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College of Agricultural, Consumer, and Environmental Sciences

Illinois Fruit and Vegetable News

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A newsletter to provide timely, research-based information that commercial fruit & vegetable growers can apply to benefit their farming operations.

Address any questions or comments regarding this newsletter to the individual authors listed after each article or to its editors, Nathan Johannig, 618-687-1727, njohann@illinois.edu or Bronwyn Aly 618-382-2662, baly@illinois.edu. The *Illinois Fruit and Vegetable News* is available on the web at: <http://ipm.illinois.edu/ifvn/>. To receive email notification of new postings of this newsletter, contact Nathan Johannig at the phone number or email address above.

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Upcoming Programs

Check the **Illinois SARE calendar** for a full list of programs and links for registration.

<http://illinoissare.org/> and <http://illinoissare.org/calendar.php>

Also see the **University of Illinois Extension Local Food Systems and Small Farms Team's website** at:

<http://web.extension.illinois.edu/smallfarm/> and the calendar of events at

<http://web.extension.illinois.edu/units/calendar.cfm?UnitID=629>.

- **Small Farm Webinar Series, January 14 through March 31. Thursdays, noon to 1:00 p.m.** For more details or to register online, see <https://web.extension.illinois.edu/registration/?RegistrationID=13379>. For more information, contact Andy Larson at 815-732-2191 or andylars@illinois.edu.
 - **Mar. 3** - Getting Your Beehives Ready for Spring, Doug Gucker, *University of Illinois Extension Local Food Systems and Small Farms Educator*
 - **Mar. 10** - Raising Meat Birds on Pasture, Andy Larson, *University of Illinois Extension Local Food Systems and Small Farms Educator*
 - **Mar. 17** - Using Cover Crops on Small Farms, Nathan Johannig, *University of Illinois Extension Local Food Systems and Small Farms Educator*
 - **Mar. 24** - Growing Great Blackberries, Bronwyn Aly, *University of Illinois Extension Local Food Systems and Small Farms Educator*
 - **Mar. 31** Setting Up a Grazing System on a Small Farm, Jay Solomon, *University of Illinois Extension Energy and Environmental Stewardship Educator*
- **North American Raspberry and Blackberry Conference, March 1-4, 2016.** Williamsburg, Virginia. For more information, see www.raspberryblackberry.com, email info@raspberryblackberry.com, or call 919-542-4037.
- **26th Annual Greenhouse Tomato Short Course, March 1 & 2, 2016.** Eagle Ridge Conference Center, Raymond, Mississippi (close to Jackson and the airport [JAN]). For more details visit <http://greenhousetomatosc.com> or on Facebook at <https://www.facebook.com/GreenhouseTomatoShortCourse>
- **Pruning Your Way to Success: Managing Small Farm Fruit Plantings, Thursday, March 10, 2016 from 4 p.m. to 6 p.m.** University of Illinois, Dixon Springs Agricultural Center, 354 State Hwy 145 N Simpson, IL.

Register at <https://web.extension.illinois.edu/registration/?RegistrationID=13874>. For more information, call Bronwyn Aly at 618-382-2662, or Nathan Johanning at 618-687-1727.

- **Market Ready Program, Thursdays, March 10 through March 31 5:30 – 8:30 p.m.** Boone County Extension, 205 Cadillac Ct., Suite 5, Belvidere, IL 61008. This four week program is designed for local food farmers who are interested in selling to restaurants, retail stores, and institutional buyers. For more information or to register visit <https://go.illinois.edu/MarketReady> or contact Grant McCarty 815-235-4125; gmccarty@illinois.edu or Andy Larson 815-732-2191; andylars@illinois.edu.
- **High Tunnel Workshop: For Intermediate & Advanced Growers. Saturday, March 12, 2016 from 9 a.m. to 4:30 p.m.** Hillsboro City Hall, 101 Main St.; Hillsboro, MO (just south of the St. Louis Metro Area) Topics include grower experiences, insect and disease management and soil health/cover crops. Cost is \$25. For additional registration or program information please contact Miranda Duschack, Small Farm Specialist, Lincoln University at 314-604-3403 DuschackM@lincolnu.edu
- **Good Food Festival, March 24-26, 2016** UIC Forum, 725 W. Roosevelt Road, Chicago IL 60608. For more information visit <http://www.goodfoodfestivals.com/>

