Organic farms in intensively managed agricultural landscapes are usually next to or surrounded by conventional agriculture. To prevent contact with a prohibited substance applied on adjoining farms, organic certification requires defined boundaries and buffer zones, which can be as narrow as a tree line or hedgerow 25 feet wide. Although such buffers may prevent the movement of soil and pesticide drift, insect pest populations move about the landscape in a much larger spatial scale; thus, pest management practices used in conventional farming can influence pest populations and control measures applied on organic farms. Presented here are case examples of how conventional pest management practices have both positive and negative impacts on organic farming.

Regional suppression of pests. Bt corn hybrids containing the bacterium Bacillus thuringiensis (Bt) genes are now planted in >90% of the corn acreage in the mid-Atlantic region. Expressed insecticidal proteins in the plant tissue provide 100% control of the European corn borer (ECB). Because corn is the major reproductive host plant of this insect, areawide adoption of Bt corn has significantly reduced population recruitment of corn borer moths that migrate to and lay eggs in other host crops. Bt corn provides only partial suppression of the corn earworm (CEW), which is more tolerant to the expressed proteins. However, larval development is significantly delayed in Bt corn, so surviving earworms pupate later in the summer, are triggered into diapause, and stay in the soil to overwinter; thus, fewer moths emerge to infest late season crops.

With data spanning four decades and across the mid-Atlantic region, a recent study (Dively et. Al. 2018) published in the Proceedings of the National Academy of Sciences analyzed trends in ECB and CEW activity, prior to (1976 – 1995; pre-Bt corn) and since Bt corn introduction (1996 – 2016). The study shows significant regional population suppression of both pests, resulting in potential benefits to conventional and organic vegetable growers. Mean nightly captures of ECB and CEW moths declined significantly from means of 6.8 and 7.5 moths respectively during 1976-1995 to less than 2 moths per night during 1996-2016, a net decline of 72 -75%. The decline in moth captures is significantly related to increasing percentage of Bt acreage planted. ECB damage in untreated sweet corn and peppers also declined as a function of Bt corn adoption. Using long-term data on ECB damage from insecticide efficacy trials, mean ECB damage in peppers in the mid-Atlantic region decreased significantly from
35% during 1980-1995 to 8% since Bt introduction in 1996, a 78% reduction. Similarly, mean sweet corn ear damage by ECB significantly declined from 50% during 1984-1995 to 15% since Bt corn introduction, a 70% reduction. Trends in control action based on blacklight trap counts of adult moths also showed a significant decline in the number of recommended insecticide sprays per crop cycle in each vegetable as a function of the percentage of Bt acreage planted. Furthermore, reported insecticide use in vegetable crops confirms the reduced usage over the past 25 years. In New Jersey, the total amount of insecticides applied in sweet corn and peppers declined by 79% and 85%, respectively. Taken altogether, the regional suppression effect of Bt corn adoption has had a positive impact on organic farmers by reducing ECB and CEW populations in their crops. Both pests have broad feeding and migratory behaviors as economically important pests on many crops, including field corn, sweet corn, popcorn, green bean, lima bean, cowpea, peppers, tomato, okra, potato, and soybean. Growers of these crops may also benefit from the regional suppression.

In addition to the regional effects of Bt corn, there are documented cases of more localized positive influences from conventional pest management practices on nearby organic farms. One case is the PRSV-resistant transgenic papaya that has been commercially grown in Hawaii since 1998 to control ringspot virus disease. Large-scale plantings of transgenic papaya provide a buffer zone to protect organic and nontransgenic papaya grown nearby. Virus-infested aphids feed on transgenic plants without causing the disease, which removes the virus from the aphids before dispersing to nontransgenic plantings. This has drastically reduced the amount of available virus inoculum and allowed growers to produce an economic crop of nontransgenic papaya. Similarly, organic farmers also could be benefiting by management practices used to control other crop diseases and possibly weeds on conventional farms. Arguably, overall weed pressure on commercial farms has been significantly suppressed by the herbicide tolerant crops, which have probably reduced the seed bank size of wind-dispersed weed species. In theory, this could reduce weed pressure on neighboring organic farms; however, to date there is no scientific evidence to document any positive impact.

