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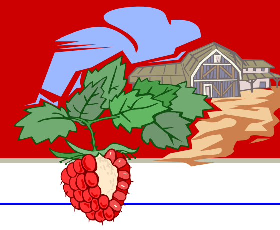
Utah Berry Growers Association Newsletter



HIGHLIGHTS OF UTAH BERRY GROWERS ASSOCIATION MEETING

Shawn Olsen, Extension Horticulture Agent, Davis County

The Utah Berry Growers Association meeting was held in Brigham City on February 6, with over 75 people in attendance. Dr. Marvin Pritts from Cornell University was the featured speaker. He discussed cultural practices for raspberry and blackberry. Berries need good soil drainage and do not do well in compacted soils. Raised beds can help improve drainage and lessen the chance of root rot. Small plugs that are grown in a greenhouse are becoming the preferred method of propagation due to fewer disease problems. In New York, straw mulch the first year of planting was very beneficial. In the second year, the mulch was not helpful because the plants stayed too wet. In Utah's drier climate, straw mulch may be useful to help keep roots cool. A single wire trellis can be used to support berries. A "V" shaped trellis is better and allows more light into the plants. With blackberries, a swing arm trellis is sometimes used where the arm is rotated from one side to other between bloom and fruit ripening.

Dr. Pritts also spoke on extending the season for raspberries. By different manipulations, raspberries can be made to fruit almost year round. Floating row covers can be placed over plants in the spring until they are about one foot tall. The row covers are then removed and the plants will fruit ten days earlier. The production peak can be shifted later by applying straw mulch and pinching the tips at 2.5 feet. The harvest season can be extended by putting a plastic tunnel over plants in September and plants can be fruited until mid-November. In small scale trials in New York, raspberries in tunnels produced 20,000 pounds per acre versus only 2,000 pounds in the field. Raspberries in the fall were sold for $5/pint with prorated gross receipts of $134,000 per acre. Tunnels provide about 4 degrees of frost protection and keep the fruit dry during rainstorms. Raspberries were also potted up and taken into a greenhouse at Christmas time and fruited February through April.

Inside This Issue

Dr. Kent Evans from USU talked about raspberry virus diseases focusing on tomato ringspot virus. This disease is spread by dagger nematodes in the soil. If infected plants are found, remove five plants on either side of the infestation. Crop rotation to rapeseed or fescue grass has been effective in controlling nematodes.

Dr. Diane Alston talked about caneberry insect pests, including cane borers, spider mites, stink bugs, and aphids. Her presentation can be viewed at http://utahpests.usu.edu/ipm/htm/publications/slideshows.

Dr. Brent Black discussed strawberry production systems. The matted row system is commonly used. Place plants one to two feet apart in the row, with rows three to five feet apart. Fertilize with 30-40 pounds of nitrogen at planting time and again one month later. Fertilize again with 30 pounds of nitrogen in late August. Irrigate frequently in the first year to establish the daughter plants. In the second and succeeding years, renovate by removing older plants and favoring newer daughter plants. In this system, plants are usually productive for three to five years. In warmer climates, an annual cropping system is used where plants are planted through plastic in the fall and runners are removed. The initial plant is fruited one or two years and then removed. This system has not worked well in colder climates.

In addition to the presentations discussed above, a brief business meeting was also held. Those in attendance voted to formally approve the formation of the Utah Berry Growers Association. An executive board for guiding the association was also approved. The board consists of: Craig Floyd, Laketown raspberry grower; Merv Weeks, Paradise fruit grower; Wayne McBride, Mapleton raspberry grower and industry sales representative; Darrell Rothlisburger, Rich County Extension Agent; Brent Black, USU Extension Fruit Specialist; and as secretary Loralie Cox, Cache County Extension Agent.

FOOD SAFETY BEGINS ON THE FARM

Brent Black, Extension Fruit Specialist, Utah State University
Cathy Heidenreich, Small Fruit Extension Support Specialist, Cornell University, Ithaca, NY

"THOSE WHO GOT SICK FROM RASPBERRIES: 1,800 IN 2 CYCLOSPORA OUTBREAKS."

The above headline in bold letters appeared in a recent Readers Digest article (The New Food Fight, April 2007 issue, pages 121-127). The two outbreaks occurred in back-to-back seasons in 1997 and 1998 and were traced to raspberries imported from Guatemala. Prior to these outbreaks, Guatemala had a rapidly expanding raspberry export industry with an estimated 85 commercial growers. By 2002, only 3 growers remained with total production at 16% of pre-outbreak levels (Calvin et al., 2003). The typical fruit-buying consumer may have forgotten the raspberry incidents, but likely remember last season's *E. coli*-contaminated spinach incident. What would another food-borne illness linked to berries do to Utah's industry?