Regional Reports

From western Illinois ... The past few weekends have had exceptionally warm weather, just great for those of us who do most of our work on the weekends. We missed the snow of last week, but definitely felt the wind. The ground has gone from saturated conditions a few weeks ago to more workable conditions, allowing a few to get started with spring tillage. I noticed a few who have started to apply anhydrous ammonia late this past week as well. Not all the fields are in the same condition, so farmers need to pick and choose fields accordingly before they start any tillage work.

The sunshine and warm weather can certainly heat up a high tunnel. The temperature was near 100 degrees before I had an opportunity to open up a side to vent over the weekend. One tomato grower who has 5 greenhouses with tomatoes sent me a picture of their first bloom, which appeared on Feb. 20th and is the earliest he has had to date. They have been alternating between running the evaporative coolers one day and firing up the gas heaters the next.

Matted row strawberries should be uncovered when ground temperatures are 40-42 degrees Fahrenheit and many locations should be close to that range now. Uncovering too early encourages early growth and early blooms, which are more at risk for a late frost. Uncovering too late may cause the plant to initiate growth under the straw. Growth without the benefit of photosynthesis can deplete food reserves of the plant. When removing straw, leave enough to protect the berries from making contact with the soil. This can help reduce leather rot concerns as well as keep the berries cleaner.

We've removed the covers from our overwintering plasticulture strawberries. Winter dessication is about normal. We used either a single 1.5 ounce cover or a double layer of 1.0 ounce cover. We didn't really see much difference between the two covers in terms of the amount of dead tissue. Even though we used many buckets of bait, we still had some overwintering voles. We just can't seem to get rid of those devils.

We're still picking spinach from our tunnels, and with the increased warmth and sunshine, the plants have been growing again. Other than watering and watching for aphids, there isn't much work involved in keeping something growing during the winter in a tunnel. The taste of winter spinach is unbelievable, as the plant produces a higher level of sucrose to help prevent winter injury. It's well worth your time to take advantage of some winter production.



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From southern Illinois ... Despite some snow and blizzard-like conditions in southern Illinois early last week it is now beginning to feel like spring. Our snow was very short lived as temperatures were in the 40s the following day. This was followed by a very warm and sunny weekend that had temperatures in the 60s to around 70 with a very windy Sunday. Since then, we have had some storms Tuesday morning, followed by a moderate cool down with highs now in the 50s for the most of this week, with the potential for more rain.

The sun, wind, and warm temperatures did allow for some of the best conditions we have had in a while to get out into the field to do a “few” things. I was able to mow off the asparagus variety trial I have here in Jackson County. Last fall, I broadcasted cereal rye as a cover crop in the asparagus plot and got a fairly decent stand. The cereal rye was just starting to green up and by mowing now I was able to do minimal harm to the cover crop. It will grow for the next couple of weeks and provide some basic cover before spring burndown. Other than pruning, it is has not dried out enough to do any tillage or other field work. In the high tunnel at my office, we have been harvesting greens, and the carrots are really starting to put on some size. Plasticulture strawberries are doing very well and starting to put on some good growth and branch crown development. Some growers have even pulled covers off for a few of our warmer days, but the covers have not gone far as mother nature still may have some days left before spring.