Pollen contamination. As a potential negative impact, organic farmers have concerns about contamination of their crops, particularly sweet corn, due to the outcrossing of pollen from adjoining Bt corn fields. This route of genetic contamination depends on a number of factors, i.e. the distance between the Bt corn and organic crop, overlap in pollen shed, area of Bt corn around an organic farm, and the speed and direction of prevailing winds. It is important to note that corn pollen is one of the heaviest of the wind-pollinated plants, and pollen dispersal studies report that corn pollen deposition drops by 50 to 75% over distances of just 2 to 4 m from the field edge. A Greenpeace study in Germany found that Bt pollen contamination of organic corn declined to 2% and resulted in a contamination rate of 0.05-0.2% at 10 m. Pollen contamination is usually very low and easy to minimize by isolating organic crops both spatially and temporally from adjoining Bt corn. The organic farmer can plant sweet corn as an early crop to avoid high insect pressure later in the growing season or plant several weeks later than conventional farmers to avoid overlapping pollination periods; or not grow organic corn directly adjoining Bt corn. While these methods can limit the amount of pollen contamination, it is virtually impossible for organic farmers to grow an entirely pure crop. For this reason, the National Organic Program does allow a presence of GMO traits within organic crops as long as the organic farmer has met the required qualifications and regulations to reach certification. To date, there has never been an
instance in which an organic farm has lost its certification because of cross-pollination with GMOs.

**Pesticide drift.** A more serious issue for organic farmers is the off-target contamination due to the airborne movement of pesticides from a conventional farm. Pesticide drift has always been a recurring problem, even on conventional farms. An organic farm next to a conventional farm should have a buffer zone in place to reduce the risk. Talk to your neighbors concerning spray applications and explain that you have sensitive crops and would appreciate it if they would spray when the prevailing winds are light or are moving away from your land. It should be noted that drift problems could increase now that conventional producers are experiencing Roundup-resistant weed problems and may be switching to the new 2,4-D and dicamba-resistant soybeans. Because these broadleaf weed herbicides do not harm grasses, they are also commonly used for lawn and turf management, and along roads, powerlines and railroads. Under certain weather conditions, these herbicides can vaporize days after application and drift off-site and cause damage to non-target crops. To date, there have been few documented incidences of herbicide drift on organic farms in the Mid-Atlantic region. More restricted use directions will be placed on these herbicides for 2018.

**Insect resistance to Bt proteins.** As mentioned above, transgenic Bt corn engineered with genes expressing insecticidal proteins are a major tool in insect pest management. With its widespread use, insect resistance is a major threat to the sustainability of the Bt technology. For all Bt corn types, the high dose requirement for resistance management is not achieved for corn earworm, which is more tolerant to the Bt proteins. In a long-term Maryland study (Dively et al. 2016), Bt expressing sweet corn hybrids were used as in-field screens to measure changes in field efficacy and Bt protein susceptibility to corn earworm. Results show significantly increased susceptibility and reduced control efficacy of Cry1Ab Bt sweet corn to corn earworms, since its commercial introduction in 1996, and significant reductions in field performance of Cry1A.105+Cry2Ab2 sweet corn, particularly during 2015-2017. Supportive data from laboratory bioassays confirm that surviving earworms collected from Bt sweet corn are now 54 times more tolerant to the Cry proteins than a susceptible laboratory strain. Together, this rapid change in field efficacy in recent years and decreased susceptibility of corn earworm to Bt sweet corn provide strong evidence of field-evolved resistance in *H. zea* populations to multiple Cry toxins. Many conventional farmers either have stopped growing Bt hybrids or are applying more insecticide sprays to compensate for the reduced control efficacy. Additionally, since 2002, field-evolved resistance has been reported in fall armyworm for Cry1F protein in Bt corn, and bollworm (corn earworm) for Cry1Ac protein in Bt cotton.

