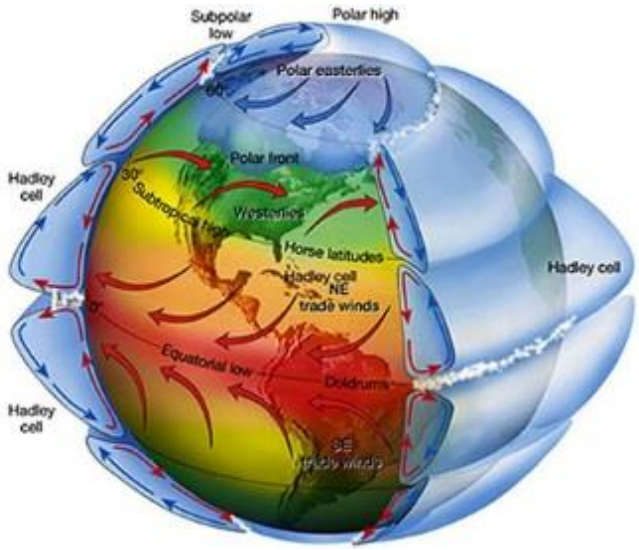
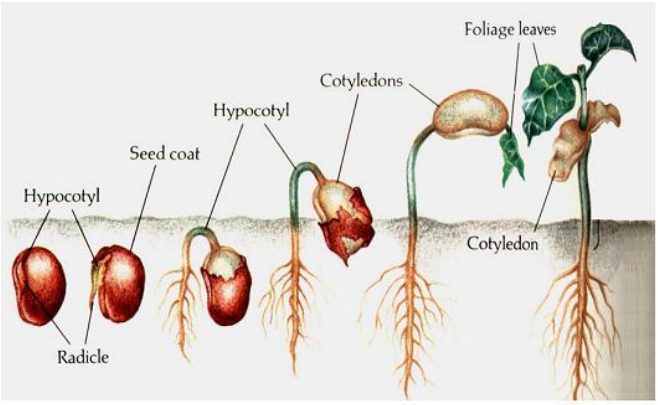
HEAT UNITS – WHAT ARE THEY?

…AND WHY THEY ARE IMPORTANT FOR YOU!

The term 'Heat Units' is also sometimes called Grower Degree Days. Understanding what these are will give you a much better understanding of why there are gluts and gaps in the supply of fruit and vegetables, and corresponding price changes, which can sometimes happen in a few days.

Heat Units are measured using a rather complex algorithm that is based on the overnight low temperature, cloud cover, daytime high temperatures and humidity. The Heat Unit measurement is predicted daily in weather forecasts, and is just as important information for farmers in daily weather updates as any other factor (rain, wind, etc.)





Every variety of fruit and vegetable requires a certain amount of heat units every day to promote growth, and every one of them is different, including different varieties of seed for the same crop, or different types of blueberries or cherries.

Let's take cilantro as an example. While cilantro seed will germinate in cool soil – say 7C – it really doesn't grow until temperatures are much warmer. Overnight low temperatures cool the top 10cm of soil. Rain, which falls quickly from clouds where the temperature is much colder, also cool soil. Then warm daytime temperatures heat the soil back up. These factors average out and the soil temperature is what defines the speed at which a plant develops in conjunction with the amount of heat units available. Cilantro is a fast growing crop – normally it germinates very quickly – just a few days, and if the soil temperatures average above 10C, and weather is normal, growth is quick, and the crop reaches maturity in less than a month. (Compare that to celery, which requires similar temperatures to cilantro, and in the same conditions takes over 100 days to mature.)

If soil temperatures cool down, cilantro gets stressed - its continuous growth goes on hold until soil warms up, and conversely if it is extremely hot and dry, stress can be so severe that the plants go into survival mode and start to 'go to seed' before they are mature – commonly called bolting.

Cilantro in our market generally comes from the desert growing areas that hug the border between the US and Mexico from October to June. Being a heat-loving plant, soil temperatures even in coastal California don't reach 10C until May, and then we are blessed with local cilantro in a normal year from July to September. However, the areas in the south – the Imperial, Mexicali and Yuma valleys are not the ideal place to grow cilantro in the winter – and the quality will never be as good as cilantro growing in continuously warm soil. Those areas, which are really the only places that produce a vast amount of green vegetables in the winter months (that feed all of the US and Canada) are not warm – overnight lows hover around 5C for many months, often dropping close to freezing, yet during the day can soar to 35C in the middle of winter. Because of the cold overnight temperatures, the soil is never really warm enough for cilantro (or celery) and while cilantro takes 28 days to grow in ideal conditions, in the desert southwest, cilantro can be a 110 day crop over the winter, and tricky to grow – however, that's the only place it CAN grow for many months of the year. And a little side-note – when temperatures hover near freezing in those southern regions, many plants, and especially cilantro, will develop a purple tinge to their leaves – that is also what creates very dark green and purplish broccoli crowns.

