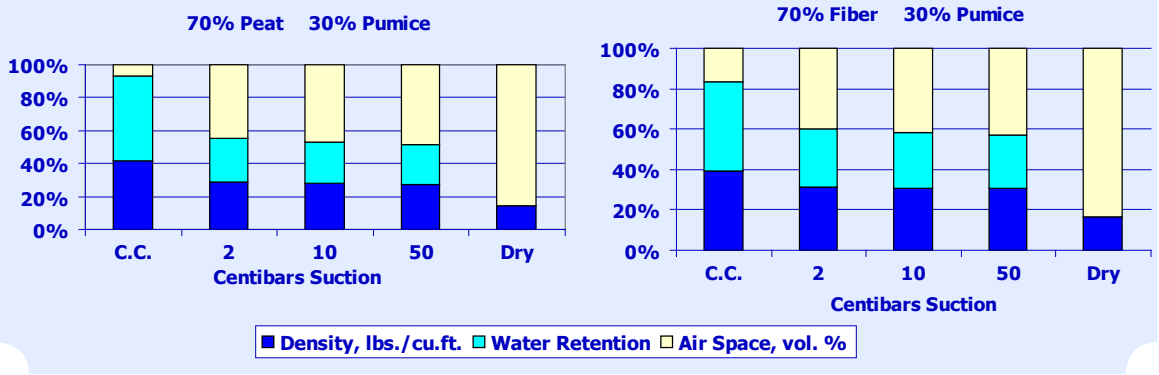
Graph 1: Comparison of Fiber & Peat



available nitrogen, phosphorus, potassium and micronutrients than peat, with the exception of manganese and iron. The high pH and electroconductivity (EC) of fiber (Table 1) could limit nutrient uptake by plants.

On-farm and research station trials utilize Petunia as an indicator plant due to its prominence in the industry and its sensitivity to high pH. All aerial plant measurements, including fresh weight, leaf length, and plant greenness were significantly lower in fiber mix than in peat mix (Graph 2). Plant "greenness" was indirectly measured using a Minolta SPAD chlorophyll meter. Based on plant tissue analysis, the chlorosis indicated low manganese and iron uptake in fiber due to the high pH level (Table 2).

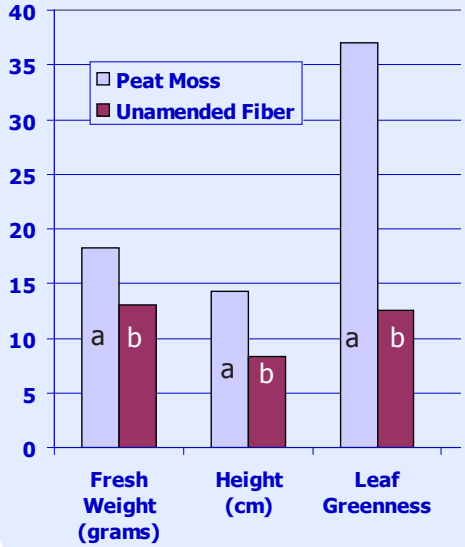
Table 1: Nutrient Availability, Electroconductivity, & pH

	Available Nutrients (per ton)											Ec	pH
	Macronutrients (lbs)						Micronutrients (oz)						
Source	N	P	K	Ca	Mg	S	Cu	Zn	Mn	Fe	B		
Unamended AD Fiber	1.56	2.22	6.4	2.24	2.35	2.51	0.2	0.91	0.52	0.38	0.03	2.5	8.8
Peat	0.12	0.02	0.2	13.88	2.22	0.44	0.1	0.19	2.31	3.24	0.04	0.4	4.8

Table 2: Initial Plant Tissue Analysis

	Tissue Analysis (ppm)	
Source	Mn	Fe
Unamended AD Fiber	70	590
Peat	242	536

Graph 2: Initial Trial - Leaf Greenness, Length, & Shoot Fresh Weight



To "unlock" the abundant nutrients in AD fiber, multiple research trials explored acidification method. A simple and inexpensive acidification treatment lowered pH and increased nutrient availability. Plants grown in treated fiber mix had statistically higher fresh weight than plants grown in peat mix. There was no significant difference between greenness or leaf length of plants grown in treated fiber and in peat (Graph 3). The increase in SPAD chlorophyll measurements from acidification is supported by tissue analysis showing acidification of fiber allows manganese uptake at a higher rate than peat and improves iron uptake (Table 3).

Research station and on-farm trials using zonal geranium, snapdragon, and vinca minor also demonstrated no significant differences detected in plant measurements or visually between treated fiber and commercial peat mixes.

In previous research, aerial measurements, such as leaf length, shoot fresh weight, and greenness, have been used to detect differences between plant growth in fiber and in peat. In most recent studies, however, root and substrate interactions have been evaluated with the aid of a root analysis software, WinRHIZO Pro 2005. Evaluation requires all substrate be removed from the root system and the roots be carefully rinsed clean. Using a modified flatbed scanner, a high-resolution digital image is captured of the root system. WinRHIZO software analyzes the image to measure root parameters, such as total root system length, surface area,

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Graph 3: Subsequent Trial - Leaf Greenness, Length, & Shoot Fresh Weight

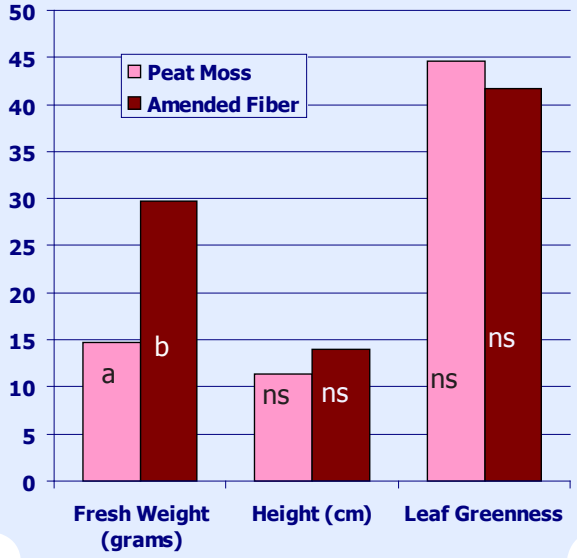

Table 3: Second Plant Tissue & Media Analysis

	Tissue Analysis (ppm)		Media Analysis	
Source	Mn	Fe	pH	Ec
Unamended AD Fiber	70	590	6.1	1.9
Peat	242	536	4.8	0.3

and average root diameter. With root measurements, the entire plant growth response can now be effectively measured.

Recent studies examined the use of a common soil additive to optimize plant growth and development in fiber. These studies reveal positive plant response to a low rate of a second additive, with statistically higher fresh weight and leaf length. Plants grown in fiber appear somewhat lighter green in color early in development but are visually similar at harvest. Root analysis of total length and surface area shows no significant difference between peat and fiber mix. However, a visual difference occurs in root systems when additive rates change (Photo 1).

These studies indicate AD dairy fiber, with minor modifications, becomes a viable value-added co-product, with potential to replace peat in soil-less mixes for use in the horticulture industry. Coupled with increasing environmental awareness, legislation, and decreasing availability of high quality peat, there is a growing need and demand for a peat alternative in soil-less growth media. AD fiber constitutes a readily available, sustainable source emanating from an environmentally friendly waste management system.