The rise in insect resistance to the insecticidal Bt proteins has important implications for pest management in organic farming. There are 53 different Bt products listed on the OMRI website that are certified organic and may be used as a pesticide to control caterpillars and other insect pests. Many organic farmers use these insecticide sprays to control corn earworm and fall armyworm on several important vegetable crops, especially sweet corn, tomato, okra and cotton. Products such as DiPel, Javelin, Thuricide and others contain spores and active Cry 1 and Cry2 proteins that are biologically the same as those expressed in Bt corn. Thus, since they have the same mode of action, insect resistance to Cry proteins expressed in Bt corn and cotton has ultimately reduced the control efficacy of Bt insecticide sprays. Some organic farmers are experiencing this negative impact; however, Bt resistant populations of corn earworm and fall armyworm may be localized in the mid-Atlantic region to some extent and could change from year to year depending on the source of moths carried northward on weather fronts. Currently, this only affects control effectiveness of Bt sprays for corn earworm and fall armyworm; most products still work on cabbageworms, loopers, and other caterpillars.

**Insect resistance to conventional insecticides.** There are several examples of insect populations developing resistance to conventional insecticides that have negative impacts on organic insecticide use. Pyrethroid insecticides are commonly used in vegetable pest management to control insect pests. Because there are many inexpensive generic products, this class of insecticides has been used extensively to control corn earworm (also known as fruitworm on tomato, headworm on grain sorghum, podworm on soybeans, and bollworm on cotton). Resistance monitoring has been conducted over the last 15 years to track the efficacy of pyrethroids against this insect. When first introduced, pyrethroids provided 95 to 98% control of corn earworm, but currently control efficacy has declined to around 50% due to resistance development. For conventional farmers, it is becoming
increasingly necessary to shift to the more expensive and newer classes of insecticides. Pyrethroid insecticides are not certified organic; however, there are 23 pyrethrum products, such as Azera and PyGanic, on the OMRI list that are certified organic. These products are made naturally in contrast to the synthetic pyrethroids, but they use the same mode of action to kill insects. Thus, conventional use of pyrethroid insecticides has compromised the control efficacy of organic pyrethrum products, which affects many resistant insect pests in addition to the corn earworm.

Another example of how insect resistance development negatively impacts organic pest control involves the use of conventional insecticides that contain spinetoram (Radiant SC) or spinosad (Blackhawk, Consero, Conserve). These products have been commercially available for more than a decade, and both active ingredients have the same mode of action as 22 organically certified spinosad insecticides. One in particular is Entrust which is widely used in organic production. Unfortunately, conventional use of this insecticide class has led to resistance development in populations of several important insect pests (i.e. beet armyworm, onion thrips, western flower thrips). This means that products like Entrust are likely to have less control efficacy against these pests.

Emergence of new pests. Western bean cutworm is a new emerging pest that is increasing in population size and expanding its range from the Midwest eastward over the past decade. It has become a serious pest of sweet corn, legumes and dry beans in Ontario and parts of New York, detected in Pennsylvania with minor economic injury, but only first sightings elsewhere in the mid-Atlantic region. Most entomologists agree that the widespread adoption of Bt corn has led to this population shift. As an ear feeder, larvae are normally outcompeted in non-Bt ears by corn earworms which are highly aggressive and cannibalistic. In Bt ears, western bean cutworms are highly tolerant to the Bt proteins and able to survive due to the lack of competition with corn earworm. In effect, this shift in interspecific behavior has created a new pest problem for both conventional and organic farmers. If this pest reaches economic levels in the mid-Atlantic region, it will be very difficult to control with organic insecticides.

Syngenta Announces $1.51 Billion Dollar Settlement to MIR162 Class Action Suit

Paul Goeringer, Extension Legal Specialist, University of Maryland

The article is not a substitute for legal advice. This article is reposted from the University of Maryland Risk Management Education Blog.

In September 2017, Syngenta agreed to settle claims brought by U.S. farmers for bringing Viptera and Duracade corn varieties to market before approval in China. On March 12, 2018, Syngenta formally announced that it would be settling all U.S. corn growers, grain handlers, and ethanol plant claims for $1.51 billion. This settlement, from media reports, will include all U.S. corn farmers including those who opted out of the original class action suit and those who grew Agrisure Duracade Corn and/or Agrisure Viptera corn varieties. The settlement will be for a period starting after September 15, 2013, and continue through the 2017/2018 crop year. You are not required to retain an attorney to assist you in collecting on this settlement.

