## What’s Growing ON? – Episode 5 Transcript

## INTRODUCTION

*Music intro*

***Kristy:*** This is What’s Growing ON? A show where we dig up the latest dirt on Ontario horticulture production, helping producers navigate best management practices and taste the sweet success of a quality crop. My name is Kristy Grigg-McGuffin.

***Cassie:*** And I’m Cassie Russell. Join us as we talk to specialists in the field of fruit, vegetables and specialty crops to find out what’s really growing on.

*Music transition*

***Cassie:*** Welcome to episode 5 of What’s growing ON. Today we are doing something a little different. Instead of two guests covering topics on fruit or vegetables, we have one very special guest that Kristy got to interview who dips their toes into production of a variety of different horticultural crops

***Kristy***: Good try at a pun there Cassie. But yes, I will be talking all things irrigation today with Water Quantity Engineer, Rebecca Shortt. This will be applicable to a variety of different fruit, vegetable and speciality crops as Cassie mentioned and definitely a timely topic as we continue through this heat wave.

So with that, lets jump into some quick crop updates first as of Friday July 10, 2020 and Cassie, I think it’s your turn to start us off with vegetables.

## CROP UPDATES (Vegetables)

It’s still hot out and across the province, irrigation pumps have been working overtime and hopefully we will see some relief with some rainfall in the forecast over the next couple days. It’s always helpful to keep in mind during these prolonged periods of hot and dry conditions that insect pest pressure can get out of hand quite quickly. A lot of those generalist pest insects such as aphids, thrips, spider mites and leafhoppers can complete their life cycle and multiply rapidly. They are also able stick around a little longer since they aren’t getting washed off the plants by rain events. That being said, as those pests are affect a variety of vegetable crops and can also help spread other pathogens to weakened plants, make sure you’re on the lookout and staying ontop of issues as they arise by scouting regularly.  For cucurbits – Downy Mildew has now been found in Ontario: it was found in Kent County on July 6th followed by Elgin and Norfolk County on July 7th. There also continues to be confirmed cases in Michigan and New York. Check out the onvetetable.com post from June 22 for more details including spray recommendations as growers should now be using downy mildew specific fungicide programs in the Great Lakes region. And we will be covering downy mildew on next weeks vegetable segment of the podcast. If you have specific questions you’d like us to answer, please send us an email to [ONhortcrops@gmail.com](mailto:ONhortcrops@gmail.com).     
  
Hand-harvest of cucumbers is now underway in all growing regions. Make sure you continue to scout for virus and bacterial wilt symptoms and infected plants should be removed before insect pest populations built up and spread those pathogens to healthy plants.

Sweet corn is experiencing moisture stress in many areas and anticipated storms should provide some relief. Lepidopteran and other pest populations continue to build: Look for European Corn Borer damage starting in Univoltine and overlap regions, as well as Corn Earworm and Western Bean Cutworm. for detailed information on lepidopteran pest presence and flights, refer to the Great Lakes and Maritime Pest Monitoring Network for updates.

In Carrots; It’s shaping up to be a carrot oil kind of year for weed control. Carrot stands are all over the place and pre-emergence activity was poor in later seeded carrots due to the dry conditions.  A link to the carrot oil label was provided on our July 9th vegetable crop report and for a refresher on weed control in carrots, listen back to our vegetable segment in episode 2 of our podcast with Dennis van Dyk.

Potato growers have started to see heat related disorders show up in fields such as re-sprouting, tuber chaining and heat sprouts. Many fields are at a critical time of tuber initiation or bulking and so those water demands are high and critical to fulfilling yield potential. And as another reminder, be on the lookout for flush of potato leafhoppers if you have haying in the area.

For Brassicas – The dry weather has caused some heat stress that has resulted in wilt in many fields. Not only is wilt caused by extreme temperatures, it can also be caused by cabbage maggots, wireworms, clubroot and other pests/pathogens that are targeting the roots or a combination of several variables. It is a good idea to dig up wilted plants with a shovel and examine roots to see if any pests are present or if the wilt is caused from the heat. Lepidopteran pests are present many fields, mainly imported cabbage worm and diamondback moth. Softrot and white mould are active in some areas and Alternaria has been observed in some fields. Keep an eye out for thrips  - once again as the hot, dry weather can allow for populations to increase rapidly.

For Onions, With adequate moisture plants are growing quickly with many direct seeded fields past the six leaf stage and some as far as 8 leaf. Stemphylium leaf blight has been observed in most fields. Refer to the vegetable crop report from June 25 for more information about Stemphylium. Purple blotch, pink root and onion smut have been observed. The second generation of onion and seedcorn maggot has reached its threshold in several regions. If you are controlling for thrips, make sure you apply no more than two consecutive insecticides from the same IRAC group as thrips have a relatively short life cycle and are at a high risk of developing insecticide resistance.

