Newsletter FruitLook March 2016: Understanding the Basics

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Dear Mr. Doe,

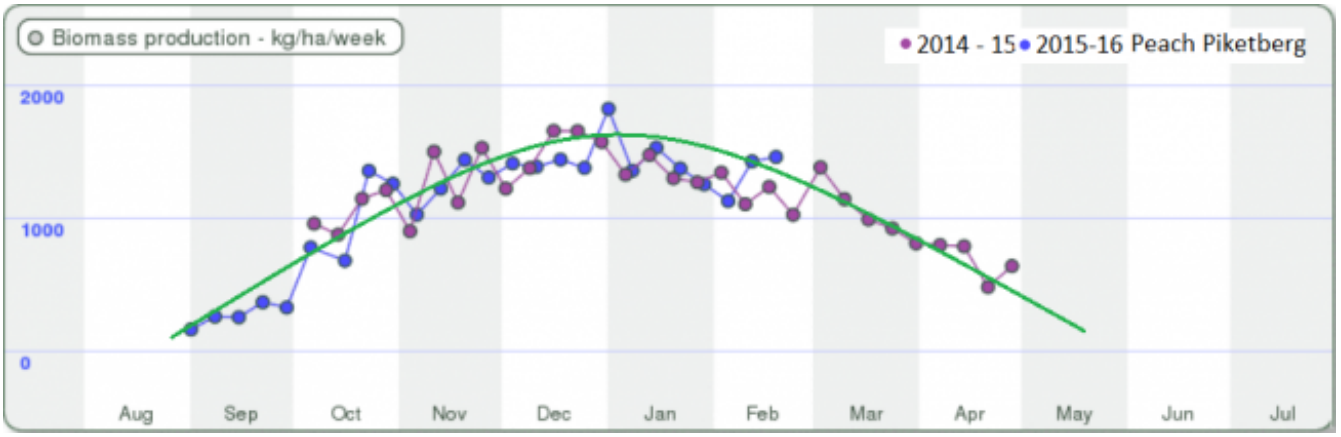
Want to learn more about FruitLook? Our next FruitLook training is on Thursday 7 April at Elsenburg. Register now via info@fruitlook.co.za!

The usefulness of FruitLook depends on your understanding and application of the data. Via various channels we try to help you use the data as efficient as possible. On the website you can find multiple sources of information, like the Manual, Poster, FruitLook Leaflet and past newsletters. If you want to dig deeper, you can consider attending one of the FruitLook training sessions. These sessions are organized every first Thursday of the month at Elsenburg; you can choose between a group session covering the FruitLook Basics or go into more detail with our trainer during the FruitLook Advanced Q&A. Via info@fruitlook.co.za you are welcome to approach us with your questions and ideas on data application in farm management.

Everything starts however with the basics. In this newsletter the spotlight is turned on the foundation of FruitLook: the data. What do these data products mean? We provide a short summary on 4 parameters: the Actual Biomass Production, the Actual Evapotranspiration, the Evapotranspiration Deficit and the Biomass Water Use Efficiency.

What is the Biomass Production? The Biomass Production is the total dry matter produced in kg/ha/week. The biomass growth includes roots, shoots, fruits, twigs, leaves and all in between (including the cover crop and weeds if present). It is strongly influenced by crop type, crop management and condition, as well as climatic conditions and growth stage. The Biomass Production can vary between no production all the way up to 2,500 kg/ha/week. Typical values for fruit crops fluctuate between 500 and 1,500 kg/ha/week during the production season. Younger crops will produce less biomass than full bearing crops.

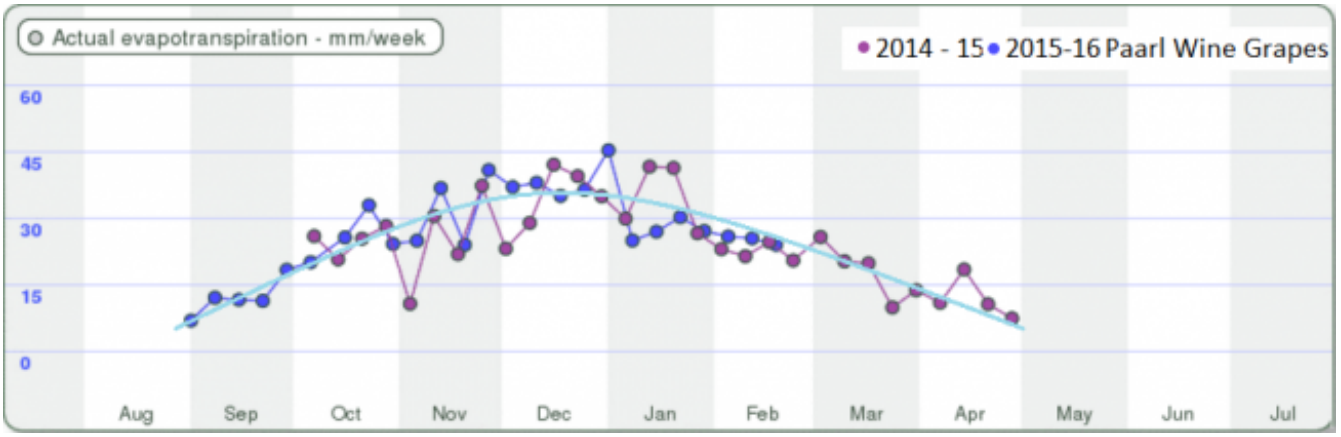
A typical Biomass Production curve is depicted in the graph below; it shows the temporal development of a peach orchard near Piketberg. The curves for the 2014-15 and 2015-16 seasons are quite similar, which indicates this field has probably experienced little water and other stress in both seasons and was managed in the same way. Small variations in Biomass Production throughout the season are likely caused by varying climatic conditions. For example, a cloudy week means less solar energy for photosynthesis than in a sunny week. Typically, if a sharp decrease or prolonged decline in biomass production is visible, there is a problem in that block.