Current condition of plasticulture strawberries in southern IL 2/29/16.
Photo: B. Colvis

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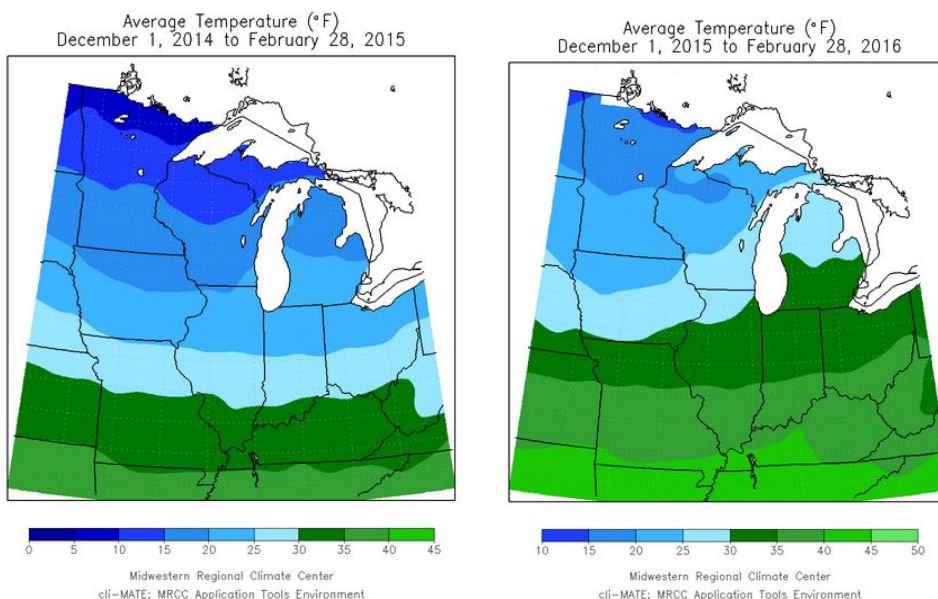
Vegetable Production & Pest Management

Warm Winter Weather Sets the Stage for Corn Flea Beetles and Stewart’s Wilt

Average winter temperatures in Illinois for 2015-2016 were much warmer than 2014-2016 (Figures 1 and 2). Warm temperatures during the months of December, January and February favor increased survivorship of the corn flea beetle and the bacterium it vectors. Corn flea beetles are the primary vector of Stewart’s Wilt. *Erwinia stewartii*, the bacterium that caused Stewart’s wilt, survives the winter in the gut of the corn flea beetle and the survival of the corn flea beetle is dependent on winter temperatures. Warmer winters result in greater survivorship of corn flea beetles, thus increasing the potential for Stewart’s wilt. Using the average temperatures of December, January, and February, the potential for Stewart’s wilt can be predicted (Table 1).

Table 1. Projected risk of Stewart’s wilt based on the average temperatures of December, January, and February.

Average temperature of December, January, & February	Probability of early season wilt	Probability of late season blight
<27° F	Absent	Trace, at most
27-30° F	Light	Light to Moderate
30-33° F	Moderate	Moderate to Severe
>33° F	Severe	Severe



Figures 1 and 2. Average winter temperatures of 2014-2015 and 2015-2016.

Corn flea beetles become active in the spring when temperatures rise above 65°F, and they feed on and transmit Stewart’s wilt bacteria to seedling corn plants. The bacterium can spread systemically throughout the plant. Although most commercial field corn hybrids are resistant to Stewart’s wilt, the disease is still a concern for susceptible seed corn inbreds and many sweet corn hybrids.

There are two phases of Stewart’s wilt: the seedling wilt phase and the leaf blight phase. The seedling wilt stage occurs when seedlings become infected at or before the V5 stage. The vascular system becomes plugged with bacteria, causing the seedling to wilt, become stunted, and die. Infections of older corn plants usually result in the development of the leaf blight phase of Stewart’s wilt. This phase is characterized by long, yellow to chlorotic streaks with wavy margins along the leaves. When the late infection phase or “leaf blight phase” of Stewart’s wilt occurs after tasseling, it is generally not a concern in sweet corn because ears are harvested before damage occurs.

Based on the recent winter temperatures from the Midwest Regional Climate Center, estimates of early season Stewart’s wilt are shown in Table 2. Remember, however, that these are only predictions; numbers of surviving corn flea beetles are not known.

Table 2. Early season Stewart’s wilt predictions, 2016.