Photo1: Petunia in (a) peat mix and (b) treated fiber plus amendment rate 3.

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Chemigation and Fertigation in Washington State

Tom Hoffmann and Byron Fitch, Washington State Department of Agriculture, Chemigation and Fertigation Technical Assistance Program

The Dawning of a Management Practice

The injection of pesticides (chemigation) or fertilizers and soil amendments (fertigation) into irrigation water for application to plants or land has been practiced since the 1970s. These management practices were widely adopted by the 1980s as a means to lower production costs, increase product efficiency, and enhance product quality. Now standard production practices throughout agriculture, Chemigation and fertigation also reduce application costs,

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increase timely applications based on crop requirements, minimize human exposure, decrease mechanical damage to crops, and improve spatial placement in the soil profile of soil-active pesticides.

Diaphragm-type pumps are positive displacement pumps and are in common usage.

While discussion commonly focuses on the benefits of chemigation and fertigation, especially due to escalating fuel and fertilizer costs, there has been little discussion about the labeling of products for these uses, the safety devices required, or the applicator's responsibility. This article provides an overview of federal and state laws governing the implementation of chemigation and fertigation practices and some of the key issues applicators understand.

Emergence of State Chemigation & Fertigation Rules

In 1980, Congress authorized the U.S. Environmental Protection Agency (USEPA) to write guidelines ensuring the safe and effective use of pesticides applied through irrigation systems. These guidelines, Pesticide Regulation (PR) Notice 87-1: Label Improvement Program for Pesticides Applied through Irrigation Systems (Chemigation), took effect in 1987.

PR Notice 87-1 requires pesticide product registrants to amend their pesticide labels to include additional use directions, equipment requirements, and other application restrictions. Hence, a pesticide label must address chemigation by either, (a) prohibiting chemigation, or (b) permitting chemigation. The label cannot remain silent as to chemigation. If USEPA authorized for chemigation, the product label must contain use directions specifying: (a) the type of irrigation system through which the product can be applied, (b) the backflow prevention devices necessary on the irrigation water supply system to prevent contamination of the water source, (c) special antipollution measures for connections to public water systems, (d) backflow prevention devices on the chemigation injection line, (e) the system interlock necessary to discontinue product injection in event of an irrigation system malfunction, (f) application monitoring, (g) treatment area posting, and (h) the quantity of water to be applied. These conditions of use are in addition to mandatory label provisions.

The Washington State Chemigation Rule became effective in 1989 and is based on PR Notice 87-1, as are the rules in nearly 30 other states. The Washington State Fertigation Rule became effective in 1991. In response to requests from the agricultural sector, the rules were revised in 2001 and are now the Washington State Chemigation Rule (WAC 16-202-1001) and Fertigation Rule (WAC 16-202-2002).

The principal differences between the chemigation and fertigation rules include treatment area posting, record keeping, and worker protection requirements, which do not apply to fertigation. In addition, there are differences in the length of time that a product can remain in an application tank before secondary containment becomes necessary. For chemigation, product can remain in an application tank only for 14 days between applications, while longer periods require tank placement in a secondary containment structure. For fertigation, the time period is nine months, or the end of the application or irrigation season, whichever is shorter.

Application System Requirements

The following antipollution devices are required for the injection and irrigation systems for both chemigation and fertigation:

Irrigation System

Mainline check valve
Vacuum relief valve
Low pressure drain

Injection System

Check valve on product supply line
System interlock

In addition, Washington State rules require an inspection port located upstream and within eight inches of the irrigation mainline check valve. This port allows the system operator to assess the integrity of the irrigation mainline check valve and to evaluate the operation of the low pressure drain. The inspection port and vacuum relief valve are typically a single device. Connection to a public water system requires special equipment. Contact your water purveyor or your local administrative authority responsible for plumbing code enforcement before

Single check valve chemigation line check valves are commonly used on irrigation systems. They are manufactures with all the required backflow devices:

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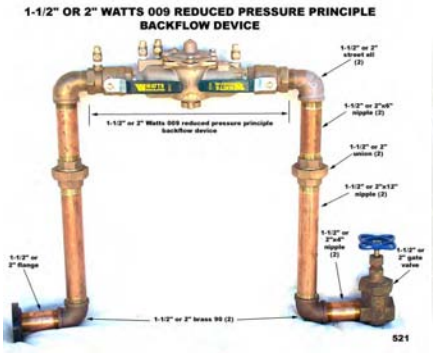

Whenever a cross connection with a public water system is possible, a reduced pressure zone (RPZ) assembly or reduced pressure principle assembly (synonymous terms) are required - no exception! This is a Uniform Plumbing Code standard for cross connections and some local municipalities (city and county) require RPZ devices whether or not a cross connection is possible (referred to a local preventive authority).

undertaking any activity to determine appropriate backflow prevention device requirements.

Washington State Chemigation and Fertigation Rules are performance based and therefore recognize alternative technology can provide substantially equal protection to the devices referenced on the pesticide label. However, only a WSDA representative can determine if a system meets the intent of the law. Authorization by WSDA staff must be granted prior to the use of alternative technology in conjunction with a chemigation or fertigation application.

Application Tank Labeling

Regardless of size, application tanks used in conjunction with a chemigation or fertigation operation must bear identifying information a minimum of two inches in height and in a color contrasting to the background. This information must be easily visible and securely attached to the tank, and must remain intact and legible throughout the application. If the application tanks are located in a secured area, such as the inside of a locked building or within a fenced area, the contact information may be posted on the outside of the structure. Other information must also be displayed on the application tank, depending on the chemigation or fertigation application. Following is a summary of the information that must appear on tanks by type of application:

Chemigation

- Complete pesticide label
- EPA establishment number, if necessary
- Maximum net capacity
- Contact name*
- Telephone number*
- Owner derived tank identifier*

Fertigation

- List of primary tank contents
- Maximum net capacity
- Contact name*
- Telephone number*
- Owner derived tank identifier*

* Minimum height requirement applies.

Placement of Application Tanks

Mixing and loading activities associated with a chemigation or fertigation application and application tanks cannot occur within 20 feet of wellheads, waters of the state (including irrigation ditches and waste ways, streams, lakes, rivers, and ponds), or sensitive areas. Sensitive areas, defined in both the chemigation and fertigation rules, include public roadways. In addition, the point of injection cannot occur within 10 feet of these sites. If circumstances prevent implementation of this rule, then the application tank may be placed in a secondary containment facility that is at least 110 percent of the tank's volume if covered, or 125 percent if uncovered.

In Washington State, chemigation and fertigation are distinctly defined:

Chemigation means the application of any substance or combination of substances intended as a pesticide, plant or crop protectant, or system maintenance compound applied with irrigation water.

Fertigation means the application of any commercial fertilizer, nutrient, soil amendment, or reclaimed water with irrigation water intended for plant or soil biota growth and development or for soil conditioning or reclamation. No distinction is made between organic and inorganic sources, so the definition is inclusive of both - this includes materials like compost tea.