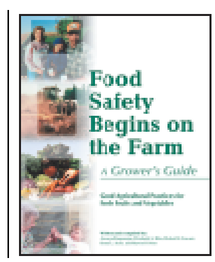
In a recent address to the Ontario Fruit and Vegetable convention, Ben Chapman from the University of Guelph talked about "Creating a Culture of Food Safety in the Berry Industry". He pointed out that national surveys in Canada and the U.S. have shown that the local farmer is one of the people most trusted by produce consumers. Are we worthy of that trust? Are we doing our part in creating and maintaining a culture of food safety?

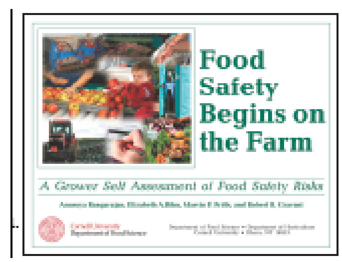
The Good Agricultural Practices Program (GAPS) is a national program that provides education information to farmers about food safety. Following are some of the resources that are available through this program.

Resources

Food Safety Begins on the Farm: A Grower's Guide
A. Rangarajan, E.A. Bihn, R.B. Gravani, D.L. Scott, and M.P. Pritts © 2000
This 28-page color booklet provides an overview of good agricultural practices that can be implemented on farms and in packinghouses as well as background information on food borne illnesses related to produce consumption. Available in English or Spanish.

Food Safety Begins on the Farm: A Grower Self Assessment of Food Safety Risks
A. Rangarajan, E.A. Bihn, M.P. Pritts, and R.B. Gravani © 2003
The assessment is designed to guide growers through the process of identifying risks particular to their operation, developing appropriate solutions, implementing good agricultural practices and developing a farm food safety plan. This document has 21 sections allowing growers to evaluate many different parts of their operation including harvest sanitation, worker hygiene, wild animals, water use, farm biosecurity, and crisis management. Each section contains worksheets so that growers can document their progress and plan for GAPs implementation.





Additional resources are available on the GAPS website (http://www.gaps.cornell.edu/index.html), and can be ordered by contacting Cindy Wright at gapsinfo@cornell.edu or by telephone at 607-255-8008.

References

Calvin, L., L. Flores and W. Foster 2003. Food Safety in Food Security and Food Trade. Case Study: Guatamalan Raspberries and *Cyclospora.* Focus 10, Brief 7 of 17. International food Policy Research Institute. www.ifpri.org.

CANEBERRY IRRIGATION

Dr. Brent Black, USU Extension Fruit Specialist,
Dr. Robert Hill, USU Extension Irrigation Specialist,
Dr. Grant Cardon, USU Extension Soils Specialist

Proper irrigation of caneberries (raspberries and blackberries) is essential for maintaining a healthy and productive planting. Over irrigation slows root growth, increases iron chlorosis on alkaline soils, and leaches nitrogen and other soluble nutrients out of the root zone leading to nutrient deficiencies. Excessive soil moisture also promotes root rot, particularly in raspberry. Applying too little irrigation water results in drought stress. Drought stress during fruiting results in reduced fruit size and yield, and poorer fruit quality. Drought stress also reduces primocane vigor and flower bud development, which then negatively affects the following season's crop.

Properly managing irrigation is analogous to managing a bank account. In addition to knowing the current bank balance (soil water content), it is important to track both expenses (evapotranspiration) and income (rainfall and irrigation).

Bank Balance (Soil Water Content)

How big is my bank account? – Water holding capacity
First, some terminology:

- Field Capacity is the maximum amount of water that can be held in the soil after excess water has percolated out due to gravity.
- Permanent Wilting Point is the point at which the water remaining in the soil is not available for uptake by the plant roots. When the soil water content reaches this point, plants die.
- Available Water is the amount of water held in the soil between field capacity and permanent wilting point. (Figure 1.)
- Allowable Depletion is the point where plants begin to experience drought stress. For caneberries, the amount of allowable depletion, or the *readily* available water represents about 50% of the total available water.

The goal of a well-managed irrigation program is to maintain the soil moisture between field capacity and the point of allowable depletion, or in other words to make sure that there is always readily available water.

