

Utah Forest News

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Box Elder County Tree Farmers Seek to Feed the World

Can you feed the world with food produced on marginal lands, where poor soil and temperature fluctuations often wreak havoc on ordinary crops?

Carol Petersen and her father, Dr. C. Reed Funk, believe they can. Petersen and Funk are founding members of Improving Perennial Plants for Food and Bioenergy (IPPFBE), a non-profit organization that seeks to breed several species of trees, grasses, forbs and shrubs to withstand harsh environmental conditions. According to its website, IPPFBE's mission is to "select and improve underutilized perennial plants for the production of food, timber and energy and the preservation and enhancement of soil for the benefit of all."

Carol Petersen's tree farm in Thatcher, Utah, is one of the organization's research farms. The farm occupies about 35 acres on the east-facing foothills of eastern Box Elder County. Petersen and her husband

Brian tend two large orchards, breeding primarily pistachios, almonds, and apricots, along with scattered

peach, apple, pear and hazelnut trees. The trees are being selected for cold-hardiness, drought tolerance and high fruit or nut production. "When you have seedling trees, you really like it when you have adverse conditions," Petersen said. "It makes your job easier; it really rates them well for you. We're always taking out the poor ones and replacing them."



Carol Petersen, Dr. C. Reed Funk and Tim Ford stand by a 13-year-old pistachio tree at Petersen's tree farm in Thatcher, Utah.

Petersen's plan to start a tree farm on the Thatcher property began after a renter gave up on farming traditional crops on the rocky land. "I thought, what can we do with a rocky

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field?” she said. “It’s a great field [with] lots and lots of rocks. But the trees don’t mind the rocks.” Brian Petersen’s family had farmed in the nearby valley for two generations, and his great-grandfather grew apples and cherries on the dry, rocky soils of Thatcher.

Carol Petersen’s father, 84-year-old former Rutgers University agronomist Dr. Reed Funk, traveled to Uzbekistan in 1999 and brought back pistachio seeds. According to Dr. Funk, pistachio “forests” occur naturally in Uzbekistan.

Funk, a Utah State University graduate, was instrumental in the development of the Rutgers turfgrass breeding program. The IPPFBE website lauds him as the most successful turfgrass breeder in the world. Funk turned his attention from turfgrass to trees in the late 1990s, and has played a fundamental role in developing IPPFBE and its research efforts.

Funk’s daughter Carol planted the Uzbekistani pistachios in the farm’s upper orchard, then waited nearly ten years for them to begin bearing nuts. Once the pistachios that survived the salty water, harsh winters and low soil fertility began to bear fruit, the tree breeders were faced with another challenge: producing a marketable pistachio.

“You want a pistachio to split on its own,” Petersen said. “We’ve got some really nice large nuts, but they

don’t split. We’ve got this little tiny one that does split. So there’s going to be some breeding work done to get the best traits.”

The almond trees on the farm originated from several different sources, and appear to be quite healthy.

Almonds are not native to North America, and these are planted about as far north as the species can be found. The ‘Utah’ variety of almond, which was bred to be cold-hardy and adapted to a northern Utah climate, is one of the primary varieties that the farm has planted in its lower, 20-acre orchard.

Tim Ford, IPPFBE’s President and Director of Plant Breeding, claims it as the most drought-tolerant tree that the organization works with, besides pistachio. “We think it could fill a huge niche in the foothill zone and marginal cropland and rangelands of the Intermountain West,” Ford said.

He described the area as “a pretty nondescript hillside” and said if current efforts to breed productive almonds, pistachios and apricots succeed, vast areas of the Intermountain West could be used for perennial food crops.

A few of the farm’s ‘Utah’ almond trees have hybridized with nearby peach trees as a result of open pollination. The almond-peach hybrids show remarkable vigor and bear peachlike fruits. The trees bear plentiful fruit, but, according to Ford, “It’s not a



This almond-peach hybrid bears peachlike fruits and shows exceptional hardiness. Almond-peach hybrids occur on the farm as a result of open pollination.

good peach, and it's not a good almond. But it's cold-hardy."