Location	Average temperature December 2015-February 2016	Early Season Wilt
Freeport	28° F	Light
St. Charles	30° F	Light
DeKalb	29° F	Light
Monmouth	31° F	Moderate
Peoria	34° F	Severe
Champaign	34° F	Severe
Springfield	34° F	Severe
Brownstown	34° F	Severe
Belleville	39° F	Severe
Rend Lake	36° F	Severe
Carbondale	39° F	Severe
Dixon Springs	40° F	Severe

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Preparing for Corn Earworm, 2016

An updated version of my usual pre-season corn earworm management recommendations ...

Corn earworms are often the most damaging insects in sweet corn in the Midwest. They overwinter in the pupal stage in the soil, but their survival rate is very low in most of the region. This winter has been very mild, but even so, the local overwintering survival of corn earworm pupae is not likely to be the cause of heavy moth flights in most parts of the state or region. Corn earworm manages to be a severe pest every year anyway because it migrates in from southern states on weather fronts every summer. In much of the region the period of first activity (and the first need to control them) can vary from June through August, depending on the time of their migration and the availability of sweet corn that is silking. Although control may be necessary in one portion of the region at a particular time, it may be unnecessary in many other locations. Consequently, it really is essential to establish a monitoring program to determine spray needs. Unfortunately, scouting for foliar damage or larvae on the surface of plants is not an option. Corn earworm moths lay their eggs singly on silks, and larvae move down the silk channel immediately after they hatch from the eggs (and hatching can occur in as little as 2 ½ days during hot weather). On corn, larvae do not feed on any exposed parts of the plant (leaves, husks, etc.), so the only practical way to kill them (short of having planted BT sweet corn, which does not provide 100 percent control) is with a contact insecticide applied to the silks. Larvae crawl across the residues on the silks, and the insecticide is taken up through the cuticle.



Left: Corn earworm larva. Right: Hartstack trap.



Corn earworm moth (Kansas Department of Agriculture).

Effective monitoring programs depend on the use of pheromone-baited traps that catch male corn earworm moths and are used as indicators that adults of both genders are present and eggs are being laid. Previously we have recommended using either a wire Hartstack trap (pictured above) or a nylon version of the same general design marketed by Scentry and several regional distributors. We've long known that paper sticky traps are ineffective at monitoring corn earworm moths, and about a decade ago research indicated that the Scentry nylon cone traps do not really work well enough. Results from monitoring work done in 2006 showed that the nylon traps also may fail to detect light but still significant flights when the wire Hartstack traps do catch moths. Consequently, I now recommend that all sweet corn and seed corn producers use the wire Hartstack trap. (Data to support this recommendation came from a regional monitoring

effort coordinated by Bill Hutchison of the University of Minnesota and conducted by several entomologists and horticulturists who participate in the Great Lakes Vegetable Workers Group.) Traps should be baited with Hercon "zealures," and the lures need to be replaced every 2 weeks. Earworm control is necessary when moth flight is ongoing and fresh silks are present. If traps are catching more than a few moths (3 to 10 per trap per night) when silking begins, sprays should be applied within 2 days after first silk – insecticide residues must be on the silks to kill larvae immediately after they hatch from eggs and before they enter the silk channel. If the only silking corn in your area is your field, the threshold for treating should be revised down to 1 moth per trap per night ... in your traps or those operated by your neighbors.

A Midwest supplier of the Hartstack trap for earworms is Bob Poppe, Route 1, Box 33, Lexington, IL, 61753 (309-723-3201). I suggest that you buy an extra top cylinder for each trap to make handling more efficient. Lures are available from Great Lakes IPM (10220 Church Road NE, Vestaburg, MI 48891; 989-268-5693; 989-268-5911; 800-235-0285; FAX: 989-268-5311). The wire Hartstack trap is not cheap ... think in the \$300 range plus shipping, and think higher numbers if the traps must be shipped a long way. But before you let the price tag make you balk, consider ...