In Garlic – With some early cultivars being harvested and the bulk of the crop harvested over the next couple of weeks, there are a few things to keep in mind; the ideal time to harvest porcelain cultivars (such as Music) is when 50% of the leaves have senesced or turned yellow. Since it takes several days to harvest, many growers start at 40% and by the time the crop is fully harvested it may have reached 70%. Harvesting later you do risk the plant lodging which makes it more difficult for bulbs to be picked up by belt harvesters. Leaving the crop in the ground longer is also a risk since moisture can degrade the bulb wrapper before trimming and cleaning. If black plastic has been used for weed control, cutting it open to allow the soil to dry before harvest can also help with harvesting and trimming; but be sure to check the weather forecast as opening up the plastic before a heavy rain could have the opposite of the desired effect.  
If you are seeing black spots on the leaf tips in some fields, this is likely Alternaria lesions colonizing the senesced parts of the leaves (picture below). If leek moth counts were high last week, consider targeting the larvae that are now feeding on the crop. by targeting these larvae on the crop now you are reducing the amount of overwintering moths and the potential damage to future crops. As well, a lot products such as Matador, Delegate, Entrust, Successs, XenTari, and Bioprotec are most effective when they make contact with the larvae. But Be sure to check the pre-harvest interval (PHI) of these products and ensure that the crop will not be harvested before the PHI has elapsed.

OK, I think that covers most of it Kristy. On to you for some fruit updates!

## CROP UPDATES (Fruit)

***Kristy:*** As Cassie has already mentioned, this heat wave has really been the focus for many growers across the province. Dry conditions can impact fruit size, decrease yields and impact fruit quality. This is usually because of the higher sugar levels in the fruit due to little water and high sun. It can also impact growth – for example, we’re starting to see fruit trees shutting down early, shoot growth in grapes is reduced and in strawberries adequate moisture is needed after renovation for runner development. Dry conditions can impact general plant health – for example, plants become more susceptible to other stresses like insect feeding or certain pathogen development. As well, impacts of dry conditions can extend into next season for perennial crops and affect fruit bud development for next year’s crop.

June-bearing strawberry harvest is winding down and many pick-your-own operations are closing for the season. Despite the hot weather, growers had a great season of pick-your-own so looking forward to this interest continuing into other berry crops especially now that raspberry and blueberry harvest has begun in southern Ontario. Renovation has started on early strawberry varieties. This is a good time for managing some pests such as spotted wing drosophila, cyclamen mites as well as weeds. Angular leaf spot and powdery mildew were reported this week. Check new and fruiting fields for signs of these diseases.

In grapes, shoot thinning and positioning and leaf removal is on-going in Vitis vinifera cultivars. Symptoms of water stress are becoming more obvious, including tendrils drying up, drooping leaves, leaf blanching and leaf senescence. Grape mealybugs are at the egg cluster stage so now would be a good timing for Movento if grapevine leafroll virus has been detected. Japanese beetle have started feeding on young leaves and second generation grape berry moth emergence has begun.

Sweet cherry harvest is on-going and tart cherry, plum and apricot harvest will begin very soon. Both pome and stone fruit have been sizing well though crop is variable for many.

The hot, dry conditions have not been particularly conducive to disease development in tree fruit. But that said, there are still many apple and pear blocks with actively oozing fire blight strikes, apple scab lesions can be found, bacterial spot infections are in peach, nectarine, apricot and plum blocks and this heat is optimal for bitter rot infection of apple. With sudden and heavy rain showers, growers could find themselves in a sticky situation if fungicide protection is not there. Try to stay ahead of forecast rain to protect from new infections.

Similar to Cassie’s vegetable report, we are seeing an increase in insect populations that prefer the hot, dry weather including mites, potato leafhopper and Japanese beetle. Second generation oriental fruit moth flight has started and apple maggot catch has picked up in some regions across the province.

*Music starts to fade in*

***Kristy****:* For more detailed information on these and other fruit and vegetable crops, check out our weekly crop updates at onvegetables.com and onfruit.ca.

## SEGMENT 1: Irrigation

***Kristy:*** In today’s special edition for What’s Growing ON?, I’m joined by Rebecca Shortt, OMAFRA’s Water Quantity Engineer to talk about what I’m sure is top of mind for many fruit and vegetable growers in the province right now – and that’s irrigation.

Welcome Rebecca. Thanks for being here.

***Rebecca:*** Thanks for having me.

***Kristy:*** So, I’m sure this is not going to come as a surprise to many but it’s hot and dry out there, if you haven’t noticed! Just to start, do you have an idea of how this year is comparing to the average year in terms of precipitation?

***Rebecca:*** Yeah, so certainly we’re seeing lower than average precipitation. If we look at the past 30 days – prior to July 8th – for southwestern Ontario, there has been some rainfall in the Essex area but east of there along the north shore of Lake Erie, we’re looking at below 85% of normal precipitation. In fact, much of that area from Norfolk through Niagara is in the 40-60% range in terms of average precipitation. And that is similar for all of Eastern Ontario. All of Eastern Ontario is in the 40-60% of average in terms of precipitation for the month of June. We look at even tougher conditions from Ottawa and further east of Ottawa towards Montreal. Very, very dry. There, we are looking at under 40% of their typical precipitation.

