Reminder on Calculating Fertigation Rates for Plastic Mulches:

Every year about this time of year, I start to get the question about fertigating vegetables being grown in plastic. I thought it might be time to dust off an old article on figuring out the correct amounts of fertilizer we need to be using, especially on our plastic mulched crops. Fertigating or the injecting of fertilizers into drip irrigation water with crops grown on plastic mulches is a very common and simple practice these days, however achieving the right balance can be tricky. Too much fertility at the wrong time and you could end up with a beautiful plant and no fruit which can happen in tomatoes and peppers or too little and you might not have achieved the optimal yields or quality you were looking for. Below are some general "rule of thumb" reminders when using fertigation:

1.) As mentioned above, some crops given too much fertility at the wrong time can result in the wrong results you are looking for. Peppers, eggplant and tomatoes in particularly susceptible to over-fertilization, especially in their early growth stages. For these crops I recommend that fertigation be held back a little bit until you start to see fruit set – after this stage is reached, the chances of over fertilizing and sending the plant into vegetative mode is greatly reduced.

2.) We tend to concentrate on nitrogen for fertigation, but don't forget that potassium is a key component in many vegetable crops and is critical for optimum growth but also is responsible for flavor and improved fruit quality including shelf life and storability. You calculate potassium rates just like you do nitrogen.

3.) **Calculating fertilizer needs where plastic mulches and drip irrigation is used:** The key to remember when trying to figure out how much fertilizer to dissolve in your bucket for a crop planted into plastic mulch is, it is **not** the same as a "field acre". You should only calculate the fertilizer needs for what is covered by the mulch.

   a. Determine your bed top width is or the area across that your mulch covers. For example, if you are using a Rain-Flo raised bed maker, a typical bed top width might be 30 inches or about 2.5 feet. There are other machines and other systems that might use a different width so you need to go out and measure it.
   b. Take this value and multiply it by the row length and finally multiply that by the number of rows per section that you irrigate at one time or "zones".
      i. For example, if my bed width is 2.5 feet, my rows are 345 feet long and I have 5 rows per section then my total acreage would be (2.5 x 345 x 5) divided by 43,560 (number of square feet in an acre) which would be 0.1 acres!

4.) **Determining fertilizer needs:** When we talk fertilizers we usually say something like, "I should give that field 7 lbs. of nitrogen". That means 7 lbs. of what we call "actual" nitrogen. If you had a fertilizer that was 100% nitrogen, then you would use 7 lbs. of that fertilizer to treat an acre. However, most of our fertilizers do not have a 100% analysis and may be a blend with an analysis of 20% nitrogen, 20% phosphorous and 10% potassium or a 20-20-10 analysis. The other way to look at it is because these are percentages, there would be 20 lbs. of nitrogen, 20 lbs. of phosphorus and 10 lbs. of potassium in every hundred pounds of the fertilizer product.

   a. If I need to apply 7 pounds of actual nitrogen (per field acre) and the analysis of my

nitrogen source is 20% nitrogen, I divide 7 pounds by 0.20. Where did I come up with .20? Again, because fertilizer is usually expressed as a percentage, you need to express it as a decimal in order to do the math. One way I remember this is "what I need" divided by "what I've got" or 7 lbs. nitrogen/0.20 lbs. actual in my analysis which is 35lbs of 20-20-10 to get 7 actual lbs. of nitrogen from the fertilizer I've chosen.

5.) **STOP! This is where it gets tricky:** That means for one <u>field acre</u> I would need 35 pounds of this fertilizer. **BUT**, because I'm only treating the acreage that is covered by the mulch, I actually only need to dissolve 3.5 pounds of this fertilizer to get my 7 pounds of nitrogen per acre. Why? I only have 0.1 acres to actually treat (the value we determined in step 1) so if you need to multiply your actual acreage (0.1 acres) x the amount of fertilizer needed for an entire acre (35 pounds) = 3.5 pounds of actual 20-20-10 to dissolve in solution**. If you didn't use the 0.1 acres as you treated area, you would be putting on almost 5 times the rate that you needed!**

6.) **Putting it all together:** Let's do one quick situation that might be the easiest to follow:
   - **a.** I have 25 rows, 190 feet long covered with plastic mulch. My top bed width is 2.5' wide. The acreage I want to fertigate then is 25 x 190' x 2.5' = 11,875 square feet. 11,875 sq. feet /43,560 sq. ft. =0.27 acres of mulched beds to be fertigated.
   - **b.** My fertilizer is Urea which is 46-0-0 or 46%. I want to supply my tomatoes with 15 pounds of actual nitrogen: 15(what I need) divided by 0.46(what I've got) = 33 lbs. of Urea.
   - **c.** What to dissolve in my bucket: Remember 33 lbs. would be if I was treating an entire acre – I'm not – we are only treating what is covered under the plastic or what we determined in calculation a: 0.27 acres. So, the total amount of urea I need to dissolve is 33 lbs. per acre x 0.27 acres = 9.0 lbs. of urea!

Some other things to remember:

1. Before you go through all the work to plumb in a fertigation unit on your drip system, make sure that the unit you purchase meets the required "gallons per minute" (GPM) needs otherwise it will not operate correctly! For example, if you purchase a Mazzi injector that needs 10 GPM and you are only irrigating a section at a time that is only using 8 GPM, there is not enough flow rate to syphon the fertilizer solution into the main line.
2. Make sure the system has been turned on long enough to pressurize it completely. Failure to do this will result in all of your fertilizer solution getting sucked up all at once and only going to a couple rows.
3. The longer the fertigation event can occur the better the distribution of fertilizer will be. That means if a typical irrigation event for you is 3 hours, then try to have the fertigation happen during the majority of this run time minus the full pressurization and time at the end to make sure the lines are flushed. Minimally I would like to see 15—25 gallons per acre of water used to dissolve your fertilizer to help ensure the best distribution of fertilizer. If you can use more than great!
4. Know your irrigation waters pH: this is something that I know many of us do not do often

enough and is a critical factor in nutrient uptake when fertigating. Most crops optimally mine most nutrients (in particular nitrogen and potassium) at a pH of 6.2—6.5. If your irrigation water is above that, you may not be getting the biggest bang for your buck with your fertigations. You can use either sulfuric acid or citric acid to help acidify your water and use the online alkalinity calculator to get your acid concentrations. Be sure to follow all directions on the calculator and pay careful attention to the pull down menus on the input side to get the correct recommendations.

5. Tissue testing: Many of the vegetable crops that we grow have established levels of what the plant should have. I think tissue testing should become a normal routine on many of our farms where we are just doing what we've always done. I know the few growers that have actually got on a tissue testing program have notice the returns very quickly with not just yield, but overall quality of their fruit.

In my opinion, I think weekly fertigation (which some growers are doing) and spoon feeding our plants is a better way to go instead of applying a large dose of fertilizer a couple times a season. It might be that this constant feeding and watering, may improve not only yield but fruit quality as well. Large doses of fertility on certain crops may lead to issues such as fruit cracking (tomatoes) or over vegetative growth. If you need help calculating rates or have questions about these recommendations or need recommendations for other crops, please feel free to contact Chuck Bornt at 518-859-6213.