The amount of readily available water is related to the effective rooting depth of the plant, and the water holding capacity of the soil. The effective rooting depth for raspberries and blackberries in Utah's climate and soils is typically between 1.5 and 2 feet. The water holding capacity across that rooting depth is related to soil texture, with coarse soils (sands) holding less water than fine textured soils such as silts and clays (See Table 1). A deep sandy loam soil at field capacity, for example, would contain 1.2 to 1.5 inches of readily available water in an effective rooting depth of 2 feet.

What's in the bank? -- Measuring Soil Moisture

In order to assess soil water content, one needs to monitor soil moisture at several depths, from just below cultivation depth (4 to 6 inches), to about 70% of effective rooting depth (14 to 16 inches). One of the more cost effective and reliable methods for measuring soil moisture is by electrical resistance block, such as the Watermark™ sensors (Irrometer Co., Riverside CA). The blocks are permanently installed in the soil, and wires from the sensors are attached to a handheld unit to measure electrical resistance. Resistance measurements are then related to soil matric potential, which is an indicator of how hard the plant roots have to 'pull' to obtain water from the soil. The handheld unit reports soil moisture content in centibars, where values close to zero indicate a wet soil and high values represent dry soil. The relationship between soil matric potential and available water differs by soil type. The maximum range of the sensor is 200 centibars, which corresponds to 45% depletion of available water in a clay soil, compared to 90% depletion for a loamy sand soil. The sensors are less effective in coarse sandy soils, and will overestimate soil water potential in saline soils. Remember that allowable depletion is 50% of available water, which roughly corresponds to soil matric potentials of 25 centibars for a loamy sand soil, and 70 centibars for a loam (Table 2. 50% depletion values for each soil texture?).

Expenses - Evapotranspiration

Water is lost from the planting through surface runoff, deep percolation (moving below the root zone), evaporation from the soil surface, and transpiration through the leaves of the plant. Of these, the biggest losses are typically due to evaporation and transpiration, collectively known as 'evapotranspiration' or ET. Estimates of ET are based on weather data, including air temperature, relative humidity and wind speed. Some weather stations in Utah are programmed to calculate and report the ET estimates for alfalfa as a reference crop (ET_{ref} or ET_r). The ET of your crop can be determined by multiplying the ET_r by a correction factor or crop coefficient (K_{crop}) that is specific to your crop and its stage of development.

$$ET_{crop} = ET_r \times K_{crop}$$

The K_{crop} for raspberry and blackberry are shown in Figure 2. At budbreak (Growth Stage = 0), caneberries are using about 15% of the amount of water used by the alfalfa reference crop. Water use increases until full bloom and fruit set (growth stage = 100) when water use is 101% of a reference alfalfa crop. By leaf senescence in the fall (growth stage = 200), water use has decreased to 80% of the reference crop. Calculated ET_r for your location can be determined by accessing weather data from a nearby weather station at the following website. http://extension.usu.edu/agweather/. Typical weekly ET_r values are shown in Table 3.

Income - Irrigation and Rainfall

In Utah's high elevation desert climate, rainfall contributes a small fraction of the in-season water requirements of the crop. Irrigation water can be supplied by overhead sprinklers, drip lines or microsprinklers. Flood and furrow irrigation are not typically recommended for raspberry, due to sensitivity to waterborne pathogens that cause root rot. Overhead sprinklers should also be used with care during fruiting, as excessive wetting can lead to fruit rot. When using overhead irrigation, watering cycles should be completed early enough in the day to allow for adequate drying of the leaves and fruit. During hot summer weather however, overhead irrigation can give some evaporative cooling of the leaves and fruit.

Whether using sprinklers or trickle irrigation, it is important to calibrate your system so that you know precisely how much water is being applied. The simplest way to do this is to place catch cans in multiple locations in your planting and collect water for a set period of time. The amount of water collected over time will give you an application rate (inches per hour), and differences in water collected among the catch cans will tell you how uniform the application is within your planting. When trying to determine application uniformity, it is best to measure output at both ends of your irrigation system. Also, if your planting is on a slope, you should measure output at the highest and lowest points of your field. Elevation differences and the distance the water travels through the irrigation lines both affect water pressure, and consequently the flow rate at the nozzle. If you have trickle irrigation, you can place catch cans under the emitters and determine flow rate for each emitter. Flow rate from each emitter and emitter spacing can be used to calculate rate per area.