The apricot trees, most of which were given to the farm by the Rutgers apricot breeding program, have seen quite a bit of success. The trees in the upper orchard bear fruit nearly every year, and one particular tree rebounded from an early freeze to blossom again and produce fruit. According to Ford, Petersen's apricots are "to die for."

The Petersens recently received a federal grant, which helped with funding the installation of a drip irrigation system on the top ten acres of their 20-acre field. The Natural Resources Conservation Service (NRCS) provided the farm with a water filter and driplines as part of the Environmental Quality Incentives Program (EQIP). EQIP is a cost-share program that provides financial assistance to agricultural producers with the purpose of improving soil, water, plant and animal resources on agricultural land. "It's been amazing to have this drip system. Things have gone really well," Petersen said. She noted that the NRCS was easy to work with.

IPPFBE is currently working on other plant breeding projects at seven sites throughout northern Utah and southern Idaho. Other plants that the organization has begun breeding include bur and gambel oaks, Saskatoon serviceberries, black and Persian walnut

hybrids, hybrid chestnuts and Siberian pines for pine nuts and timber.

Ford is excited about the potential marketability of the Saskatoon serviceberries that were selected from among the best trees at the University of

Saskatchewan. "It's kind of a gold mine," he said. "We envision [serviceberries] as a possible cottage industry in the Intermountain West, or perhaps as edible landscapes for people. We want to promote edible landscapes [and] just get people to plant trees."

"Our objectives are to feed people and to harvest the extra carbon in the atmosphere. We view the extra carbon as an

asset: we just need to grow a trillion trees to capture it," Ford said. "I think it's very worthwhile."

by Rose Long, Extension Assistant



These young pistachio trees may grow for up to ten years before bearing fruit. "It's a long term process," Box Elder County tree breeder Carol Petersen said.

To learn more about IPPFBE and its projects, visit www.ippfbe.org.

For more information about the NRCS and EQIP, visit <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip>.

Cofiring Research Presented

Over the past two years, the Utah Biomass Resources Group (UBRG) has been working with Dr. Eric Eddings of the Institute for Clean and Secure Energy, and Dr. Stan Harding of Harding and Associates to increase understanding of the potential and the pitfalls of mixing wood with coal in coal-fired power plants. On August 23, Eddings and Harding presented the results of their research to the UBRG, summarized here.

The UBRG contracted N.S. Harding and Associates to do a thorough literature review of the state of the science of mixing wood with coal in industrial power plants. Harding presented his paper, "Biomass Cofiring in Utility Boilers," where he outlined the history of utilizing pulverized coal boilers for biomass cofiring, reviewed some of the details of the handling and mixing of the biomass with coal and listed the pros and cons of using raw wood vs. torrefied wood (wood that has been dried and partially turned into charcoal).

Harding outlined that renewable energy makes up approximately seven percent of our total electrical energy consumption in the U.S. Of that seven percent, biomass utilization makes up the majority of energy consumption, followed by hydroelectric, with small portions coming from wind, solar and geothermal sources.

Cofiring wood with coal utilizes wood that may currently be going to waste and can reduce emissions over burning straight coal. Cofiring requires low capital investments compared to building new power plants and is actually more thermally efficient than

pure wood-fired power plants. Wood is renewable and generally considered CO₂ neutral, although there is considerable controversy surrounding that fact. One of the challenges of using wood is that it is only ten percent as energy dense as coal, therefore a higher volume of wood is required to get the same heating value as coal.



Pictured are the pilot combustion reactors at the University of Utah's Center for Clean and Secure Energy. Treated pinon juniper wood chips were mixed with coal in five and ten percent ratios, with minimal change in output.