So, we’re looking at quite dry conditions right now. Although there are some thundershowers forecast, the long range forecast is for continued dry conditions into August; although, hopefully some moderating of the temperatures. And then warm and dry conditions are forecast through into the fall – so September and October – as well.

We’re looking at certainly the need to irrigate where it’s possible and some difficult conditions in terms of moisture for crop production.

***Kristy:*** When I think of the classic “dog days of summer”, I always think of end of July and into August. To say that we’re seeing 40-60% of average precipitation in June, is that earlier than usual? Are we seeing this pattern earlier?

***Rebecca:*** This would be similar to some previous drought years if we look at 2016, 2012, 2007. Certainly in 2016, we had very little rain for a good 6 week period in June through July time period. So it’s similar to some of those other years where we’ve had low precipitation.

We’ve had quite a bit of heat this year but the one thing that’s a bit of a saving is that it has been quite humid and the humidity it actually – it’s hard on us as humans being outside, working outside – but it’s not as difficult on the plants. So, in 2016 we had some very unusual weather at the end of July where we had very hot as well as relatively low humidity and also windy. Which for us, it feels great; once you finish work, you stand in the shade, you feel refreshed, you feel a bit of a breeze. But for the plants, that’s desiccating. The lower humidity, the winds coming, that’s forcing a lot of evapotranspiration. Often in Ontario, we’re often a bit surprised, even in the hot weather because that high humidity is causing the driving force of the plant to not be quite as high as if we had lower humidity conditions. But we’ll see what the next few weeks bring.

***Kristy:*** Ok, so if we’re getting this higher humidity, there may not be as much stress on the plants as in a drier year?

***Rebecca:*** Right. And also if you might have very hot conditions but if you have some cloud cover for example, again the plant is not going to be transpiring as much because solar radiation is another part of the equation of the potential of evapotranspiration.

There’s one place right now where you can get ET values and that’s at ONpotatoes.ca. There’s still a limited number of stations within southwestern Ontario. You can click on there and see the previous day’s potential evapotranspiration. That gives you a value in millimeters. So, you can imagine if you have a 1 acre field and you evapotranspired by 5 millimeters, then you know how much water you need to replace on that field.

***Kristy:*** Can you just go back to basics for a second and describe what exactly is evapotranspiration?

***Rebecca:*** Excellent question. Evapotranspiration is the water that is lost both from the surface of the soil and the plant, as well as water that’s transpired through the plant. When we talk about potential evapotranspiration, that’s a measurement that is – because of the weather conditions – what would drive the plant to use water if it had water available to it. So, it’s potential because of course if the plant doesn’t have water, it won’t actually transpire. But it’s potential if the plant does have water, it will transpire at the rate we expect which is based on temperature, relative humidity (the lower the humidity, the drier it is and the more the plant is going to transpire), wind or wind speed, and solar radiation. So, those are the 4 factors that are measured.

In many weather stations, you won’t be measuring solar radiation. There’s different ways that are quite complex calculations to get the evapotranspiration and there are different formulae that can be used so it’s a bit of a complex task. I do recommend using an existing product. Unfortunately, a number of the services we had reporting on evapotranspiration data are no longer available and so ONpotatoes is one of a few that’s there.

If people are interested and you have your own weather station, I’d be happy to help you establish a spreadsheet to make those complex calculations.

***Kristy:*** Oh, very cool. So, kind of along that line, you recently posted a great article on the ONfruit blog – which by the way I think you just created an awesome tag line and I’m going to use it. Are there ways for a producer to get the most crop out of every drop of irrigation?

***Rebecca:*** Yes! So, I think there are 3 things that I wanted to highlight this summer. The first is measuring how much water you are actually delivering to your crop using either buckets or bowls. The second is scheduling your irrigation with soil moisture instruments and/or evapotranspiration data like we just talked about, or both. And the third is to use a water meter to make sure that you’re measuring and recording your water use so you can compare how you did this year compared to other years.

***Kristy*:** Why would a grower care about their irrigation? Why is that important?

***Rebecca:*** Especially in years like this year where it’s very dry, you want to make sure that you’re making the most use of every drop that you’re pumping. The pumping costs money and you don’t want to be under irrigating and potentially losing profitability. You put a lot of money into the plants already with fertility, crop protection, etc and you want to make the most of that. So, it’s really important to get the most crop per drop.

***Kristy*:** See – it’s a good tag line! Well, and I’ve heard from a number of growers that are saying that their irrigation ponds are starting to get pretty low so it is really important. You have to salvage everything that you’ve got.

***Rebecca:*** So, that’s an added consideration if you have a limited water supply. That’s an added reason why you want to be very conscious that every drop you’re using is going to the right place, at the right time and making the difference that you need.

***Kristy:*** So, is it just assumed that when you put down your irrigation lines or start your gun system, it’s uniform across the field? No issues and everything is getting exactly what it needs? Or what work actually goes into determining are you for sure getting the right amount to each plant?