Monitoring of the Application

For a chemigation application, on-site monitoring of the application apparatus must occur at least every four hours while it is in use, unless the label requires, or circumstances compel, more frequent monitoring. The fertigation rule requires the application system to be visually inspected at least once each day it is used. However, constant monitoring must occur whenever a sensitive area is at risk. Since the application system includes the injection apparatus and the irrigation system, the operation of the entire system must be assessed.

Applicator Responsibility and Application Requirements

All chemigation systems, from the homeowner using a hose end sprayer applicator to a commercial producer using a micro-irrigation system, present the potential to contaminate water supplies in the absence of adequate safeguards or proper operation. State legislation requires the proper installation, appropriate operation, and adequate maintenance of safety devices and the application apparatus. The irrigation system and injection equipment are deemed an application apparatus.

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The responsible applicator is wholly responsible for all the equipment used in an application, without regard to ownership. State pesticide rules may require the responsible applicator possess a current pesticide license and, in some cases, an appropriate endorsement. When applying a pesticide authorized for chemigation, the applicator must comply with all the chemigation provisions on the label. Conditions of use (i.e., wind speed, temperature, setbacks or buffers, drift prevention, and temperature inversions) apply to chemigation as to any other application method. The pesticide label is a legal document that requires the user to read and understand label provisions, and to comply with all the conditions of use.

With few exceptions, all chemigation and fertigation systems have the potential to contaminate the irrigation water supply. Backflow and safety devices must be properly installed, adequately maintained, and appropriately operated. Before conducting a chemigation or fertigation application, the irrigation system and injection devices must be evaluated to assess equipment integrity and operational performance. System leaks or malfunctioning sprinklers or emitters contribute to poor distribution uniformity and may result in crop damage, illegal pesticide residues, surface runoff, or deep percolation of a chemical. For these reasons, it is essential that the irrigation system be evaluated prior to each and every chemical/fertilizer application.

Most newer chemigation and fertigation injection systems incorporate proportional rate injection systems. A flow meter regulates a variable speed drive injection pump. In the past, variation in water flow rate resulted in very poor application uniformity of the injected product. To compensate,

Chemigation and Fertigation Technical Assistance Program

The Chemigation and Fertigation Technical Assistance Program is a part of Compliance Services, one of three branches within the Pesticide Management Division of the Washington State Department of Agriculture (WSDA). The goal of this program is to advise operators of chemigation and fertigation systems in order to safeguard human health, protect waters from contamination, and obtain voluntary applicator compliance with relevant federal and state legislation.

The ability of growers to continue using chemigation and fertigation in Washington State will depend principally on the legal application of these practices. These practices are increasingly scrutinized by the public with regard to public health and environmental impacts. Adequate system maintenance, system monitoring, and operator diligence are essential for the continuation of these management practices. By following existing safeguards and voluntarily adopting stewardship practices, growers will be able to continue to use these effective practices.

Additional Information

Washington State Chemigation Rule (WAC 16-202-1001).

Washington State Fertigation Rule (WAC 16-202-2002).

Other related Washington State Rules and Regulations.

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Mobile Livestock Processing Units Rolls into Northeast Washington

The opportunity to direct market locally raised beef just became easier for ranchers in Northeastern Washington. Unveiled in October and immediately put to use, a mobile livestock processing is quickly gaining interest from local cattle producers.

"Traditionally, ranchers in this area have sold their beef as fall calves to feedlots and growers in other regions," said Terry Swagerty, the Small Farms Program Director for WSU Extension in Stevens County. "With the introduction of this unit into our community, small scale ranchers can now access the infrastructure necessary to add value to their products and sell the finished product to local consumers."

The processing unit, a USDA certified slaughtering facility, was initiated as a community project. Building

on the success of the mobile poultry processing unit already in place in the region, WSU Stevens County Extension submitted a successful

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USDA Rural Development grant to plan and initiate the process required for such a unit. Grassroots interest grew as fast as grass fed beef and a community coalition quickly formed.

Local government in both Stevens and Ferry Counties took an interest and helped sponsor the project. In addition, the Community Agricultural Development Center (CADC), a non-profit organization created to develop markets and marketing strategies for local producers, took a lead role in the administration of the project.

The CADC currently controls the mobile processing unit and contracts with a private company to manage the day to day activities of the operation. Due to a shortage of USDA inspectors in the region, the mobile processing unit can operate at no more than two sites within a 25 mile radius. The rural nature of NE Washington makes it difficult to operate within those parameters, so the most economically sound strategy has been to keep the unit stationary (currently located at Smoky Ridge Meats, a cut and wrap shop). While it may seem contradictory to keep a mobile unit stationary, the unit is enjoying incredible success. "Right now a rancher can have an animal slaughtered, processed, and packaged, all in one trip. In turn, growers can take their finished product, whether beef or another meat, and directly market it to restaurants or at farmers' markets," adds Swagerty.

The unit has only operated for two months, so its role in the region continues to evolve. Swagerty believes the unit's continued success will rely heavily upon the public, private, and non-profit partners who have joined together to create and implement the project. Luckily for those who are now enjoying the use of the unit, the mobile livestock processing unit found strong community support from the beginning. Swagerty asserts, "So far everyone is real happy with how the processing unit is operating. We would like to get the unit more mobile, but right now we are making the necessary adjustments to allow this valuable community resource to continue having a positive impact on our ranchers, our local economy, and our local system of food."

To learn more about the mobile processing unit, contact Terry Swagerty at 509-684-2588, WSU Stevens County Extension.

Drip Irrigation For Vegetable Production

George H. Clough, Oregon State University, Hermiston Agricultural Research and Extension Center

Drip irrigation frequently applies water in small flow rates directly to the root zone. This allows precise control of soil moisture and nutrient levels. In a well-managed system, the volume of water applied approaches the consumptive use by plants. By keeping the soil water in the root zone close to field capacity, plants are never under water stress caused by over or under-irrigation. The roots can be kept at the optimum level of air and water balance.

Drip irrigation is an extremely efficient method of applying both water and fertilizer to vegetable crops and has an application efficiency in the 90-95% range compared to 75% for sprinkler irrigation and 60% for furrow. Research shows drip irrigation potentially provides up to a 50% savings in water application. In addition, fertilizers can be applied directly to the root zone through the drip system, improving fertilizer efficiency and reducing the potential for groundwater pollution. Soil fumigants, injected through the drip irrigation system before planting crops, controls diseases, weeds, and nematodes in the wetted area.

Other advantages associated with drip irrigation include:

1) Smaller water system components may be used since drip irrigation requires less water than other irrigation methods.

2) Lower pressure, lower flow rates, and reduced volumes require less energy for pumping.

3) A smaller water supply may be used, or larger areas may be irrigated with a limited water supply.

4) Disease may be reduced because foliage remains dry.

5) Labor and operating cost are generally less.

6) Field operations, such as cultivation, spraying, and harvesting can continue during irrigation because the row middles remain dry; this also improves weed control.

7) Watering can be done on varied terrains and in varied soil conditions.

8) Soil erosion and nutrient leaching can be reduced.

Disadvantages associated with drip irrigation include higher initial costs and increased management requirements. Additionally, frost protection provided by sprinkler systems cannot be achieved with drip irrigation.