The settlement will include four classes defined as:

1. Growers who did not use Duricade or Viptera,
2. Growers who did use Duricade or Viptera,
3. Grain handlers,
4. Ethanol producers.
    Claims to three of the four classes will be limited in the amount that can recover.
1. Class 2 will be limited to $22.6 million,
2. Class 3 will be limited to $29.9 million, and
3. Class 4 will be limited to $19.5 million.

A bulk of the settlement will go to the growers who did not grow Duricade or Viptera corn seeds with Class 1 receiving at least $1.44 billion. If a person qualifies in two classes (for example you grew Duracade seed one year but not in other years) you are permitted under terms of the proposed settlement to collect in multiple classes as long as no duplicative recovery is collected. The settlement will not allow for recovery on silage or fed on-farm corn.

Producers in Class 1 and Class 2 will prove the amount they are entitled to recover by using USDA’s Form FSA 578. Form 578 determines the producer’s corn acreage minus any failed acres and silage acres. This acreage will be multiplied by the county average yield for the marketing year reported by NASS deducting the percentage of bushels fed on the farm reported by the producer, multiplying by the marketing year weighted average to get the recovery amount for that marketing year.

The weighted averages for each market year are:
1. 2013/14 – 26%
2. 2014/15 – 33%
3. 2015/16 – 20%

The weighted averages represent damage impact determined by the Plaintiffs’ economic experts during the course of the litigation. For example, if a producer seeking recovery had reported 100 acres on her FSA Form 578 with a county yield of 150 bushels per acre and no silage or fed on-farm corn reported in marketing year 2014/15, the producer is entitled in 2014/15 to a compensable recovery quantity of 4,950 bushels. At this time, a dollar value is unknown on that compensable recovery quantity. The recovery method for the other two classes (grain handlers and ethanol producers) will follow a different format. This overview will not cover those recovery methods.

Judge Lungstrum must still approve the settlement. If approved, a fund will be created to pay claims to farmers (possibly in early 2019). Ten days after approval of the settlement the first notice will be sent out. A producer will have 90 days after the first notice is mailed to opt-out of the settlement. Many growers may have already opted out of the class action, but will potentially need to opt-out again based on the language of the proposed settlement agreement. Claims are paid within 150 days of the first notice being mailed out. To notify corn growers, a mailing list of U.S. producers who received corn subsidy payments from USDA from 2013-2017 was obtained from USDA. The attorneys will also look at buying additional mailing lists of corn growers from ethanol plants and grain handlers.

As additional details are made available, I will work to update this post with the latest information.

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MD Grain Marketing Site Updated for 2018: Field Crop Budgets and Custom Rates

Shannon Dill, Agriculture Extension Educator, University of Maryland Extension, Talbot County

The University of Maryland Extension has updated www.extension.umd.edu/grainmarketing site with new input data for 2018 crop budgets. Also posted is the 2017 Maryland Custom Rate Survey.

**Crop Budgets**

Cost of production is very important when making decisions related to your farm enterprise and grain marketing. Enterprise budgets provide valuable information regarding individual enterprises on the farm. This tool enables farm managers to make decisions regarding enterprises and plan for the coming production year. An enterprise budget uses farm revenue, variable cost, fixed cost and net income to provide a clear picture of the financial health of each farm enterprise.

The 2018 Maryland enterprise budgets were developed using average yields and estimated input
cost based upon producer and farm supplier data. The figures presented are averages and vary greatly from one farm and region to the other. It is therefore crucial to input actual farm data when completing enterprise budgets for your farm.

**How to Use University Enterprise Budgets:**

The enterprise budgets can be used as a baseline for your operation. Make changes to these budgets to include your production techniques, inputs and overall management.

The budgets are available electronically in PDF or Excel online at [www.extension.umd.edu/grainmarketing](http://www.extension.umd.edu/grainmarketing). Use this document as a start or reference to create your crop budgets. If you have problems downloading any of these budgets contact information is located on the website.

**2017 Custom Rate Survey Now Available**

Financial and economic considerations such as limited capital, untimely cash flow, insufficient labor, small acreage or other reasons require farmers to hire custom service for field operations.

Custom work charges are determined by demand and supply and are negotiated between farmers and custom operators. The purpose of the publication is to provide information on custom work charges in Maryland and to provide data to assist in decision making regarding purchasing equipment.