- These traps will last for many years (I have a couple that are over 30 years old) ... as long as you don't run over them with tractors or other vehicles.
- Along with a few dollars for lures every year and daily monitoring of moth counts, they provide you with guidance that can keep you from spending thousands of dollars unnecessarily or losing thousands of dollars' worth of sweet corn sales. If you spray 10 acres of sweet corn even twice a week for 3 weeks before earworms are actually present and require control, that's 6 applications at (conservatively) \$20.00 per acre for each application if you use something that's effective ... multiplied by 10 acres, that's \$1,200 (plus the loss of time not spent doing something more necessary). Multiply that by a 20-year life span for the trap, and the total exceeds \$24,000. I think that pays for the trap and the lures. Viewed in a different way, if high trap counts lead you to spray more often in order to get the control you really need, you market more corn. For a fresh-market producer who sells sweet corn at \$4.00 per dozen, a yield of 1,200 dozen per acre is worth \$4,800. Preventing a 5 percent loss by spraying extra when needed saves \$240 per acre in sales. Multiply that by 10 acres and 20 years, and the total reaches \$48,000 ... that, plus keeping your customers from complaining about wormy corn, certainly pays for the cost of a trap and a package of lures every year.

Insecticide and "trait" choices for corn earworm control ... and there are some new Bt varieties for 2016

First, insecticides ...

- The goal of insecticide applications in sweet corn is to put a residue on fresh silks that kills larvae before they can move from the egg on the silk into the tip of the ear. (If sprays kill some adults, that's a benefit, but that's NOT what makes an effective spray program, especially for growers with smaller fields and diverse plantings.) This means that sprays must be applied repeatedly as the silks elongate. Although the residual activity of many insecticides is several days, newly emerged portions of silks near the ear tip were not exposed to the sprays applied a couple of days earlier. This is why sprays are recommended on 2- to 3-day intervals as long as silk growth continues. If traps are catching just a few moths and temperatures are moderate, a 3-day spray interval can be adequate. If traps are catching 30 or more moths per night and temperatures are in the 90s, spraying every 2 days will be necessary to produce corn with very few damaged ears. Sprays should begin within 2 days after silks have begun to emerge if moths were flying when silks appeared.
- At least some of the corn earworm populations that migrate into the region are resistant to pyrethroids (Baythroid, Brigade, Hero, Mustang Max, Warrior, and their generic versions). Alternatives to pyrethroids – such as Belt, Coragen, Entrust (for organic growers), and Radiant – are not quite as effective as the pyrethroids used to be before resistance development. Where markets demand corn that is nearly worm-free, relying on a pyrethroid or an alternative alone is not likely to give adequate control when moth flights are high. Combinations of a pyrethroid plus one of these alternatives or a pyrethroid plus Lannate are likely to give the best results. If you take this approach and tank-mix two different kinds of insecticides, use each at their label rates (often the middle of range listed on each product's label). Making timely applications on the right interval (2 or 3 days) is FAR more valuable than using the highest possible rates. A pre-mix of the active ingredients in Warrior (lambda-cyhalothrin) and Coragen (chlorantraniliprole) is sold under the trade name Besiege. It provides an alternative to tank-mixing two different chemicals.

What about Bt sweet corn varieties?