Systems Design

A properly designed drip system requires thorough planning. The system must satisfy crop needs while fitting with the field and cultural operations required to grow and harvest the crop. The basic drip

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system consists of the delivery system, filters, pressure regulators, injectors for chemical application (chemigation) or fertilizer application (fertigation), and safety devices for backflow prevention.

The pump is the first component of the delivery system. The type of pump used depends on the quantity of water required, the pressure needed, water source, and location. Other common components include pressure relief valves, air vents, and check valves. Mainlines composed of buried plastic or PVC, or above-ground aluminum pipe, deliver water to the fields, where field control valves regulate water pressure. Submains transport water to laterals or drip lines which supply water to the crop. Rigid PVC, flexible PVC layflat, and polyethylene pipe are commonly used for submains. Layflat and polyethylene are used when not trenching, although layflat is probably more common. Feeder tubes or plastic fittings connect the submain to the laterals. Laterals slowly "drip" water to the plant root zone through very small emitter holes every 8 to 36 inches. Most drip tapes emit water at about 25 gallons per 100 feet per hour at about 12 psi. The drip line may be placed on the surface, or buried several inches deep to reduce rodent and insect damage.

Filters are the single most important component of a drip irrigation system. Filter selection depends upon the type and amounts of contaminants in the water, the maximum amount of water needed, and the desired quality of the water. A complete water analysis will reveal the amount and type of precipitates or other contaminants present, in addition to chemical properties which may cause problems with fertilizers or other chemicals to be injected.

Water may come from wells, ponds, lakes, municipal lines, or pits. For well or municipal water, a screen filter or disc filter can normally be used. Disc filters operate with a series of discs stacked vertically to separate out small particles. A centrifugal separator removes particulates, such as casing scale, sand, silt and other fine particles in pumped well water. Centrifugal separators do not remove algae, bacteria, or other aquatic life. Sand media filters are an absolute necessity to remove these particulates from surface water and other sources.

Sand media filters are closed canisters with a sand media bed. The sand particles provide a three dimensional surface which removes algae, slime, fine suspended solids, and other fine particulates. The tanks are installed in pairs and can be individually backflushed to clean themselves. Tanks range from 14 inches (enough for two acres) to 48 inches in diameter, depending on the size of the system.

Water management

Irrigation scheduling means determining when to irrigate and how much water to apply. Both depend on the desired soil moisture, the crop water requirement, the water supply in the root zone, and the water-holding characteristics of the soil.

Irrigation should be sufficient to meet the crop water requirement. Water loss results from evaporation from the soil (E) and from transpiration (T) by plants. The combination is called evapotranspiration (ET). Additional water may be lost by deep percolation beyond the crop roots if excess water is applied. If the soil moisture is kept fairly constant and percolation losses are minimized, the crop water requirement will equal ET.

Environmental factors, primarily solar radiation, air temperature, relative humidity, and wind, determine the evapotranspiration rate. Reference evapotranspiration (Eo), calculated from the these factors, estimates ET from a well-watered, uniform height, actively growing crop.

Pan evaporation (Epan), a more common technique used to estimate relative evaporative demand, measures the daily loss of water from a standardized open, water-filled pan. Although it varies somewhat between climates, Epan usually averages about 20-25% higher than ETo.

While Epan and Eo values provide an estimate of the relative evaporative demand, the crop water requirement

Drip irrigation pattern of buried tape with emitter set 18" apart in a raised bed, 4 hours after initiating irrigation (left) and 8 hours after (right). Vegetables are transplanted into the field after irrigation is set.

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is mostly a function of crop growth stage. Crop coefficients (Kc) are used to adjust either Eo or Epan for crop canopy development and maturity. While readily available for most vegetable crops, Kc values are specific to either Eo or Epan and must be applied accordingly. (See Crop Evapotranspiration: Guidelines for Computing Crop Water Requirements, FAO Irrigation and Drainage Paper 56.)

Alternatively, growers may develop their own Kc values based on estimating the percentage of soil surface covered by foliage. This ties the coefficient directly to the field configuration and plant vigor of a grower's crop. Simply measure the average plant width, and divide by the bed width. This method works well with most vegetable crops, but may underestimate the canopy development for staked or trellised crops.

The estimate of the crop water requirement is:

(Eo x Kc) - ER = D or

[(Epan x Kc) x 0.8] - ER = D

where Epan, Eo, and ER (effective rainfall) are expressed as cumulative depth (inches) since the last irrigation, and D is the depth of water to be applied. When using Epan, an additional factor (0.8) must be used to compensate for the difference between Epan and Eo:

Tensiometers or moisture blocks may be used to measure soil moisture directly. Generally, irrigation is applied whenever these devices indicate that the available soil moisture has dropped to about 70-80% of field capacity. Tensiometer readings at 20% depletion are approximately 20-25 centibars (cb) for sandy soils and 25-35 cb in loam and clay-loam soils. For more detailed information on these or other similar devices, contact your local county extension office.

Fertigation

One of the advantages of drip irrigation is the ability to apply nutrients in small quantities at the times appropriate to match the crop need throughout the growing season. Plant growth follows a sigmoid curve; dry matter accumulation starts low, proceeds at a slow rate for two or three weeks following emergence, then becomes quite rapid, followed by a leveling off as the crop matures. Growers need to understand the growth and development rate of their particular crop, and fertilize accordingly. Generally, this entails applying small amounts early in the season and increasing the amount as the crop growth rate and demand increases. Once the crop reaches maturity, nutrient application should level off, or depending on the crop, decrease slightly, or even cease.

Although most nutrients can be injected through the drip system, the most commonly applied are nitrogen and potassium. Crop needs for these are high, and fertigation provides the means to supply the N and K requirements throughout the growing season. The leaching potential for these nutrients makes split applications attractive for improving application efficiency. In addition, N or K injection cause few precipitation and emitter clogging problems.

In general, preplant fertilizer should supply 15-40% of crops' N and K requirement and all of the phosphorus, calcium, magnesium, and minor elements. Fertilization rates should be based on a combination of soil test and grower experience. Tissue analysis throughout the season can be used to adjust the fertigation program, monitor for nutrient deficiencies, and provide data to adjust the program for the following season. The basic nutrient requirements for vegetable production are listed in production guides available from the OSU Extension Service.

All nutrients applied through the drip system must be soluble. To reduce the potential for emitter clogging, all fertilizers and chemicals should be injected upstream of the main filters. Chemicals can be introduced into a drip system through pumps, venturis, pressure differential tanks, bladder tanks, and gravity feed.

The system should be brought up to operating pressure before injection starts. After completion of fertilization, the system should be operated for a period of time sufficient to flush the fertilizer out of the drip tubes and into the soil. This emphasizes the importance of correct system design since fertigation and the flush must be achieved in a time period which does not overwater the crop.

State law requires backflow prevention for chemigation or fertigation. A backflow prevention assembly consists of a vacuum relief valve, a low-pressure drain, and a check valve, located between the pump and the injection site, and in the order listed. When the injected chemicals are listed as toxic or poison, two of these assemblies may be required. The injection line should have a check valve to prevent backflow of water into the chemical tank, and the injection system should be interlocked with the irrigation system such that chemicals cannot be injected unless the irrigation system is operating.