**Custom Work Charges**

A mail survey was conducted in the fall of 2016 to determine custom works charges in Maryland. Rates were collected from 40 custom operators and farmers, and summarized for the state. Participants indicated the rates they charge for various field operations. The charges reported in this publication may serve as a guide in determining an acceptable rate for a particular job where little other information is available. The charges can also be compared with costs and returns and may be used as a basis for working out more equitable charges for both the custom operator and customer. These are available online at [www.extension.umd.edu/grainmarketing](http://www.extension.umd.edu/grainmarketing) or contact your local Extension Office.

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**Early Season Scouting For Wheat Diseases**

*Andrew Kness, Agriculture Extension Educator, University of Maryland Extension, Harford County*

![Figure 1 (left). Powdery mildew growth on lower leaves/stems of a wheat plant (red arrow). Image: Mary Burrows, Montana State University, Bugwood.org](image)

Spring is a busy time on the farm that demands a lot of different tasks; one of the tasks that can be overlooked is scouting your small grains now for the presence of diseases. For a few select diseases, scouting now could pay off later in the season.

Most of the wheat in Maryland is somewhere between Feekes 5 (green up) and Feekes 6 (jointing), and most has received its first shot of nitrogen. This is the perfect time to scout your fields for foliar diseases like powdery mildew and the leaf blotch complex diseases.

Powdery mildew (Figure 1) is one of the more common diseases of wheat in our region and it's...
important to keep tabs on it early in the growing season. The fungus that causes powdery typically colonizes wheat in the fall when the plants are small, then goes dormant inside the plant over the winter. Green up is the perfect time to scout for powdery mildew because you will be able to see the powdery white tufts of fungus growing on your wheat plants (Figure 1). These signs are typically observed close to the crown deeper in the canopy and/or on plants that are in double-planted pinch rows or headlands. The disease is often more severe on over-fertilized fields, too. It is good to scout for the presence of powdery mildew now, but do not treat until the wheat begins to joint. Powdery mildew will not begin actively growing until the wheat plant comes out of its winter slumber and begins rapid growth (jointing, Feekes 6), and fungicides have little to no activity on dormant fungi, especially the DMIs. Instead, hold off on a fungicide application until your second nitrogen application at jointing. If you only notice a few sporadic instances of powdery mildew now, you may not even need to treat at jointing, especially if weather conditions are dry and hot (powdery mildew requires moist, humid, and mild temperature conditions to grow). If you decide to hold off on a Feekes 6 application, you’ll still want to keep an eye on it, especially as the flag leaf emerges. The top three leaves, especially the flag leaf, contributes to nearly all of your yield.

Also, know your wheat variety because there are significant differences in resistance and tolerance. Data from University of Maryland, University of Delaware, and Virginia Tech can help you determine your wheat’s susceptibility. In addition, varieties containing the pm6 resistance gene have broken down and are no longer providing adequate resistance here in the mid-Atlantic region, so consider those varieties susceptible.

Similar management should be taken against the leaf blotch complex diseases. If you find them now, hold off on a fungicide application (if at all) until at least Feekes 6. And again, protecting the flag leaf is your main priority, so if the disease is slow to progress due to inadequate weather conditions or host tolerance and the disease is present at low levels, then a fungicide application at Feekes 6 may not be warranted at all. Also, the fungicides we commonly use to manage Fusarium head blight/head scab (DMI, group 3) will also work on powdery mildew and the leaf blotch complex; so our fungicide applications at early flowering typically do a good job at keeping these diseases from progressing to the flag leaf. However, if you see these foliar diseases creeping up closer to the flag leaf prior to head emergence and flowering, then you may want to consider an additional early fungicide application other than your flowering application to manage head scab.

Another factor to consider when using additional fungicide applications is cost. Recent research in Delaware found that a two pass program at Feekes 6 and 10.5.1 did not yield a return on investment until wheat prices exceeded $5.00/bu.

For help with identifying diseases on wheat, you can send samples to the University of Maryland Plant Diagnostic Lab, or call your local Extension Agent.

Job Search: Nutrient Management

Searches are underway to fill four Nutrient Management Advisor positions in four UME offices. Applicants should go to ejobs.umd.edu and search by the posting number listed below to apply.