- From a grower's perspective, there are three different categories of Bt sweet corn varieties on the market. (1) The Attribute series sweet corns produce one kind of Bt toxin. It is very effective against European corn borer and moderately effective against corn earworms. The "problem" is that only 3 of 4 kernels on ears in Attribute series Bt sweet corn fields produce the toxin (a result of the heterozygous nature of the genetics of the variety and random recombination in the offspring – the kernel, because the endosperm is F₁ tissue). Additionally, the Bt toxin in the Attribute series is not very effective against black cutworm or western bean cutworm (and not at all effective against rootworms or sap beetles). (2) The Seminis "Performance" series of Bt sweet corn varieties produce two toxins that kill Lepidopteran larvae; they also have genes for corn rootworm larval resistance and resistance to Roundup. The second Bt toxin in these varieties provides much greater control of black cutworm, fall armyworm, and western bean cutworm (as well as European corn borer and corn earworm). However, only 3 of 4 kernels on ears in Performance series Bt sweet corn fields produce the toxin (again, a result of the heterozygous nature of the genetics of the variety and the fact that the genes for the two toxins are linked and so they move together – not independently – in the recombination of genes in the offspring – the kernel). (3) The "Attribute II" series of sweet corn varieties developed by Syngenta includes a few new varieties for 2016. In the Attribute II series, genes code the production of two very different toxins that kill Lepidopteran larvae (cutworms, armyworms, European corn borer, and corn earworm). These genes are not linked, and as a result, 15 of 16 kernels on ears in Attribute II series Bt sweet corn fields produce one or both toxins. The Attribute II hybrids that I and others have tested have been far more effective against corn rootworms than any other Bt hybrids available to date. Information on [Syngenta's Attribute and Attribute II series Bt varieties](http://www.syngenta.com/seeds/vegetables/sweet_corn/sweet_corn.aspx?tab=3) is available at http://www.syngenta.com/seeds/vegetables/sweet_corn/sweet_corn.aspx?tab=3; information on the [Seminis Performance series Bt sweet corn varieties](https://www.seminis.com/global/us/products/Pages/Performance-Series-Sweet-Corn-Seed-Varieties.aspx) is available at <https://www.seminis.com/global/us/products/Pages/Performance-Series-Sweet-Corn-Seed-Varieties.aspx>. Newly available Attribute II series varieties are much better suited for direct-market producers than the one available in 2015.
- Do Bt sweet corn varieties still need to be treated with insecticides? Yes ... although the Attribute II series will suffer less damage when untreated than other existing Bt varieties. The original Attribute series and the Performance series varieties must be treated when corn earworm moth flights are heavy. The jury is still out on the characteristics of a reduced spray program that would adequately protect these varieties. In varieties with long silk channels, early sprays might be skipped (because larvae would ingest Bt toxins as they feed on silks while moving toward kernels). Bt concentrations decline somewhat in silks after pollination, and as ears elongate and kernels have less cover, sprays may be more necessary. The point for now: be prepared to use insecticides on Bt sweet corn if it must be worm-free for your markets.

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2015 Illinois Farmers Market Price Reporting Summary

University of Illinois Extension Educators, Bronwyn Aly and Deborah Cavanaugh-Grant, began this project in 2014, collecting weekly price information from eleven different farmers markets across Illinois. During this first year, market reporters were asked to provide the average price for each crop being sold at the market. When the pricing information was being summarized at the end of the market season, it was realized that making price comparisons between markets on the different crops was going to be inaccurate due to variations in reporting quantities. As an example, comparisons for the average price per bag of spinach could not be made because the bag size varied or was not recorded. In order to report more meaningful pricing information to growers and consumers, the comparison quantities needed to be equal. Because of the vast number of fruits and vegetables that can be grown in Illinois, it became evident that the reporting system needed to be streamlined and made more manageable for reporters.

In 2015, data was collected from twelve farmers markets and one produce auction across the state; from Woodstock to Harrisburg and Quincy to Charleston. Each week, Extension Educators, program assistants and/or Master Gardener volunteers collected information on 20 crops. The lowest and highest price for each available crop was reported using standard measurable units (bulb, head, peck, pint, pound, quart, etc.). Using an online survey software tool (Qualtrics), reporters submitted their weekly reports. This information was then compiled into a weekly report that was sent to the University of Kentucky for posting on their webpage <http://www.uky.edu/Ag/CCD/ILfarmersmarket.html> as well as being linked to the University of Illinois Extension Local Food System and Small Farms website at

http://web.extension.illinois.edu/smallfarm/cat139_4407.html. Table 1 is a summary of the lowest and highest prices for each of the 20 crops from all reporting markets. The last column lists the top ten marketed crops from 2015 from all markets. While this number is not meant to indicate the top crops grown in Illinois, it does give an indication of how many times these specific crops were sold at markets. A summary of the 2014 and 2015 pricing reports can be found as a pdf on the University of Illinois Extension webpage <http://web.extension.illinois.edu/smallfarm/farmersmarket.html>. The Illinois farmers market price reporting project will continue again during the 2016 market season, and we are currently finalizing the reporting form and participating markets.