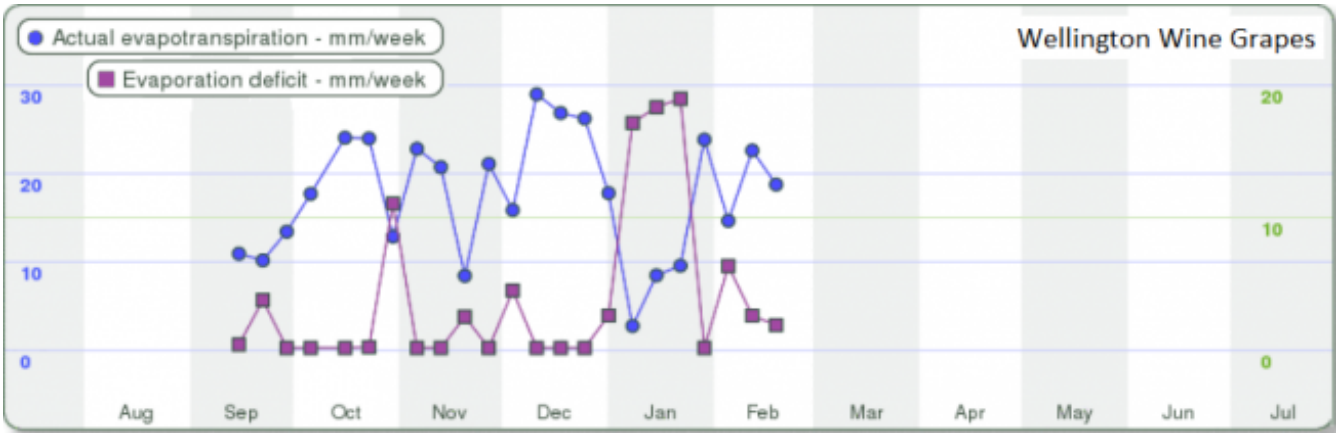
Knowledge of the growth stages of your (fruit) crop will contribute greatly to interpret the FruitLook data and curves. The "theoretical" seasonal Biomass Production curve, for a healthy field like the one depicted above, has a typical bell-shaped curve (green line). At the beginning of the season the crop starts developing and solar energy is relatively low; as a result the initial Biomass Production is low. Towards the middle of summer solar energy, used for photosynthesis, is more abundant and hence the plants are growing vigorously and fruits are produced. The Biomass Production is reaching its peak. Following harvest, biomass production decreases and at the end of the season the leaves start colouring, chlorophyll breaks down and the deciduous fruit crop enters a period of dormancy. Typically, the Biomass Production reaches minimum values.

What is the Actual Evapotranspiration? The Evapotranspiration (ET) is the sum of the amount of water evaporated from the soil (E) and lost through transpiration by the crop, cover crop and/or weeds (T). It represents the actual amount of water lost in the crop production process and is expressed in mm/week. The ET represents real water losses and is not the same as your crop water requirements or irrigation applied.

The Actual Evapotranspiration can vary between no or little evapotranspiration and values as high as 55 mm/week. Commonly values for deciduous fruits grown in the Western Cape were found to fluctuate between 15 and 45 mm/week. The amount of Actual Evapotranspiration is closely linked to photosynthesis and growth. As a result the seasonal curve is similar to the seasonal development of the Biomass Production, which can be seen in the next image. The crop type, crop development, climatic conditions and water available to the plant will affect the Actual Evapotranspiration from week to week. Typically the same crops grown in close vicinity and managed similarly show comparable Actual Evapotranspiration curves.