***Rebecca:*** I think that’s a common assumption. Often people, they get an irrigation system and it gets installed, set up and turned on. There’s this assumption that it’s going to work as expected. When things are new, often they do work quite well. But there is no way of knowing unless you actually measure it. I have seen drip systems where portions of the field have been receiving no water. I have seen traveling gun systems where there was inappropriate overlap between the pulls and some areas were receiving twice as much water as was needed while other areas were getting almost no water.

So, my observation in Ontario is that the biggest risk has been portions of the field that are not getting the water we would expect. A lot of the time, like in a year like last year in 2019, you would not have noticed because it was a wet year. Or even some years where we have a bit of dry, it’s a small difference that we may not really see. But in years where we get a number of weeks without rainfall, that’s when we’ll really start to see the impact. So, I’d like to see growers get ahead of that. Rather than experience a negative consequence, how can we get ahead of that and ensure every year our irrigation system is set up so that we’re covering all of the crop that we’ve invest in.

***Kristy*:** Then are there ways that a person can do that? Like let’s start with a sprinkler or travelling gun system, are there ways that they can measure?

***Rebecca:*** With a sprinkler or travelling gun system, you want to use buckets. You know, your typical buckets of about 30 cm diameter opening. And they all have to have the same size – same opening and same height. Otherwise, you can get some weird results. With a travelling gun, that’s very common in vegetables but also sometimes used in tree fruit, you want to set up a line of buckets perpendicular to the travel path and you want to be able to capture all the water you are putting on, right out to the edge.

Once you’ve collected all that water, use a graduated cylinder to measure how much was in each bucket and write that all down. Then think about when I have my next pull beside, what would have gone in on the sides to see how much overlap you’ve had.

With the travelling gun and the sprinklers, a lot of the uniformity is about ensuring that you have the right amount of overlap. Generally, what I see are people don’t have enough overlap either between the pipes with the sprinklers on them being too wide or too spaced apart, or with the travelling gun with the lanes too spaced apart. What happens there is you get a lot of water going near to the sprinkler line or right near to the travelling gun but on those edges, you have very little water. And sometimes, what I see people doing in order to compensate, is they’ll just put a lot more on. Basically, they’re overwatering in the middle and maybe getting almost enough at the edges.

***Kristy:*** Ok, because the edges are where you need that overlap to add in that extra volume.

***Rebecca:***  So, in the blog post, I went through an example. I had a grower and with their particular gun, they were having exactly that situation. I showed them that in that field, instead of 2 pulls and running those pulls for a slow rate so you’re getting a heavy application, it would be better to do 3 pulls – that’s 3 laneways that are going to be irrigated and more overlap – but you have the pulls go faster. So, you’re applying less in each pull but you’re going to get a nice even application because now those edges are all going to be overlapped. Before the grower was applying 3” in the middle and almost none in the edges of his pull, now with 3 pulls instead of 2, he was applying almost completely evenly 2” over the whole field.

***Kristy:*** Wow – amazing! And that’s a pretty easy change.

***Rebecca:*** Right, because that’s what we’re looking for when we’re looking at the distribution in uniformity. We’re looking at if every plant is getting enough water; we’re looking for things we can fix. There are things that we can’t fix. Sometimes you have a field and just because of the size or the shape, it’s just not going to be possible. But there are opportunities to improve and we’ve seen the exact same situation with sprinklers. Typically you’re set at 60x60 but you might not get enough coverage. Maybe you have a crop where you’re irrigating a lot during the day and you have more wind disturbance so another good reason to bring those sprinklers together and have better coverage because you’re going to get less distortion. You don’t know unless you measure.

It’s not fancy equipment. It’s plastic buckets. I got mine from Dairy Queen from their strawberry topping. But you need a good number of buckets. Ideally you set your buckets out in something that’s a multiple of 4. I’ve used 24 or 40 buckets because then you can nicely calculate what we consider the classic Distribution Uniformity.

So, if I set out 40 buckets, for example, going cross-wise across my travelling gun lane, then when I measure how much is in each bucket with the graduated cylinders and then I calculate how much overlap I would have had. Then you look at all those numbers and convert that to the depth because then it’s easier to visualize. So, you take the volume of water in ml and divide by the area of bucket opening (Area=πr2) in cm2. And that will give you the depth in cm of how much water occurred in every spot that you measured. Now I can see right away, I’ve got 5 cm near my gun and only got 2 cm occurring along the edges and there’s a few buckets on the west side that only got a little bit because the wind was blowing. Then you take those 40 values and take out the lowest ¼ of them, or 10 lowest. Take the average of those and divide it by the average of the whole set of values. That gives you an idea of how different those lowest values are compared to the average of all the values. If there’s a really big difference – if you’re only getting 65% or lower – you’ve got an issue; you’re not getting good uniformity. If you had perfect uniformity, you’d have 100% because the average of the low values would be the same as the average of all the values.