Harding presented the combined results of more than 150 cofiring demonstration tests at utility power companies from around the world, about a third of which were from the U.S. Of those tests done in the U.S., none were done in the West. Harding's analysis compared the ash content, heating value, emission outputs and other variables of wood chips, straw, cereal grains and orchard residues. He also talked about the challenges of quality control of the incoming wood chips to the power plant, relaying stories of concrete being hidden in the load to increase weight output, which fouls the mixing and delivery systems for days at a time. Further handling comparisons were drawn between various screening and blending equipment configurations and methods.

Storage of wood chips is a surprisingly tricky endeavor, requiring compacting to prevent bacterial activities that can quickly raise temperatures to the point of combustion from taking place. He relayed another story of a project in Canada that has been on hold for more than a year because of an explosion that occurred from the mishandling of the woody biomass during storage. Furthermore, woody biomass must be protected from the weather as it will absorb moisture and lead to fouling the feeding and combustion processes.

There are many benefits from using torrefied wood, but this process can increase costs significantly, making it unattractive under current market conditions. The report goes much deeper into the details of pulverized coal power production and how it is impacted by the addition of woody biomass, including in-depth analysis of the ash deposits and emissions produced.

The bottom line from Harding's perspective is cofiring can be done successfully if done carefully and with attention to the many pitfalls detailed in the report. The other bottom line deals more with the economic and regulatory environment. Currently in Europe, Canada and in some states, policy makers have passed regulations that require certain percentages of energy production to come from renewable sources. Those countries and states that have these regulatory mandates or incentives are turning to wood in a big way. Very large wood pellet mills that are exporting large

quantities of pellets to meet the demand have sprung up along the eastern coast of the United States, from Texas to North Carolina, Utah has not passed mandated standards, but instead has passed recommendations to use renewable energy.

Eddings, Associate Dean for Research in the College of Engineering at the University of Utah in Salt

Lake City, contracted with the UBRG to conduct cofiring tests, mixing pinion and juniper chips with coal in five and ten percent ratios, and monitoring the results. He mixed raw wood, torrefied wood and biochar with coal in the burn trials. The results showed that the addition of small amounts of wood chips, torrefied wood and biochar to the mix did very little to change the flaming characteristics or the outputs when compared to burning pure coal. This turns out to be a good thing, as power plant operators are most concerned about how the wood will change the outputs. Emissions and BTU outputs are just a few of the variables Eddings monitored. He also paid close attention to how the material was mixed and fed into the system.



Dr. Eddings' cofiring study used chipped pinion-juniper woody biomass harvested during the 2011 Biomass Field Days near Beaver, Utah.

Eddings directs the Industrial Combustion and Gasification Research Facility, located in an industrial warehouse complex on the south side of Salt Lake City. This 20,000 square foot facility is filled with scaled down reactors that are the same as those found in power plants across the West. These pilot facilities are equipped with monitoring devices that allow Eddings' team to closely inspect the inputs and

outputs from the combustion process. This process is designed to give the utility companies a reasonable approximation of the results they can expect when they modify the inputs to their industrial reactors. This can go a long way toward convincing them of the safety of the approach we are advocating.

The bottom line is that fossil fuels are still clearly much less expensive to use. Unless utility companies are given an incentive, such as a tax credit, to use renewable sources of energy or given a mandate, such as a regulation, they will have no motivation to produce bioenergy. Adding wood to the coal presents a wide variety of potential pitfalls, and the utility operators will have no reason to make their job harder than it already is.

However, when you consider the saved cost of fighting a wildfire that has been reduced in size

and/or intensity because of fuel reduction projects, it becomes a different economic model. We are currently paying an average of \$300 per acre to treat pinion juniper woodlands in Utah to make them less fire-prone. This is very expensive when you consider the ten million acres of PJ that stretch across the Utah landscape. If we don't treat at least a portion of these acres, they remain in an increasingly fire-prone status. The cost of fighting the wildfire can easily exceed \$600 per acre. From this perspective, woody biomass utilization begins to make a lot more sense.

by Darren McAvoy

These reports are available in full on the UBRG website, utahbiomassresources.org.