Table 1. 2015 Illinois farmers market price report summary.

Illinois	2015 Farmers Market Price Report		Number of times reported	Top Ten Marketed Crops
	<i>Averages across all markets</i>			
12 Reporting Markets	Low Price	High Price		
Asparagus (lb)	\$3.43	\$4.30	24	
Apples				
(lb)	\$2.01	\$2.37	31	
(peck)	\$10.13	\$10.27	15	
Blackberries/Raspberries				
(pint)	\$4.21	\$4.64	57	10
(quart)	\$5.11	\$5.25	14	
Beans, Green (lb)	\$2.39	\$2.66	115	1
Broccoli (head)	\$1.81	\$2.25	54	
Cabbage (head)	\$1.80	\$2.21	57	10
Cantaloupe (head)	\$2.87	\$3.48	37	
Cucumber				
Slicing (each)	\$0.65	\$0.86	106	3
Slicing (lb)	\$1.60	\$1.60	10	
Pickling (lb)	\$1.60	\$1.82	17	
Garlic (bulb)	\$0.72	\$0.89	62	8
Lettuce, Romaine (head)	\$1.90	\$2.26	44	
Onions (red, sweet, white, yellow)				
(each)	\$0.82	\$0.98	76	6
(lb)	\$1.40	\$1.64	46	
Peppers, Bell				
(each)	\$0.63	\$0.95	99	4
Potatoes (Red, White, Yellow)				
(pint)	\$1.99	\$2.21	19	
(quart)	\$2.57	\$2.76	35	
(lb)	\$1.43	\$1.67	58	9
New (pint)	\$2.00	\$2.00	7	
New (quart)	\$3.02	\$3.21	31	
New (lb)	\$1.50	\$1.54	14	
Squash, Acorn				
(each)	\$1.14	\$1.81	31	
Squash, Butternut				
(each)	\$1.43	\$2.13	29	
Strawberries				

(pint)	\$3.47	\$3.72	16	
(quart)	\$4.33	\$4.65	26	
Sweet Corn (dozen)	\$4.63	\$5.22	67	7
Tomatoes				
Red Slicing (lb)	\$2.05	\$2.41	109	2
Cherry/Grape (pint)	\$2.40	\$2.85	46	
Cherry/Grape (quart)	\$3.57	\$3.90	15	
Cherry/Grape (lb)	\$1.90	\$2.00	5	
Green Mature (lb)	\$1.83	\$1.83	21	
Watermelon (each)	\$4.24	\$5.06	43	
Seedless (each)	\$4.54	\$5.46	26	
Zucchini				
(each)	\$0.74	\$1.08	94	5
(lb)	\$1.39	\$1.55	20	

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Pricing Information and Marketing Resources

The following websites can be good resources for growers seeking more information on pricing and marketing.

2010 Guide to Selling at Farmers' Markets (published by Growing for Market) @ <https://web.extension.illinois.edu/smallfarm/downloads/46912.pdf>

Farmers Market Coalition @ <http://farmersmarketcoalition.org/education/qanda/>

Market Farming Success - The Business of Growing and Selling Local Food, 2nd Edition, Lynn Byczynski @ <http://www.chelseagreen.com/market-farming-success-revised-and-expanded-edition>

The Packer – Vegetable Commodity Pricing @ <http://www.thepacker.com/vegetables/commodity-pricing>

Pricing for Profit (article by Craig Chase, Iowa State University) @ http://www.agmrc.org/business_development/operating_a_business/direct_marketing/articles/pricing-for-profit/

Pricing Your Farm Products (created by the Rutland Area Farm and Food Link) @ http://www.uvm.edu/newfarmer/marketing/marketing_resources/pricing_raffl.pdf

Rodale Institute - Organic Price Report @ <http://rodaleinstitute.org/farm/organic-price-report/>