The efficiency of your system is a measure of how much you have to over water the wettest spots of the planting to get adequate water to the dry spots. Efficiency is related to the uniformity of application and to the amount of evaporation that occurs before the water can move into the soil. A well-designed microsprinkler or drip system can be 70 to 90% efficient. Overhead sprinkler systems are typically 60 to 75% efficient, while flood and furrow irrigation is typically 30 to 50% efficient.

Case Study

Following is an example of how to calculate water needs for a mature summer-bearing red raspberry planting on a deep sandy loam soil, just after fruit harvest.

- Water use (Expenses)
  - ETr values are 2.10 inches per week (weather station data).
  - Crop coefficient is 0.95 (Figure 2).
  - $ET_{crop} = ET_r \times K_{crop}$
  - ET_{crop} = 2.10 inches/week * 0.95 = 2.00 inches/week
- Soil storage capacity (potential bank balance)
  - The total storage capacity for readily available water over the effective rooting depth is 1.2 inches (Table 1).
  - 1.2 inches / 2.00 inches per week = 0.6 weeks or 4.2 days between irrigations
- The soil moisture in the rootzone will go from field capacity to plant stress levels in 4.2 days.
- To recharge the soil profile, you will need to apply 1.2 inches of water. Assuming a microsprinkler irrigation system with an efficiency of 90%, 1.33 acre inches of water will be required per acre for each watering.

Summary

Good irrigation management requires:

1. An understanding of the soil-plant-water relationship
2. Properly designed and maintained irrigation system
3. Knowing the efficiency of your irrigation system
4. Proper timing based on
   a. Soil water holding capacity
   b. Weather and it's effects on crop demand
   c. Stage of crop growth.

Each of these components requires a commitment to proper management. Proper management will lead to the maximum amount of "crop per drop" and will optimize the long term health and productivity of your planting.

Additional resources.

AgriMet Crop Coefficients, Pacific Northwest Regional office of the Bureau of Reclamation, U.S. Department of the Interior. http://www.usbr.gov/pn/agrimet/crop-curves/crop_curves.html.

Irrigation Scheduling Techniques. Water Conservation Factsheet. No. 577.100-1. British Columbia Ministry of Agriculture and Food. March 1997. http://www.agf.gov.bc.ca/resmgmt/publist/500series/577100-1.pdf.

Hill, R.W. 1994. Consumptive Use of Irrigated Crops in Utah. Ut. Ag. Exp. Stn. Res. Rpt. #145. Utah State University, Logan UT. Available on the web at http://nrwrt1.nr.state.ut.us/techinfo/consumpt/default.asp

Pritts, M.P. and D. Handley. 1989. Bramble Production Guide. NRAES Publication #35. Cornell Cooperative Extension. Ithaca, NY.

Western Oregon Caneberry Irrigation Guide. Oregon State University. November 1997. http://biosys.bre.orst.edu/bre/docs/caneberr.pdf.

Tables and Figures

Table 1. Available water holding capacity for different soil textures, in inches of water per foot of soil. Available water is the amount of water in the soil between field capacity and permanent wilting point. Readily available water is approximately 50% of available.

Soil Texture	Available (*inch/foot*)	Readily available (*inches*) 1'	1.5'	2'
Sands and fine sands	0.5 - 0.75	0.25 - 0.38	0.4 - 0.6	0.5 - 0.75
Loamy sand	0.8 - 1.0	0.4 - 0.5	0.6 - 0.75	0.8 - 1.0
Sandy loam	1.2 - 1.5	0.6 - 0.75	0.9 - 1.1	1.2 - 1.5
Loam	1.9 - 2.0	0.9 - 1.0	1.4 - 1.5	1.9 - 2.0
Silt loam, silt	2.0	1.0	1.5	2.0
Silty clay loam	1.9 - 2.0	0.9 - 1.0	1.4 - 1.5	1.9 - 2.0
Sandy clay loam, clay loam	1.7 - 2.0	0.85 - 1.0	1.3 - 1.5	1.7 - 2.0

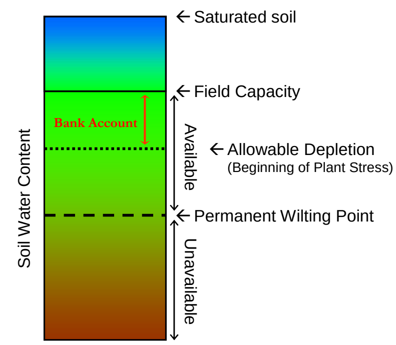


Figure 1. Soil water content from saturated to dry. Optimal levels for plant growth are between field capacity and allowable depletion.