So, that’s a good way of fully assessing whether you’re getting good coverage or not. You could just use the buckets and measure. You don’t have to do all the calculations. But if you don’t even put out a bucket and measure, you won’t know. Is your gun or your sprinklers even putting out what you think they are? You think, ok I turned it on this long, I’m getting 2”. Maybe it’s not. Maybe there’s been wear. Maybe there’s plugging. All these types of things can affect the sprinklers.

The other issue can be pressure. As you get more distant from your pump, the pressure will be lower because the friction in the pipes means you’re going to be losing pressure. So you are going to have less water at the far end of your field.

***Kristy:*** Are we talking gun as well as drip?

***Rebecca:*** Well, with the gun there is always the long hose that the water is going through. It would be a bit different if the gun is up on a hill and coming back to you. Hills and any type of topography is going to exacerbate that.

You can use a little instrument called a pitot tube and screw on a pressure gauge. Not with gun because it’s too dangerous – there you just have to use the pressure gauges that are on your gun. But in a sprinkler system, you can go and stick that pitot tube right into the spray at the nozzle to measure what the pressure is. And that helps you because now if you’ve measure with your buckets how much water you got, well now why did you get a different amount of water? You can use the pitot tube at different sprinklers to measure if it’s a question of the pressure. Am I losing too much pressure at the far end or particularly if you have some kind of hill you’re going on?

Not a lot of folks are irrigating on hilly ground. The one group that I would say I’ve noticed would be some of our apple growers have some slopes. Some of them some serious slopes! Everything is relative. I remember when I first came to OMAFRA, a grower near Leamington was complaining to me about the hill in the middle of his field and I had just come from working in New Brunswick and it was a real mystery to me where the hill was in his field. We then walked his field and he pointed out to me that there was a 2% rise and fall over the length. [laughs]

***Kristy:*** That’s huge in some areas. It’s like calling certain areas mountains. I think there are some who would disagree with that. [laughs]

***Rebecca:*** Yeah. [laughs]

So, that’s how you’d look at things with overhead irrigation.

***Kristy:*** Ok so what about using drip. How do you measure that?

***Rebecca:*** I have a really good series of videos on my irrigation page. If you google “Irrigation OMAFRA”, hopefully my page is the first one that comes up. Right at the beginning in the series of horticultural videos, I have a nice series that starts with 2 videos about measuring pressure and flow. Also how to maintain your drip system and it talks a bit about the system for drip.

So, similar idea, you want to measure what is actually coming out of the emitters. I have a little set of brightly coloured bowls that I bought at the dollar store. You want to have at least 28. Choose one zone to evaluate and measure 16 emitters close to the pump, 16 emitters mid way and 28 emitters farthest from the pump since that’s usually where the trouble occurs.

Which zone should you pick? Typically, I go for the most troublesome zone which is usually the one furthest from the pump but other ones that may be a problem are ones that are in higher elevation so its harder for the pump to pump the water that high. Or I had a situation with a grower where we were together looking at the uniformity of his drip system and we measured up this hill that was way up from the pump. And it was just curious, the zone that was right beside the pond, he had quite long runs there; very long lengths of pipe for drip line. We actually measured there and found more pressure loss because of those long, long lines then we did way up on top of the hill. So, especially in drip line because that pipe is very small, you lose a lot more pressure because of the friction in such a small diameter. Depending on what product you have, typically anything over 500 feet, I would recommend checking the ends of the lines to see if you have sufficient pressure. Most products you want to have at least 5 PSI in order to ensure your drippers are working properly. If you get less than that, you’ll see that the volume coming out of those drippers will be reduced. That’s what we’ve seen in a number of cases. A couple of folks have all their drippers set out and what ends up happening is that last 10% of the field at the far end is receiving almost no water.

So that can be a little more tricky to remedy. If you’re a vegetable grower and you’ve got drip tape and it’s just something for this year, something you want to keep in mind is that next year, you’ll want to rearrange your fields and your layout so your drip tape is not so long. If you have a permanent set up like apples or a vineyard, it’s going to be more tricky to make a retrofit there. You may want to increase your pumping rather than changing the whole layout and orientation of the field. But it’s still important to know what is happening at those far ends.

So, same as with the sprinklers, you use a pitot tube with a pressure gauge on it and poke a hole in the drip line. Take a pressure measurement and see is the reason I’m not getting so much volume is it because of low pressures or maybe there’s plugging. So, those are the things to look at but you won’t know until you actually put the little cups out and actually measure how much is actually coming out the emitters.

***Kristy:*** So, would you say that is something a person would do once a year or multiple times per season?   
  
***Rebecca***: I would say this is less frequent than once a year. Particularly if you have a drip system that is a permanently installed system in a permanent crop. Maybe do it a year or two after you establish the system. It is something you can do when the system is new to make sure the system is working as you expect. You might do it after 10 years to make sure it is still performing. After 10 years you may have plugging, some components have been swapped out, a pump has been changed. So this is not something you are doing regularly.   
  