Maintenance

Both screen and sand filters should be checked regularly, and cleaned as needed. A sand filter should be backflushed when the pressure differential between the inlet and outlet sides exceeds 5 psi. Control systems which sense this difference and automatically backflush the filters are available.

Bacteria, algae, and slime can plug drip line emitters. This can be prevented by regular injection of chlorine or several commercially available compounds which prevent the growth of these organisms. Chlorinate the system after every fertigation, and once a month with a 10 to 50 ppm chlorine

Continued on next page

solution; the amount of chlorine to be injected should produce at least 3-5 ppm free chlorine at the end of the drip line farthest from point of injection. Acidification of the water to reduce pH may be necessary to prevent emitter plugging by chemical precipitation of calcium and other compounds.

Periodic flushing of the main line, submain, and drip lines is a good practice (and a must when the system is first installed). Drain/flush valves can be installed at the end of the laterals to automatically flush the lines each time the system is pressurized.

Summary

A properly designed, installed, and managed drip irrigation system can increase crop yield, produce higher crop quality, reduce water and energy consumption, decrease fertilizer and chemical usage, reduce leaching and runoff, produce fewer weeds, reduce soil compaction, and maintain drier furrows.

Given the extremely competitive nature of the fresh vegetable and fruit industry and the market demand for high quality, producers who fail to meet high standards will eventually be driven out of the marketplace. The grower who cannot obtain consistent high yields while also maintaining good quality will fail to survive. Changing production practices and keeping up with the latest technology is the key to remaining viable in a competitive industry.

Agricultural Plastics Recycling Program Serves as National Model

Lisa Friend, RE Sources

Last year, the Whatcom County Solid Waste Division initiated an agricultural plastics recycling project with the goal of developing a local system for collecting and recycling 29 tons of plastic. RE Sources, a non-profit environmental education organization based in Bellingham, coordinates the project. The project recycles: agricultural films, plastic baling twine, the white wrap around hay bales, rigid plastics (such as buckets, barrels, and pesticide containers), and the huge polyethylene bags ("super sacks") that often hold grain for animal feed. After only one year in operation, the project exceeded its goal by recycling nearly 40 tons of farm and greenhouse plastic, and is inspiring similar programs from British Columbia to Virginia.

How it Works

To meet its project goals, RE Sources organized a meeting of farmers and recyclers to determine their needs. They worked with nine recyclers and a variety of farmers and farm groups to promote recycling initiatives by local businesses. RE Sources also helped smaller Whatcom County businesses, such as Del's Farm Supply, Elenbaas, and Specified Fittings, begin or expand their recycling programs. Many items can be recycled for free, though some businesses charge for fumigation film and collection services. This cooperative effort made a significant difference in keeping agricultural plastics out of the garbage once farmers and businesses realized plastics could be recycled into useful materials rather than trucked to eastern Washington and buried in a landfill. Not only can burning plastics cause severe health hazards, but it is illegal in Washington State and can bring fines up to $14,000.

Baling Twine

Soon after the program became operative, RE Sources began to receive calls and e-mails from other communities hoping to establish their own recycling programs. The most common question concerned disposal of nursery containers. Working in cooperation with the Whatcom County WSU Master Gardener program and its volunteers, RE Sources successfully recycled three tons of pots and flats at the spring Master Gardeners' Plant Sale. That experience helped Island County design a similar program and RE Sources currently corresponds with recyclers in Missouri and Virginia to help them create or refine programs of their own.

Recycling Agricultural Plastics

Farmers in Whatcom County can either deliver their clean, sorted plastics to a drop-off facility or request monthly pick-up from the local recycling provider. Pick-up on the farm is not free, but the costs are lower than garbage costs. For recycling purposes, agricultural plastics are divided into two general categories, film/twine and rigid. These materials must be kept separate for recycling:

Film/Twine

- Mulch film (any color)
- Drip irrigation tape
- Row covers
- Tunnel film
- Box liners
- Greenhouse film
- Peat moss, potting mix, & manure bags
- Hay bale wraps
- "Super sacks"
- Plastic twine (bag separately)
- Silage bags
- Bunker covers

Rigid Plastics

- Buckets
- Barrels/drums
- Plastic hangers
- Irrigation pipe
- Other molded plastics

Continued on next page

To recycle pesticide containers, contact your local Extension office for the schedule in your area or visit the Northwest Ag Plastics, Inc. website.

Tips for Recycling

Keep like items together and remember film/twine and rigid plastics are recycled separately. Roll drip irrigation tape and tie with drip tape only. Mulch film, tunnel film, peat moss bags, and similar agricultural plastics should be rolled and tied with a piece of the same type of product that's in the roll (do not use twine or wire). Plastic twine should be stored loose in a clean "super sack" or large plastic bag. Keep materials as dry as possible since moisture adds weight and increases the cost of recycling. Keep materials as clean as possible. Shake plastics to remove contaminants, such as dirt, haylage, and water. Overly contaminated material might be rejected at the collection site or could raise the recycling costs. Keep stored used plastics out of the sunlight since this may breakdown the material.

The Fate of Recycled Plastic

In Whatcom County, most collected plastics are made into bales, loaded on a truck, and shipped to Oregon. There, nursery pots are chipped and then melted into plastic pellets. Bags and mulch film are "pelletized" at another location. Twine is ground into a fine confetti and baled for shipping. Once processed, the plastic confetti or pellets can be mixed with compatible "virgin" materials to create new products with recycled content such as:

Processed Plastic Pellets

Collecting Large Plastic Bags

- black plastic garbage bags
- plastic pilings for piers and bridges
- plastic posts for signs and highway guard rails
- automotive components
- wall-covering
- flooring
- pallets
- tool handles

Future of the Program

Because Whatcom County has successfully met its agricultural plastics recycling goals through this program, local Solid Waste funding will be used next year for different projects. By providing the initial funding, Whatcom County Solid Waste showed a commitment to cutting-edge recycling programs. Funding for continuing the agricultural plastics recycling program will come from the Northwest Clean Air Agency and Natural Resources Conservation Service (NRCS). RE Sources will continue to support local farmers and recyclers in Whatcom County and the program will expand into Clallam, Island, Jefferson, San Juan, Skagit and Snohomish counties. The program will be highlighted in a presentation at a national plastics recycling conference in Dallas.

For More Information

RE Sources offers education to the public on a variety of local environmental issues, provides opportunities for active citizen involvement, and operates The RE Store, which sells used but usable building materials. For information about recycling agricultural plastics, contact RE Sources at 360-733-8307, 1-800-760-8434, or 1155 N. State St., #623, Bellingham, WA, 98225.

Northwest Clean Air Agency has provided programs and services for over 35 years in Island, Skagit and Whatcom counties with the goal of preserving clean air for future generations. For more information, call 1-800-622-4627.

Northwest Ag Plastics, Inc. recycles agricultural and other plastics, including rinsed plastic pesticide containers. Based in Moxee, Washington, 509-965-6809.

Agri-Plas, Inc specializes in recycling agricultural plastics. Based in Brooks, Oregon, 503-390-2381.