Forest Service Awards Grant to Central Utah Wood Energy Project

A grant administered by the USDA Forest Service provided financial assistance to a central Utah renewable energy project. Evergreen Clean Energy of Provo, Utah, was awarded a \$250,000 grant that will be used to support engineering and design for a renewable energy project at the Moroni Feed Company in Sanpete County. The Sanpete cogeneration project plans to utilize turkey waste and wood chips to create heat and power that will be sold to the grid and used in turkey growing and processing.

The "Woody Biomass Utilization Grant," which is administered by the Forest Service's Forest Products Laboratory, distributed over \$3.9 million to 20 small businesses, community groups, and tribal organizations throughout the country. The grant is designed to facilitate the use of low-value woody biomass to create bioenergy. Funding from the grant will allow grantees to help pay for engineering and design for bioenergy projects.



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Forestry Extension Introduces New Webinar Series

Mark your calendars for the upcoming webinar series produced by the Forestry Extension. The “Learn at Lunch” forestry webinar series brings the experts to you for live presentations about forestry topics.

The webinar series will occur on a monthly basis and will take on a regular schedule in 2013. Presentations are slated to take place from noon until 1 p.m.

“Learn at Lunch” will offer presentations relevant to arborists, urban foresters, rural forest landowners, environmental educators and the public. International Society of Arboriculture continuing education credits will be available.

Stay tuned to the Forestry Extension website and Facebook page for more information about accessing “Learn at Lunch.” See forestry.usu.edu and www.facebook.com/USUExtensionForestry.

2012 Webinars

Utah Canopy Cover Mapping - Turning Assessment into Action

Monday, October 22, noon until 1 p.m.

Speakers: Ian Hanou, Principal with Plan-it Geo and Christopher McGinty, Associate Director of the USU Remote Sensing/GIS Lab

Strategic Tree Planting - State and National Efforts to Maximize Tree Benefits

Tuesday, November 27, noon until 1 p.m.

Speakers: Randy Gordon, Program Manager with the Arbor Day Foundation and Meridith Perkins, Urban Forestry Coordinator with the Utah Division of Forestry, Fire & State Lands

For more information regarding any of the information presented in this newsletter, please call Darren McAvoy at Utah State University, 435-797-0560, write to him at 5230 Old Main Hill, Logan, UT 84322-5230, or email darren.mcavoy@usu.edu.

To get on our list for email delivery of this newsletter go to <http://forestry.usu.edu> and click on Join Our Mailing Lists. For back issues visit <http://forestry.usu.edu> and click on Publications and Utah Forest News.

The Utah State University Forestry Extension website, found at <http://forestry.usu.edu>, is an excellent source of technical forestry information for woodland owners.

State of Utah Division of Forestry, Fire & State Lands service foresters for your area can be contacted by calling 801-538-5555.

Ideas and written contributions to this newsletter are encouraged. Send your contributions or comments to the return address above or call 435-797-0560, or email darren.mcavoy@usu.edu.

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COOPERATIVE EXTENSION

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COMING EVENTS

Society of American Foresters National Convention: October 24-28, 2012, Spokane, Washington.

See www.safnet.org/natcon12 for more information. USU's Department of Wildland Resources will host an alumni and friends reception at the Red Lion Hotel Manito room Thursday evening from 6:30 to 8:30 p.m.

Restoring the West Conference 2012: Balancing Energy Development and Biodiversity: October 30 & 31, 2012, Utah State University. See restoringthewest.org for more information.

Northern Utah Arborist School: November 5-8, 2012, Utah Botanical Center, Kaysville, Utah.
See utahurbanforest.org/events/calendar for more information.

Southern Utah Arborist School: December 3-6, 2012, Santa Clara, Utah. See utahurbanforest.org/events/calendar for more information.



Temple Fork Sawmill: The remains of the Temple Fork Sawmill will be preserved in memory, thanks to a historical marker placed on its site in 1993.