***Kristy***: So it’s not like the plugging is happening spontaneously?

***Rebecca***: You could, sometimes you do have fertilizer accidents. That would be a good time to measure. You could also do a hybrid approach. I’ve been describing a full assessment rigorously to see if the whole system is acting as you would expect. But you could also do some spot checks. With an overhead system, just put out 5-6 buckets instead of the whole thing to see if its functioning as you expect.

***Kristy***: In an area where you are questioning?

***Rebecca***: Yeah, you can do something that is not the full complete Rebecca, OMAFRA assessment process. Something partway in between, but we really don’t know unless we measure. Plants might look ok but you might be getting losses and you don’t know unless you measure.

***Kristy:*** I’m not going to lie, it sounds like a lot of work. But for a grower who might not have the time, are there consultants that do this? How can these be done?

***Rebecca***: Excellent question; I would be happy to do a limited number of assessments in 2021. If you are interested, send me an email and I’ll put you on my waiting list. If you currently work with a crop consultant, I’d be happy to have a discussion. Any scouts out there who would be interested in training or get information about how to do a rigorous distribution uniformity assessment. There is nobody I know of that has this as their regular service, but maybe if there was an interest people could have it as part of their portfolio for looking at irrigation systems and how they are performing. It does take time, with the drip you have to set the buckets out. I like to work with a partner, because I like to measure every emitter for 5 minutes and so if you are setting out 16 or 20 bowls you want to set one under an emitter and 10 seconds later you start the next one and you go along the line, otherwise you are waiting there too long so you want to do them all at once, but you can’t set all the bowls there at the same time, so that’s the technique. But then you have to rush back and start pulling them out again.

***Kristy***: Ok so it helps to have a second set of hands

***Rebecca***: Helps to have a partner when you are measuring the volume coming out of drip irrigation.

With the overhead you would be leaving it out for your full set so if you normally irrigate for 2 hours, you would do your regular irrigation and then come back after that and measure what you have in the buckets.

***Kristy:*** Ok, so you mimic what would be a regular irrigation session. So if they have their buckets out and doing that monitoring, what could a grower do if they have poor coverage?

***Rebeca***: So I talked a bit about that, with the traveling guns and sprinklers it’s a question of overlap mostly. Sometimes it can be related to pumping and that is true with drip irrigation as well. As an example, one of the farms I was at in California a few years ago we did an assessment that showed they did not have enough pressure and discovered that the pump had not been constructed properly. So they were able to go back to that vendor to get the pump fixed to have the correct pressure through the system.

Another problem I see with drip is particularly when people have manual back flushing on their filters; those filters are getting too clogged up and not getting back washed often enough so you are getting a lot of pressure loss across the filter. It can happen with automatically back flushed filters as well. Sometimes mistakes happen and something maybe came in and clogged the filter and caused some issues. It’s always good to have a permanently fixed pressure gauge before and after the filter to see how much loss there is across that filter. Those are some of the key things that I’ve seen. I’ve also seen existing systems where over the years you are expanding and you are going beyond what the pump was designed to do. It was designed to have a certain horsepower and pressure and adding another 20 acres on; it’s just not able to handle that. Those are the types of things we see. The overlap are relatively easy, it does mean more labour but somethings are a little bit more challenging to address and have a cost associated, but its important to know how the system is performing.

***Kristy***: Say the grower has good uniform irrigation, is that all they need to worry about, can they just turn it on and go?

***Rebecca***: It’s a good place to start but the next question is are we doing a good job of scheduling? Is there still moisture there, that’s where using a process of looking at evapotranspiration and rainfalls as that checking account type of math of how much is coming out each day and how much is coming in when it rains. The other options to look at using a soil moisture instrument.

***Kristy***: Ok, so what would that show?

***Rebecca***: If you have a soil moisture instrument, what you’re going to see is that every time it rains or you irrigate the soil moisture is going to spike way up. There will be a certain amount of moisture that drains right out within the first 24 hours, especially in sandy soils which is most of our horticultural crops. After that, what you will see is the moisture at night will stay flat but each day it’s stepping down as the plant is drawing up and transpiring. It’s really cool you see these stairsteps and you can just imagine these roots sucking up moisture from the soil. In order to get that type of picture, you need an instrument that is installed and logging data every hour. So you can see how the moisture steps down. As it steps down, it will flatten out and that is because the plant is drawing water from that depth and at a certain point, there is sill moisture in the soil but the plant can’t extract it anymore so you will see that the curve will flatten out and that’s an indication that you’ve let it go too long.

***Kristy***: Ok, you don’t want to get to that stage?

***Rebecca***: No, you want to see that the plant is nicely taking water every day and the moisture is going down and down and if you see the moisture not declining anymore, that’s getting to the permanent wilting point where the plant is not able to withdraw water anymore. There might be other reasons why they aren’t taking water such as harvesting or a very cool and cloudy day. If you have hot weather and the moisture is not stepping down, at that point you know it’s not available for the plant to be taking up that moisture.

***Kristy***: If you are measuring the soil moisture, are there spots in the soil where these instruments should be installed?