Selling Farm Products at Farmers Markets (article by Matt Ernst, University of Kentucky) @ www.uky.edu/Ag/CCD/marketing/farmmarket.pdf

Understanding Organic Pricing and Costs of Production and other ATTRA publications @ <https://attra.ncat.org/publication.html>

USDA Agricultural Marketing Service, Fruit and Vegetable Market News @ <http://www.ams.usda.gov/market-news/fruits-vegetables>

University of Kentucky, Center for Crop Diversification @ <http://www.uky.edu/Ag/CCD/>

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Food Safety Updates

Produce Safety Rule: AGRICULTURAL WATER QUALITY – article 3 of 7

Agricultural water is defined, in part, as water that is intended to, or likely to, contact the harvestable portion of covered produce or food-contact surfaces. The Produce Safety Rule establishes requirements for water sources and microbial quality of water, including periodic testing and actions to be taken when such water is not safe or of adequate sanitary quality for its intended use. There are two sets of criteria for microbial water quality. Both criteria are based on the presence of generic *E. coli*, which can indicate the presence of fecal contamination:

Water directly applied to growing produce (other than sprouts)

- This criteria is based on two values, the geometric mean (GM) and the statistical threshold value (STV).
 - The GM is an average, and represents the average amount of generic *E coli* in a water source. **The GM level of tested water samples must show a value of 126 colony forming units (CFU) or less of generic E coli per 100 mL of water.**
 - The STV reflects the amount of variability in the water quality (indicating *E coli* levels when adverse conditions come into play, such as rainfall or a high river stage). It is best described as the level at which 90 percent of the samples are below the value. **The STV level of samples must show a value of 410 CFU or less of generic E coli in 100 mL of water.**
- The GM and STV values, when used, can account for variability in the data and allow for occasional high readings of generic *E coli*, making it less likely that a farm will have to discontinue use of its water source due to small fluctuations in water quality
- If the water does not meet these criteria, corrective actions will be required as soon as is practicable, but no later than the following year.
- Farmers with agricultural water that does not initially meet the microbial criteria have alternatives by which they can meet the criteria, and then be able to use the water on their crops
 - Allowing time for potentially dangerous microbes to die off on the field by using a certain time interval between last irrigation and harvest, but no more than 4 consecutive days
 - Allowing time for potentially dangerous microbes to die off between harvest and end of storage, or be removed during commercial activities such as washing
 - Treating the water

Water used during or after harvest

- **Water used for washing hands during and after harvest, used on food-contact surfaces, used to directly contact produce (including making ice) during or after harvest, and water used for sprout irrigation, must be free of generic E coli.** Should *E coli* be detected in the water source, such water must be immediately discontinued and corrective actions taken before re-use. The Produce Safety Rule prohibits use of untreated surface water for any of these purposes.
- Certain uses of agricultural water, where there is a possibility of potentially dangerous microbes being transferred to produce through direct or indirect contact, require that no detectable generic *E coli* be present

These two criteria are intended as a water management tool for farmers, for use in understanding the microbial quality of their agricultural water over time, and determining a long-term strategy for use of water sources when growing produce other than sprouts. The FDA is exploring the development of an online tool that farms can use to input their water sample data and calculate these values.

Questions/Comments:

The Food and Drug Administration has established a Food Safety Technical Assistance Network to provide a central source of information to support industry understanding and implementation:

<http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm459719.htm>

Next article in the series will address Agricultural Water Testing

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Less seriously...

- *Always listen to the experts. They'll tell you what can't be done and why. Then do it.* - Robert Heinlein
- *Why not go out on a limb? Isn't that where the fruit is?* - Mark Twain
- *I am no longer young enough to know everything.* - Oscar Wilde
- *One day Alice came to a fork in the road and saw a Cheshire cat in a tree. "Which road do I take?" she asked. His responses was a question: "Where do you want to go?" "I don't know," Alice answered. "Then," said the cat, "it doesn't matter."* - Lewis Carroll
- *Here are the opinions on which my facts are based.* – Anonymous
- *I'm at an age when my back goes out more than I do.* - Phyllis Diller

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