Succession planting is one way growers can maintain a continuous supply of vegetables. In an ideal world, if they planted beds of lettuce every 2 weeks, they would get a new crop every 2 weeks, and most commercial growers have very complex succession planting schedules. But the world isn't perfect, and as the growing season warms up and cools down, those scheduled plantings can be a few days apart at the beginning and end of the season, and widen to 10 or 15 days during the peak of the warmest months, to give that continuous supply all farmers hope for – and all based on the expected amount of Grower Degree Days. Where things go sideways is when there is a very cold spell, or several weeks of higher than expected temperatures. This is when plantings either slow down, or speed up, with several successions 'coming on' at once. Most growers also have certain seed varieties that they have good track records with, and many farmers will change seed varieties over the planting season which are particularly heat sensitive, or grow in cooler soil etc.

So, as a grower, in your perfect world, balancing prior year sales, and having a planting plan that will keep you in continuous supply goes haywire when the weather changes and your crops slow down or speed up because of a run of hotter than normal weather. Not only do successions catch up, but the situation can be exacerbated by a change to a different type of seed during the season. Heat units also impact how quickly transplanted crops like cauliflower or lettuce adjust to their new growing conditions and soil - and recover from transplant stress. If you were a baby cauliflower and had been growing in a tray in a warm greenhouse, and were then plunged into soil that was colder, or that became cold quickly because of a change of weather, you would get stressed out. If, as a human, you went to Mexico in the winter and only took summer clothing and a bathing suit because the forecast was wonderful for your holiday, and instead a storm brought rain and cold winds, you would hunker down in your hotel room – that would be called 'holiday stress.'

Luckily all crops aren't 'volatile' and can hold in the field for many days if not weeks – farmers don't panic if their cabbage plantings are out of whack – they can leave it in the field waiting for market pricing to improve, or harvest it and put it in storage, where it can hold for weeks (if not months.) But there are many, many plants that have a very finite harvest window – cilantro for one, which can go from under-sized to bolted and over-mature in a matter of 72 hours. Lettuce, broccoli, Asian greens like baby bok choy, cauliflower and spinach all fall into the 'volatile' category. These are the crops that usually create the most amount of grower anxiety – this is when producers use the following terminology: 'I'm drowning in broccoli, I'm really long on spinach, can you help me out on lettuce, I'm hung on cilantro, HELP, I don't care what you sell it for' etc. and will adjust prices twice a day to keep the harvest going – even if they are harvesting at a loss. Considering they have already invested in seed, water and weeding, they still usually come out farther ahead if they sell below production cost. Instead of tilling in the crop out of anger and frustration, they also have to keep their labour force working every day. Luckily, organic growers can, if nothing else, sometimes find homes by dropping prices and selling into conventional markets where prices are generally lower because of the much lower production costs.

The same situation applies to fruit. Blueberries require a certain amount of heat units from the time they blossom until they are ripe and ready to pick. If the total number of grower degree days should normally happen in a 70 day period, but temperatures are warmer than normal – that 70 day period can be compressed to 50 days, and the crop will come on 20 days faster. And if that increase in heat units is 20%, then the next variety of blueberries in the succession that would 'normally' be ready to harvest 10 days later (because it requires more heat units to develop) - will now ripen 20% faster and be ready 7 or 8 days after the first variety. That situation compresses the market and forces prices down as well. This is similar to succession vegetable farming – fruit producers have many varieties of tree fruit and berries to give them the same nice harvest flow, but which can also be dramatically affected by low or high soil temperatures and daytime highs.

When broccoli prices plummet, what you are seeing is many growers having their broccoli all catching up because of a heat wave, and the market being very over-supplied. Prices will of course also decrease if there are too many growers producing the same crop for the same time period – but obviously farmers don't talk to each other about who has planted what and when. Right after a glut, there is usually a gap, and prices will soar very quickly as producers know that everyone's future plantings are behind because their phone is ringing off the hook. Then the sky can be the limit when you are the only farm in the game.

The organic market is different than conventional for several reasons – for one, there are far fewer commercial fruit and vegetable producers than conventional, and in the conventional industry prices,

although they do fluctuate, never demonstrate the high peaks and valleys as organic. Over 85% of organic fruit and vegetables are sold at stores that sell both organic and conventional produce, and when prices are very high on organics, those stores have the option to de-list certain items when the price is too 'out-of-whack' with conventional, but for stores that only sell organic, and just have to have those price-sensitive and volatile items on their shelf, they take the brunt of what can be huge market price shifts – and those are nearly always to be blamed on severe changes in grower degree days or heat units.

And just for fun, if you're interested in calculating your own Heat Unit chart for your home garden, here is how you do it:

Calculating Daily CHU (Climactic Heat Units)

The following equation is used to calculate a daily CHU for a site:

Daily CHU = (Ymax + Ymin) ÷ 2

where:

Y max = (3.33 x (T max-10)) - (0.084 x (T max-10.0)^2) (If values are negative, set to 0)

Tmax = Daily maximum air temperature (°C) (measured from midnight to midnight)
(Accuracy should be <0.25°C)

Y min = (1.8 x (T min - 4.4)) (If values are negative, set to 0)

Tmin = Daily minimum temperature (°C)