- Anne Arundel County (# 123711)
- Carroll County (# 123710)
- Somerset County (# 123714)
- Wicomico County (# 123259)

Nutrient management advisors develop nutrient management plans for agricultural producers to balance nutrient inputs with crop requirements, thus enhancing production potential, improving farm profitability, reducing excess nutrient inputs into the Chesapeake Bay and enabling producers to comply with the Water Quality Improvement Act of 1998.

Minimum Qualifications:

- BS in an agricultural, environmental or natural resource science.
- Personal transportation and a valid drivers license.
- Knowledge of agricultural production practices and cropping systems.
Currently, about 25% of the State is abnormally dry and about 2% is in a moderate drought. Temperatures have been unusually cool for March, and the one-month outlook predicts 33% cooler than normal temperatures through April. Much of the State is predicted to receive 33-40% more precipitation than normal for the month of April. These predictions suggest a cool and wet start to the planting season in Maryland.
Even though the calendar says spring, the weather does not always cooperate. Snow is predicted to hit some parts of Maryland later this week, particularly Northern Maryland. Producer’s may be wondering what the risk for damage may be to their wheat with this late snowfall event.

Winter wheat is of course a cold-hardy crop. A good stand of wheat that was planted at the proper depth and has two or more tillers going into the winter has a very high tolerance for freeze injury; down to about −10°F. As the plants come out of their winter dormancy and begin to green up, their tolerance drops to about 10–15°F. Once the wheat reaches Feekes 6 and begins to joint, the main growing point and the grain head emerge from beneath the soil surface, thus exposing the most important parts of the plant to the elements. Once wheat reaches this stage, the plants can only tolerate temperatures as low as 15°F at the beginning of jointing, and 28°F towards the end of jointing.

For wheat that has jointed, exposure to temperatures below 28°F for more than two hours can cause noticeable damage, including leaf burn, which is mostly cosmetic and plants will generally grow out of it if sufficient nitrogen is present; but in more severe cases the developing grain head can be injured. In this case, significant yield reductions will occur.

To assess the damage after a spring freeze, pull back the leaves and stems from the main tiller of some wheat plants, exposing the developing grain head. A healthy grain head will be plump, turgid, somewhat green/green-yellow, slightly translucent, with very distinct and well defined edges (Figure 1). A freeze-damaged grain head will be limp, shriveled, milky discoloration, and will not be well defined (Figure 1). Note that these growing points are very small, so you’ll likely need a hand lens to observe these structures and a very sharp razor blade to do the dissections.

Dr. Carrie Knott, agronomist at University of Kentucky, has a great instructional video on how to dissect a wheat plant and assess freeze damage. The video can be found here.

The Maryland Department of Agriculture will partner with Garrett Soil Conservation District, University of Maryland Extension and U.S. Department of Agriculture to host a manure injection workshop and demonstration field day on Tuesday, April 17. Registration will begin at 9:30 a.m. and demonstrations will run from 10 a.m. to 4:30 p.m. at the Mast Farm, 3108 Hare Hollow Road, Grantsville. Participants should register no later than April 13 by calling the Garrett Soil Conservation District at 301-334-6951.
Other Publications & Resources From University of Maryland Extension

University of Maryland Vegetable & Fruit Headline News (published monthly during the growing season)

University of Maryland TPM/IPM Report (published weekly during the growing season for nurseymen and greenhouse growers)

Great resources are just a click away!

Maryland Grain: http://extension.umd.edu/grain

University of Maryland Agronomy News Blog: http://blog.umd.edu/agronomynews/

Agriculture Law: http://extension.umd.edu/aglaw

Agricultural Nutrient Management Program: http://extension.umd.edu/anmp

Women In Agriculture: http://extension.umd.edu/womeninag

University of Maryland Plant Diagnostic Laboratory: http://extension.umd.edu/plantdiagnosticlab

If you have any requests or suggestions for future articles, contact Andy Kness at: akness@umd.edu or (410) 638-3255.

Who's my local ag agent?

The University of Maryland, College of Agriculture and Natural Resources programs are open to all and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, or national origin, marital status, genetic information, or political affiliation, or gender identity and expression.