Table 2. Recommended Watermark™ sensor values at which to irrigate.

Soil Type	(*centibars*)	
Loamy sand	40	50
Sandy loam	50	70
Loam	60	90
Silt loam, silt	70	90
Clay loam or clay	90	120

Watermark™ is a registered trademark of Irrometer, Co., Riverside, CA.

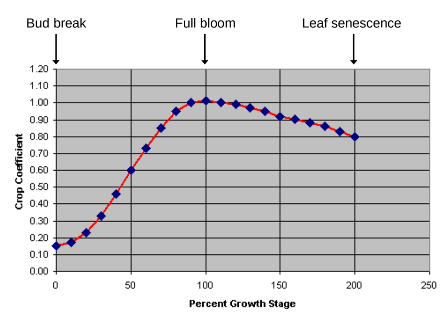


Figure 2. Crop coefficients for blackberries and summer-bearing raspberries. From AgriMet values available online at www.usbr.gov/pn/agrimet/cropcurves/crop_curves.html.

Table 3. Typical weekly alfalfa reference evapotranspiration (ET_r) values for Utah locations.

Location	May	June	July	August
		(*inches per week*)		
Laketown	1.35	1.74	1.91	1.68
Logan	1.38	1.83	1.94	1.68
Ogden	1.48	1.98	2.10	1.80
Spanish Fork	1.48	1.94	2.08	1.74
Cedar City	1.57	1.95	2.04	1.74
St. George	1.95	2.40	2.53	2.02

Calculated from consumptive water use tables (Hill, 1994) available on the web at: http://nrwrt1.nr.state.ut.us/techinfo/consumpt/default.asp

The above article will soon be available as a fact sheet from USU Extension

HIGH TUNNELS FOR LATE FALL RASPBERRIES

Marvin Pritts, Professor, Dept. of Horticulture, Cornell University, Ithaca, NY 14853

Producing fruits, vegetables and flowers out-of-season is one way to increase value and income because crops usually can be sold at a higher price then. The use of high tunnels is a technology that can be implemented just about anywhere for a modest cost, and can be used to bring crops on earlier or extend them later in the season. A high tunnel is simply a large hoophouse covered in plastic, with sides that can be rolled up or opened for ventilation. High tunnels are not powered by electricity so they do not typically have fans, heaters or lights. Because the plastic covering is generally applied and removed seasonally, and because they are not powered with electricity, high tunnels are usually classified as temporary structures and may fall outside of certain taxing, building and zoning requirements.

Plants are set directly into the soil under the tunnel. Tunnels are high and wide enough to allow tractors through to spray and cultivate. A typical size is 15 to 30 feet wide and 96 feet long. Europeans have been using this technology for years, and often connect several tunnels together (Photo 1. Raspberries under a high tunnel in Scotland). The Chinese also have been using a type of tunnel technology to produce fruits and vegetables. Because the United States is such a large country, we have found it economical to grow crops in the south and ship them north to extend the season. However, even in warm climates, tunnels are helping to improve fruit quality (Photo 2. Raspberries under rain shelters in central California).

Researchers at Penn State University have demonstrated that many crops can be grown under tunnels in the Northeast. Our objective was to take one of the most promising crops and push the limits of season extension.

Raspberries are a high value crop that, in season, sell for more than $3.00/lb. In the middle of winter, raspberries can sell for more than $10.00/lb. Our goal was to produce raspberries in October and November, after the field season ends from frost and rain, and when the selling price of raspberries jumps. We planted primocane-fruiting raspberry varieties, managed them in various ways to delay their production beyond the normal late August-September season, and then fruited them under a plastic tunnel.

Primocane-fruiting raspberries were planted in April of 2004 in 4 rows spaced 7 ft apart. Plots were 16 ft. long (6 per row). All canes were mowed to the ground in the fall of 2004 after summer's growth. In spring of 2005, we installed the framework for a tunnel over the planting. The tunnel was covered with plastic on September 13, 2005, just prior to harvest.

Typically, a grower would prefer that fall-bearing types fruit early to avoid frost so that a full harvest can be achieved. Our objective was to delay fruiting of 'Heritage' until late in the fall when they would be protected by the high tunnel, and when the availability of fresh raspberries is low and the price is high. Five treatments were used: an unmanipulated control, applying straw over plots in late February to delay cane emergence, mowing canes to the ground in early June shortly after they emerge, pinching primocanes (removing the top 4 – 6 inches) when they reach a height of about 2½ ft., and pinching when canes were 3½ ft. tall. Each of these manipulations delayed flowering and shifted production later in the season.