***Rebecca***: Yes, two things there. They have to be in the root zone of your crops. For vegetables it should be typically 6 inches below the surface, for tree fruits I say typically 12 inches. By all means make an adjustment, but the instrument needs to be where there are lots of active roots. Not at the surface, but in the active root zone. Don’t have it in the ally in between, so you can see as the roots draw the water out of the soil, you see the moisture going down. You also need to make sure you have a really good contact between the instrument and the soil and not a lot of air pockets.

***Kristy***: How would you ensure that and get that good contact?

***Rebecca***: It depends on the type of instrument you have, some of the instruments you dig a whole and then insert them into the wall of the whole to see you have good contact and got it down to the depth you want it at. Then you want to pack the soil back into the whole as best as you can to make it how it was before. If you are inserting it into the wall, you are inserting into undisturbed soil. Some of the other instruments go straight vertically down and one technique is to first auger the whole and then make a slurry with the soil and then pour that into the hole and shove the instrument down. On my page on the OMAFRA website, along with those videos, the last set of videos is all about monitoring soil moisture with soil moisture instruments so there are some nice demos there about installing.

***Kristy***: What I can do, is include the link to your page in the show notes. Speaking in terms of soil instruments, are there certain ones growers should use and what would a grower anticipate a cost would be?

***Rebecca***: Good question, I’ve used a portable instrument because then you can get a sense about the differences across your field. I bought mine a few years ago and I would estimate they are around $500. My preferred instrument is one that you install permanently, or at least for the season, and you’ve got some type of logger that you download or connected someway to the cloud to get the data automatically. That’s preferred because then you can see how the soil moisture is changing overtime. Your probe is always at the same location and you get that picture of what is happening over the season. One of the challenges is you need to pick a representative spot in your field since you will only be measuring in one place. The probe I have used a lot is from a company called Meter and those probes are about $300 a piece and the loggers are $1000 with an extra fee every year if you want to have it upload to the cloud. That is typical for the lower end. You can get more expensive instruments which we do use on the research station where the values that its measuring are very good. The ones I prefer to use are good with the relative values, and to see the up and downs over the past two weeks or so. So if you think you’re spending about $30 000 on an irrigation system, I think it’s worth it to spend another $2000 on a soil moisture monitoring.

***Kristy***: Yeah, its worth that expense with the benefit your getting.

***Rebecca***: You can also go for the low tech method where you dig a whole down to the depth where you have active roots and take part of the soil and squeeze it in your hand.

***Kristy:*** I’ve heard a lot of people say that.

***Rebecca:*** You know, I have a lot of experienced growers, one who says “my dad knows exactly when to irrigate because he licks the leaf and he just knows” and that’s great but not everyone has experience like your dad. And then like I said, having a soil moisture instrument gives you that x-ray vision. How much of that rainfall infiltrated? Did it all run off the top? You won’t know unless you actually have a sensor in there to measure. When I irrigated, did it soak in, am I putting on enough or too much? You can’t know unless you have some sort of instrument in there to actually “see” whats happening.

***Kristy***: So there are a number of instruments that measure in different ways, is there one you would say is best?

***Rebecca***: Yeah, there are tensiometers which are your classic instruments there are electrical resistance blocks, called gypson blocks. There are a whole range of dioletic sensors so you will hear TDR, FDR or capacitance type probes. With your classic tensiometers, essentially it’s a plastic tube with water in it and it has a porous ceramic tip at one end and at the other end a pressure gauge. You insert that into the soil and after 24 hours, as the soil dries out it draws water out of the tube through the ceramic tip and you will start to get a suction reading on that pressure gauge. I really like it because it’s a real measurement, the plant is trying to draw the water out of the soil and the tensiometer its drawing the water out of the tube. The disadvantage is that I often see these in peoples barns because they are finicky to use. You need to install them in the spring, fill them up with water every week or so and traditionally they have an analog dial. I know some growers say, the tensiometer is my favourite because we walk the field, I see the dial, I know what it means. But lets face it, most people want that data on their phone. There are new tensiometers that are electronic. They will give you the same idea of logged data and then you can see the changes over time. Electrical resistance blocks are also measuring the soil water tension, but the different mode. They are measuring the electrical resistance in a current in electrodes that are embedded in a material like a find sand and there is a synthetic material on the outside of it. So if you stick those into the ground, the porous material will equilibrate to the same moisture that your soil is. The measurement is actually done inside the block. It alleviates the problem that all the soils are a little different with different textures and properties since the measurement is occurring inside. They are also quite a traditional instrument. When the soil is wet, the current passes easily and when its dry the current is harder to pass, so it’s translated into a measurement just like the tensiometer. There are also instruments generating an electromagnetic wave measuring the velocity, frequency or capacitance of those waves and then they do some complex mathematical formulas to convert back to relate to volumetric water content in the soil. So they are really good at providing relative values of soil moisture. They are really good when you are using the data over a number of weeks, but there is a significant range of accuracy and price with these instruments. What I’ve found is for these farm applications, some of the lower priced options are fine as long as you know you will have to gather lots of data until you understand what this means. You can’t just put it in, you need to see when it rains what typical measurements you might get and compare that to the numbers you get when it starts to dry out.