Events

Vegetable Gardening Symposium

A one day class featuring experts Nick Andrews, Carol Miles, Dr. Paul Jepson and Eleanor O'Brien, sharing variety selections, organic practices and pest control. Carol Miles will speak on New Vegetable Crop Ideas for Summer and Winter Production; Nick Andrews will speak about Soil Testing and Fertility Plans; Paul Jebson will discuss Conserving Biological Diversity on the Farm Through Habitat Management (Insectary Plantings) and Pest Control Using Organic Methods; and Eleanor O'Brien will explore Favorite Vegetable Varieties.

Book and seeds will be available for sale. Pre-registration is required and the cost is $40. The Symposium will be held at Clackamas Community College on Saturday, January 20th, from 8:00 a.m. to 4:00 p.m., in the Gregory Forum. For information and registration flyer, contact Elizabeth at 503-657-6958 ext. 2389 or email Loretta Mills.

Producing Organic Vegetable Seed

The Organic Seed Alliance will host two Organic Seed Winter Workshops as part of their WSARE-funded, farmer-led education project, "Producing Organic Vegetable Seed". They hosted twelve Organic Seed Field Days on organic seed farms in Washington, Oregon, and Idaho during 2005 and 2006. The two-day workshops will follow-up on the field days with an overview of field day activities and presentation of the new OSA Organic Seed Production Manuals along with additional workshop sessions developed in response to grower feedback. Topics include crop variety improvement, seed economics, marketing, technical aspects of seed production, disease management, record keeping, and seed harvesting and cleaning. These workshops are a chance to meet other growers, seed industry professionals, and university researchers while expanding seed growing skills.

January 8-9, 2007. Twin Falls, ID, Agenda TBA. Please check www.seedalliance.org for updates.

February 8-9, 2007. Mount Vernon, Washington. The first day of workshop presentations will include a summary of the 2005-2006 Organic Seed Field Days, presentation of the new OSA Organic Spinach Seed Production Manual, introduction to organic seed production, new research on organic seed treatments, and factors that favor transmission of seed-borne disease. The second day of the workshop will be an intensive class on the Fundamentals of Plant Variety Improvement taught by OSA Director of Research, Dr. John Navazio.

Please contact OSA to register. Advanced registration and payment required. Cost is $40 for two days and includes lunch, snacks and beverages. Registration is limited. Please send a check and your contact information to: Organic Seed Alliance, PO Box 772, Port Townsend, WA 98368.

Building Soils for Better Crops

This workshop will take place on February 22 at Big Bend Community College in Moses Lake, Washington. For information contact Andy McGuire at 509-754-2011 x 413, or Ron Hull, Grant Conservation District at 509-754-2463 ext. 5, or look for flyer on the Extension website.

10th North American Agroforestry Conference

This conference, whose theme is Economic Opportunities and Environmental Benefits from Agroforestry, will be held June 10-13, 2007, at Université Laval in Québec City. The intent of the conference is to stimulate the development and the adoption of sustainable rural land management practices centered on the integration of trees into the landscape. Riparian buffers with trees, windbreaks and shelterbelts, silvopastoral systems, intercropping systems and forest farming systems will be the main practices discussed during the conference. Target participants belong to all spheres of the advisory, teaching and research sectors, whether with private companies, advisory groups, municipalities, government departments, educational institutions or research centres specializing in the fields of agriculture, forestry, environment and land-use planning.

Agriculture at the Metropolitan Edge: New Ruralism and other Strategies for Sustainable Development

ATTRA. On April 5-6, 2007, The New Ruralism Symposium, a project of the Agriculture at the Metropolitan Edge Program (AME), will bring together researchers, practitioners, producers and policy makers involved in bridging sustainable agriculture and smart growth. The symposium will explore systems- and placed-based issues affecting the urban-rural interface.

If you have questions about the symposium, please contact Sibella Kraus, AME Director.

Harvesting Change - 2007 Washington State Farmers Market Association Conference

This conference will take place in Ellensburg, Washington on January 20-21.

Continued on next page

Harvesting Clean Energy Conference

This is the Northwest's premiere gathering for agriculture and energy interests working to advance new opportunities for agriculture producers and rural communities in clean energy production. Clean energy offers real solutions, financial and practical, for farmers, ranchers, rural utilities and towns, tribes, and the regional economy. January 28-30, Boise, ID.

2nd National Conference on Facilitating Sustainable Agriculture Education

This conference will be held at Cornell University in Ithaca, New York on July 11-14. Join faculty, staff, undergraduate and graduate students, administrators, extension educators, farmers and food system practitioners who are active or interested in sustainable agriculture education at institutions of post-secondary learning. Conference goals include promoting and supporting sustainable agriculture education, sharing curricula, teaching experiences & hands-on learning approaches, exchanging educational approaches & materials, and learning how to start & sustain sustainable agriculture education programs. For more information, please contact Kathi Colen Peck, Conference Coordinator.

Knotweed Symposium

The Western Society of Weed Science will sponsor an Invasive Knotweed Symposium at the WSWS Annual Meeting in Portland, Oregon on March 15-16, 2007. International experts John Bailey from the United Kingdom and Petr Pysek from the Czech Republic will be keynote speakers, discussing genetics and ecology of invasive knotweeds. Other experts will discuss biology, physiology, ecological impacts, and management of Japanese knotweed, giant knotweed, Bohemian knotweed, and Himalayan knotweed, a group of species that have become so problematic throughout the world. A complete agenda will be announced in late January, 2007.

The registration fee is $50 if you also attend the 2007 WSWS annual meeting and $75 if only attending the Knotweed Symposium. Registration includes a one-year, complementary membership to the WSWS. Student discounts are available. Go to the WSWS website. Online pre-registration is available until February 15, 2007.

5th International Organic Tree Fruit Research Symposium

The Conference will cover current soil, ground cover, tree, pest and horticulture management and other advances in organic tree fruit production with an emphasis will be on practical research, on-farm advances and realistic marketing strategies. March 4-7, 2007 East Lansing, MI. For details, email RPMNews@msu.edu or call 517-353-9425.

WSU Creamery Cheese Making Classes

Registration is now open for the WSU Creamery's three day Basic-Plus Cheese Making Class in Lynden, WA scheduled for Feb. 20-22. The Creamery's 22nd Annual Cheese Making Short Course will be held March 5-8 in Pullman and a Pasteurization Workshop will also be held April 18-19 in Pullman.

Rural Roots Workshops

Rural Roots, in partnership with University of Idaho Extension, USDA Risk Management Agency, and the Western Center for Risk Management Education, will sponsor three workshops in Spring 2007:

Everything You Ever Wanted to Know About Liability, But Were Afraid to Ask, Caldwell, Albertson College, January 12, 2007 Moscow, University of Idaho Commons, February 9, 2007

Are Farm Cooperatives For You? A Workshop on the Ins and Outs of Developing a Cooperative, Caldwell, Albertson College, January 13th.

Taking Sales to the Next Level: A Workshop to Increase Your Marketing Skills, Pocatello, Location TBA, March 24th Post Falls, UI Post Falls Research & Technology Park, March 30th.

OSU Small Farms and Farm Direct Marketing Conference

Marion Nestle will be the keynote speaker at the 2007 OSU Small Farms and Farm Direct Marketing Conference February 17th at the LaSells Stewart Center at OSU. There will be nine concurrent sessions on marketing, production and policy. Contact Chrissy Lucas at 541-766-3556 for information.