A second experiment examined several high quality varieties that often cannot be completely harvested due to frost. These varieties were Caroline, Josephine, Autumn Britten, NY01.63, NY01.64, and NY01.65. The numbered selections were made by fruit breeder Courtney Weber who suspected that they may have traits that allow them to perform well in high tunnels.

Harvest started in early September at the normal time. Tunnel sides were rolled up in the morning and closed in the evening to regulate temperature. As the weather turned colder, outdoor plants slowed their production and fruit quality deteriorated. October was characterized by record rainfall, so any outdoor fruits that survived were moldy and tasteless. Inside the tunnel, however, fruit quality remained high (Photo 3. High tunnel planting on October 22, 2005) and harvest continued into November (Photo 4. Raspberries harvested in Ithaca in early November). On particularly cold

Photo 1. Raspberries under a high tunnel in Scotland.

Photo 2. Raspberries under rain shelters in central California.

Photo 3. High tunnel planting on October 22, 2005.

nights, we covered the plants with row cover since tunnels do not provide a large amount of frost protection (Photo 5. Row covers used to protect raspberry plants on extremely cold nights in November). On most nights, however, we simply closed the sides and doors of the tunnel while allowing some ventilation during the day.

We were concerned that pollination would be a problem in the fall, so were anticipating requiring a bee hive. However, native bumble bees were attracted to the house in large numbers, without adding a hive. The stayed in the house continuously, sleeping under the leaves and foraging on raspberry flowers during the day.

Yields were high; we averaged nearly 2 lbs. per ft. of row in control plots of Heritage. Because rows were closer together than in the field, our yield per unit area was about 4 times higher than yields from outdoor plantings. Since much of the fruit was produced out-of-season, we sold our fruit at the Cornell Orchards store for $5.00/pint ($6.70/lb). Assuming that all of the plants in the tunnel produced as well as the Heritage controls, and assuming that we could sell everything from the tunnel, our gross sales from our 96 ft long x 30 ft wide tunnel would have been $5,150. Extrapolating to an acre, the value of the crop would be close to $80,000.

Material costs for the tunnel were about $5,000 and labor added another $1,000, so sales from the first year were nearly enough to cover the cost of the tunnel materials. Of course, labor and other costs have to be covered from the first year sales, but even so, our preliminary observations suggest that high tunnels will be profitable in the long run. We have obtained support from the New York Farm Viability Institute to document the profit potential over several years.

A second aspect of our study was to evaluate how other varieties performed in the tunnel, particularly those that fruit too late for the field. Josephine produced outstanding fruit quality in the tunnels, and it fruited quite late without manipulation. The other varieties also performed well, but their season was similar to that of Heritage. Autumn Britten produced large fruit, but yields were smaller than Heritage. The selections were not quite up to cultivar standards, but they were certainly late and one selection had enormous fruit size.

We plan to follow this first year's observations for another year and collect detailed economic data for analysis. We also plan to construct a second tunnel to examine early season blackberries, strawberries, and dayneutral strawberries.

Given that energy and transportation costs continue to rise, and knowing that high tunnels use free solar energy, it may worth considering placing a few high tunnels on the farm to extend the season of the most highly-valued crops.

Photo 4. Raspberries harvested in Ithaca in early November.

Photo 5. Row covers used to protect raspberry plants on extremely cold nights in November.

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Farmers Markets

SALT LAKE CITY - Farmers and Growers…Be a part of Utah's largest Farmers' Market in Downtown Salt Lake City. Our market has large crowds hungry for fresh, local produce in Historic Pioneer Park every Saturday from June 9 to October 20. Our booth prices are low, and our vendors regularly sell out. For applications or further information, visit www.downtownslc.org or call Kim at 801-333-1103. Happy Growing!

KAYSVILLE - **Utah Botanical Center 2007** Farmers Market The Farmers market is a great addition to the educational and recreational experiences the UBC provides. We are excited about the opportunity to host the farmers market, enrich the lives of people in surrounding communities and support local growers, gourmet food producers and artisans. *Dates and Times:* 5:00pm-8:00pm, Thursday Evenings, July

We hope you find the information in this newsletter useful. If you have comments regarding information in this newsletter, or would like to see in future newsletters, please contact Loralie Cox at loraliec@ext.usu.edu, or (435) 752-6263
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We are planning two summer tours: One in Bear Lake and the other in the Utah Valley. Look for dates and locations in the next issue of the newsletter.