***Kristy***: Right, so like getting a base line.

***Rebecca***: Right, so the factsheet about soil moisture instruments on my page explains all about how moisture is held into the soil with different soil textures and a range of what you can expect and what is the maximum that those soils can hold. Clay soils can hold more water at their capacity, sandy soils is lower – so it gives you a starting point for what some of those numbers would be but you need some experience with the instruments and your own data to see what is that in your specific context.

***Kristy***: You’ve mentioned a couple dealers where people can get these, but where would someone be able to get these instruments?

***Rebecca***: I recommend looking through your irrigation dealers. I have a list of irrigation dealers on my webpage at the bottom, there’s a whole list that covers most of the dealers in Ontario. Hoskin Scientific, Campbell Scientific, Hortau is a Quebec company that specializes in electronic tensiometers, and there are others. I know that the irrigation companies would be a good place to start.

***Kristy***: Do you have any other ideas about how growers can optimize their irrigation?

***Rebecca***: The last thing would be if we know we are having good uniformity; applying the water where we want to apply it, getting it at the right time, so applying it according to either a schedule with evapotranspiration or according to soil moisture – then the last thing would be to use a water meter. There is that classic saying, you can’t manage what you don’t measure. So if you don’t measure what you are putting out, then you have no idea. So this is where the water meter helps you. If you have an irrigation system and when it was new and the whole crop was getting nicely watered, but over time that changes - a water meter will show you. If you get lots more water than you expect, maybe there is a leak or ware. If you are getting a lot less water than expected, maybe is a pressure issue or plugging issues. So those are somethings the water meter can quickly help you with.

Because you need to keep track each day for regulatory reasons, it also helps you compare over time, one block to the next, did I use more or less water this year. It’s a bit tricky in Ontario because you can’t necessarily compare this years water use compared to last year since its so much drier, but it’s still very important. Otherwise, how can we be a good manager.

You talked about some growers with limited water supplies. Say they want to expand, but they if they don’t know how much water they were using last year or how much for certain blocks – it’s important to keep that kind of data. It can get quite complicated if you’ve got different varieties, zones or crops. It will take a bit more time to keep those records so that they are useful to you. But a water meter is your basic starting point. At minimum if you are writing down how much you used each day, that is your minimum operating with a water meter

***Kristy***: Ok, so a daily check. And is there a correct way to install a water meter?

***Rebecca***: You want to have a certain amount of straight pipe before and after your water meter. You don’t want to put it in after an elbow. You want to know what the diameter of your pipe, and then you want to have the equivalent of 5 diameters upstream from your water meter and at least 3 diameters downstream from your water meter before you have an elbow or anything because you don’t want to have a lot of turbulence and disturb the water. And once again, your irrigation dealer is a great place to shop for that and get some information for installation and what style will be most appropriate.

***Kristy***: Big picture; do you think that measuring really makes a difference? I can hear a grower saying it will cost a lot, so is it worth it?

***Rebecca***: Generally what I’m seeing in Ontario, is generally growers are irrigating too late. My observation is that underirrigation is leading to yield loss, and some years when we have dry years, it becomes significant. If I quickly look at some recent studies, work in strawberries showed that if you’re having 50% of what the ideal amount of water is that needs to be applied you will have 25% yield loss. If you look at some work out of Washington in pears, they looked at adequate irrigation with reducing corky fruit in the pack out.

Those are just two examples. We know irrigation pays, why else would we bother irrigating. We shouldn’t treat it like it doesn’t matter how much we apply. If you have irrigation, you should be applying it in ways that meets the needs of the crop.

***Kristy***: Absolutely, more crop for your drop!

***Rebecca***: That’s right!

***Kristy***: Well, you’ve covered a lot of information, so I’ll be sure to put the link to your site on the show notes. I really appreciate your time. This is a big topic most years, but especially now with the dry conditions a lot of people are thinking about this. So thanks for joining with us.

***Rebecca***: Thanks!

*Music starts to fade in*

***Kristy:*** I was just speaking with Rebecca Shortt, Water Quantity Engineer with the Ontario Ministry of Agriculture, Food & Rural Affairs.

*Music transition*

## CLOSING:

***Cassie:*** Thanks for tuning into our episode today. This has been Cassie Russell -  
  
***Kristy:*** - and Kristy Grigg-McGuffin, for the What’s Growing ON podcast. For more information on horticulture grown in Ontario, check out the links to our fruit, vegetable and specialty crop blogs in the show notes.

***Cassie:*** A big thanks again to our guest this week, Rebecca Shortt. Another big shout out goes to Michael Pupulin for the editing of our episodes, and music from this episode is the track Aspire from Scott Holmes.   
  
***Kristy:*** We will be back next week with an all new episode of What’s growing ON. In the meantime, if you have questions, comments or suggestions for a topic you would like us to cover, Please send us an email us at [ONhortcrops@gmail.com](mailto:ONhortcrops@gmail.com). We would love to hear from you.

*Music fade out*