Water Law & Public Policy: Water Rights – Water Wrongs

Friday, January 12, at Port Townsend 9-5 (7.5 realtor clock hours CEU). This 2007 workshop will give an overview of the fundamental information any professional needs to work with local water issues. How do we assess claims? Where can we find information about existing water rights? What are the current developments in water law that apply to our watersheds? How are the regulatory agencies likely to respond?

An overview includes current water resource planning, including in stream flow, shorelines, critical area and salmon and groundwater management. The workshop will provide a basic overview of Washington Water Law 101 as well as a survey of recent court cases and legislation. Specific attention will be provided in an overview of local planning processes and decision making.

Continued on next page

Water law is incredibly fact dependent and complex. Trying to figure out what law is a combination of history, economics, politics, and policy. One is quickly confronted with a broad variety of competing interests, a broad variety of regulatory agencies and complexity. The issue in water law has always been—how do we manage this limited resource for maximum net social benefit.

For more information or to register contact: WSU Jefferson County Extension at 360-379-5610 ext 200.

Farm-to-Table Regional Trade Meetings: Connecting Agricultural Producers and Buyers

Interested in forming valuable trade relationships with local farmers, restaurants, retailers or institutions? Come, meet folks who have local agricultural products or to find buyers for what you produce. Explore the opportunities and challenges of forming direct connections that will bear fruit for years to come. Sponsored by the Cascade Harvest Coalition with paritial funding by WSDA. For additional information, contact Peggy Campbell at 425-357-6024.

Port Hadlock, Monday, January 29 from 1 - 4 p.m. WSU Jefferson County, Spruce Room, 201 West Patison, Port Hadlock. RSVP by Jan. 24 to (360) 379-5610, x200. Partnered with WSU Jefferson County Extension

Puyallup, Monday, February 12, 10 a.m.-1 p.m. WSU Allmendinger Center, 7612 Pioneer Way East, Puyallup. RSVP by Feb. 7 to klchristen@cahnrs.wsu.edu. Partnering with WSU Pierce County Extension.

Bremerton (Seabeck), Monday, February 26, 10 a.m. - 1 p.m. Seabeck Conference Center, 15395 Seabeck Hwy NW, Seabeck 98380. RSVP by Feb. 21 to klchristen@cahnrs.wsu.edu. Partnering with WSU Kitsap County Extension.

Everett, Monday, March 5, 1 - 4 p.m. WSU Snohomish County Extension, Cougar Auditorium, 600 128 St SE, Everett 98208. RSVP by Feb. 28 to klchristen@cahnrs.wsu.edu. Partnering with WSU Snohomish County Extension.

The Pesticide Stewardship Alliance (TPSA) 7th annual Working Conference

Set for February 25-28, 2007, in Reno, Nevada, conference details/ registration information are available on-line. Conference themes will cover:

Collection and disposal of obsolete pesticides in Europe, Mexico and the U.S. What are the needs and what is the future of these programs?

Recycling of pesticide containers and other agricultural plastics. Strategies for collecting and marketing the recyclables and disposing of the others.

Reducing agrochemical movement in air and water. Status and implication of regulations. What's happening to mitigate spray drift?

Reducing potentially harmful exposure to pesticides through improvements in packaging, transportation, storage, and containment. Pesticide poisoning—What's happening in the U.S. and why?

New approaches to communicating about stewardship.

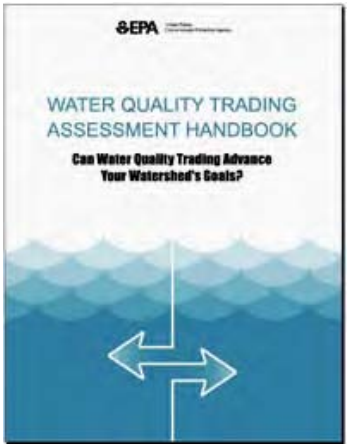
TPSA
The Pesticide Stewardship Alliance

TPSA is a non-profit organization that brings together technical experts, researchers, pesticide applicators, regulators, educators, crop protection industry, hazardous waste industry, ag plastic recyclers, the environmental and public health constituency and others to promote and support improvement to pesticide stewardship in the United States and internationally.

Announcements

Pollution Credit Programs Offer Farmers Compensation for Conservation

ATTRA. Farmers Union launched a Carbon Credit Program to provide financial incentives for farmers to adopt farming practices that promote environmental stewardship. The voluntary, private-sector carbon trading program at the Chicago Climate Exchange allows agriculture producers and landowners to earn money for cropping practices such as no-till, long-term grasslands, forestry and other practices. The Chicago Climate Exchange (CCX) approved Farmers Union to enroll producer acreages of carbon into blocks of credits traded on the CCX.



Meanwhile, USDA and EPA introduced a water quality, market-based credit trading agreement to encourage farmers and ranchers to improve water quality. While reducing pollution through conservation practices, farmers and ranchers can earn credits they can trade with industrial or municipal facilities required by the Clean Water Act and other laws to reduce the amounts of pollution in wastewater. The agreement features a pilot project within the Chesapeake Bay basin to showcase the effectiveness of environmental markets.

Tidbits

Farming for Food Quality

David Granatstein, WSU

Does the way you farm affect the quality of the food you produce in terms of nutrition and health? Consumers, growers, and health professionals increasingly ask this question in light of widespread health concerns, such as cancer, obesity, and diabetes. Since the 1970s, organically grown foods have been purported to contain higher levels of nutrients,

vitamins, and other health promoting substances, even though the scant scientific literature reports mixed results. To better understand whether particular farming practices or systems, including organic, produce measurable changes in food composition, WSU and OSU organized the Farming for Food Quality Symposium on November 10 in conjunction with the Washington Tilth Producers annual conference. The event drew 200 people from around the Pacific Northwest to hear from regional researchers, as well as the lead scientist of the QualityLowInputFood (QLIF) program in Europe.

Dr. Chuck Benbrook, from the Organic Center, discussed the Center's interests and efforts on the topic. Center staff developing a Food Quality Index to rate foods. Dr. Benbrook discussed how high nitrogen fertilizer may increase plant cell size and thus dilute nutrients. The stretched cell walls may be more susceptible to fungal and bacterial pathogens. Understanding these mechanisms is crucial and The Organic Center funds research on this topic.

Dr. Carlo Leifert, QLIF scientist, explained the QLIF program, the influences of dairy production systems on food quality, and the influence of crop production practices on phytonutrients. QLIF research found that cows fed silage produced milk containing more saturated fat than milk from cows fed a non-silage forage diet. Increased grazing generally led to improvements in the nutritional profile of the milk. QLIF research also found an interesting connection between mineral fertilizer use and increased mildew and increased mycotoxin contamination on wheat.

Other speakers from WSU included Dr. Steve Jones who spoke on his efforts to breed wheat for organic systems and enhance nutrient density in grain; Dr. Preston Andrews who presented on his team's studies of apples and strawberries under different management systems and the effects on phytochemicals; and Dr. Jan Busboom who talked about management influences on meat quality.

The Symposium video-recorded all presentations which will be put on the CSANR web site by early 2007. Currently, several of the Symposium's PowerPoint presentations are on the Organic Center web site. The symposium was organized by Carol Miles (WSU), Alex Stone (OSU) and David Granatstein (WSU) with funding support from the CSANR BIOAg program, OSU, The Organic Center, Western SARE, and CF Fresh.

Native Dye Plants Studied as Alternative Crop

ATTRA. A renaissance in natural textiles and fiber art has created a demand for traditional native dye plants that New Mexico State University researchers believe might be met by small-scale growers. Dye plants were historically collected from the wild, but the researchers, working under a USDA SARE grant, hope to cultivate wild species of dye plants to create new crops. Growers participating in the study tried cultivation of cota, Hopi dye sunflower, tansy and weld, plus four other species of their own choice for the particular growing conditions of their area. They also cultivate woad, madder, coreopsis, cosmos, yellow yarrow, holly hocks, black-eyed Susans, safflower, marigold, alkanet, and Mexican sunflower. Establishing the plant in a cultivated environment is just one aspect of the study. The second part of the study is to determine the marketability of the dye material to the local natural textile enterprises in New Mexico.

AGR-Lite Crop Insurance Expands to Ten Additional States

ATTRA. The Adjusted Gross Revenue-Lite (AGR-Lite) insurance plan expanded into the states of Arizona, Colorado, Kansas, Minnesota, Montana, Nevada, New Mexico, Utah, Wisconsin, and Wyoming. AGR-Lite will now be available in 28 states for the 2007 insurance year. "This insurance is a useful risk management tool, particularly for small diversified producers," said Agriculture Secretary Mike Johanns. "It is based on individual farm revenue, so producers are offered a great deal of flexibility in how they manage their farm or ranch operations." Most farm-raised crops, animals, and animal products are eligible for protection. The plan uses a producer's 5-year historical farm average revenue as a basis to provide a level of guaranteed revenue for the insurance period.

Few Research Dollars For Midsize Farms

Leopold Center. This report reviews projects funded by four USDA grant programs in 2001 and 2002 (the Rural Business Enterprise Grant program (RBEG), the National Research Initiative (NRI), the Initiative for Future Agriculture and Food Systems (IFAFS) and the Value-Added Producer

Continued on next page

Grant Program (VAPG)1. Employing the Center for Rural Affairs' "Small Farm Research Relevancy Assessment" instrument, only three percent of nearly 2,500 funded projects served small and medium sized and beginning farmers and ranchers. Only five percent of the combined funds for these four programs in 2001 and 2002 went to projects relevant to the needs of small and medium sized and beginning farmers and ranchers.

Despite the recommendations and challenges of the Small Farm Commission and the rhetorical commitment of USDA to smaller agricultural enterprises, we found that the vast amount of funded projects and program funds do not benefit small and medium sized and beginning farmers and ranchers and are not relevant to their needs. In fact, the data suggest these USDA programs funded numerous marketing and value-added initiatives meant to benefit large food distribution and food processing companies. The report also found that these USDA programs failed to invest in research that relates to the development of economic opportunities in the context and place that will keep families on the land and promote a new generation of agriculturalists. Read the 31 page report for details.

Wild Wheat Gene Boosts Nutrients

ATTRA. University of California, Davis, USDA, and University of Haifa researchers cloned a gene from wild wheat that increases the protein, zinc, and iron content in the grain. The cloned gene accelerates grain maturity and increases grain protein and micronutrient content by 10 to 15 percent in the wheat varieties studied. Research team leader Professor Jorge Dubcovsky was surprised to find that all cultivated pasta and bread wheat varieties analyzed so far have a nonfunctional copy of the gene, suggesting this gene was lost during the domestication of wheat. Dubcovsky leads a consortium of 20 public wheat-breeding programs known as the Wheat Coordinated Agricultural Project, which is rapidly introducing this gene and other valuable genes into U.S. wheat varieties using a rapid-breeding technique called marker assisted selection. The resulting varieties are not genetically modified organisms, which will likely speed their commercial adoption.

Resources

Tools for Assessing Urban Ecosystems & Street Tree Populations.

i-Tree software tools help users, regardless of community size or technical capacity identify, understand and manage urban tree populations. Better awareness of the benefits and services provided by the urban forest resource leads to increased attention to stewardship, appreciation of operations, and investment in maintenance. After two decades of development by the USDA Forest Service Research & Development and its collaborators, the applications included with i-Tree are now being made available to the public within a fully developed support framework.

Agricultural Marketing Resource Center Newsletter

The Fall 2006 newsletter is available in both pdf and html formats and highlights the positive alignment of U.S. travel trends with agritourism options of farmers. How many biodiesel plants are currently under construction? How many laying birds are there in the United States? Where can I find useful enterprise budgets for an operation?

Central Washington Round-Up Newsletter

This electronic newsletter is published by the Central Washington Animal Agriculture Team, comprised of Washington State University Extension educators in the fields of animal science, range management, agronomy, and entomology. Topics include: pregnant animal care, body condition and reproduction in beef cows, hay quality testing: what does it mean?, forage residual height in irrigated pastures, post-fire grazing considerations, western cow/calf management guide online, online pork production information, and an online horse resource.

Renewable Energy Opportunities on the Farm

ATTRA. Renewable energy represents an important option for agricultural producers. A 2006 publication introduces three renewable energy resources that can be attractive and economically feasible for the farm: solar, wind, and renewable fuels. While not a technical guide for designing or installing renewable energy systems, this publication provides overview information on wind, solar, and renewable fuel technologies, cost and savings, site planning, and financial incentives.

New USDA Tool Estimates Energy Use in Animal Housing

ATTRA. USDA has unveiled a Web-based energy awareness tool designed to help agricultural producers reduce energy costs related to animal housing. The "Energy Estimator for Animal Housing" evaluates the energy use and costs associated with heating, lighting and ventilating poultry, swine and dairy housing. This is the fourth energy estimator tool USDA has developed as part of its overall energy strategy to reduce the impacts of high energy costs and to help develop long-term solutions for producers. According to USDA, producers with animal feeding operations can save up to $250 million annually nationwide by regularly maintaining their ventilation and heating systems and using more energy-efficient

fixtures and equipment. An individual producer may realize up to 50 percent savings in energy use by maintaining ventilation and heating equipment regularly.

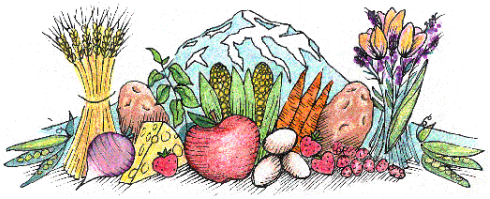
OSU Small Farms Newsletter

The Oregon State University Small Farms Program just released its first issue of Oregon Small Farm News, an online quarterly. The current issue includes:

- Top Ten Things I Learned about Buying a Small Farm
- Organic Fertilizer Calculator: A new planning tool
- Finding Market Information for Agricultural Products
- Winter's Coming Don't Get Stuck in the Mud!
- Is Agroforestry Appropriate for your Small Farm?
- Keep the Compost Cooking this Winter
- Selenium Fertilization of Forages

Cow Power

Central Vermont Public Service unveils "Cow Power" on their website. Be sure to check out "from poop to power"!



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