What is the Evapotranspiration Deficit? Where Actual Evapotranspiration is the *real* crop water use during a specific week, the potential evapotranspiration represents the amount of water that could be evaporated and transpired under actual meteorological conditions. The difference (Potential minus Actual) reflects the crops shortfall in what it can potentially achieve: this absolute Evapotranspiration Deficit is expressed in mm/week. Whether or not this potential is reached is strongly dependent on the amount of stress put on the plant by external conditions: for example through water shortages in the soil, but also due to heat stress or stress resulting from pests and diseases. In the image depicted below you can see peaks in Evapotranspiration Deficit correspond with dips in the Actual Evapotranspiration.



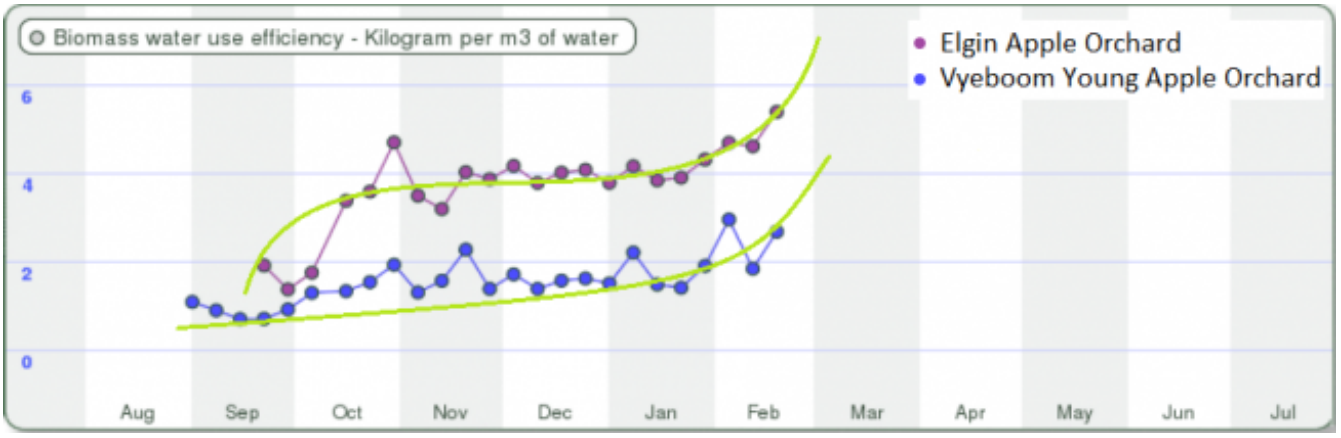
ET Deficits can be visible at certain periods over the growing season. No ET Deficits during a (period of a) season could indicate wet conditions and possible over-irrigation. High or increasing ET Deficit values occurring over a number of consecutive weeks indicates the plant is experiencing stress and optimal production is not achieved.

Often this is the result of the soil drying and this could indicate the producer is getting behind with irrigation applications. Very hot or dry air can also cause an ET Deficit to occur. When a crop loses too much water because the moisture gradient between leaf and surrounding air becomes too steep it tends to close off its stomata causing a decrease in evapotranspiration. Factors like soil salinity, poor land fertility, the presence of hard or impenetrable soil horizons, pests and diseases and poor soil management also cause plant stress which can lead to an Evapotranspiration Deficit.

Currently we would advise you to look carefully at blocks where the ET Deficit reaches at least 7 mm/week. Always ask yourself whether your crop, in its current development stage, can afford any stress without an impact on crop production. Lastly, always apply a logic test when looking at the FruitLook data: if a heatwave struck it is likely the ET Deficit is a result of physiological or heat stress. This has been visible in various areas during a number of weeks this past year.

What is the Biomass Water Use Efficiency? The Biomass Water Use Efficiency (WUE) describes the amount of biomass (in kg) produced per unit of water (in m^3). A high Biomass WUE is an indication of efficient water use. Higher Biomass WUE can be achieved when less water is used to produce equal biomass or when Biomass Production increases while total water consumption remains equal. The Biomass WUE does not tell you how much water has been used to produce a specific amount of crop yield, since it takes total biomass production into account.

The Biomass WUE can vary from values close to 0 to values as high as 7 kg/m^3 for fruit crops. Typically Biomass WUE values for deciduous fruits grown in the Western Cape were found to fluctuate between 2 and 5 kg/m^3/week. Differences do exist between different crops. A higher value means more efficient water use by the crop. By combing the ET Deficit with the Biomass WUE curve in MyField Analysis you can get a feel for the water status of your block. The Biomass WUE of a mature block often is relatively low at the start of the season, followed by a prolonged period with near constant values and ending with a sharp increase at the end of the season. The lower Biomass WUE at the start of the season is often due to more soil evaporation compared to transpiration and growth, hence more "non-beneficial" losses. A younger block tends to show a slightly increasing biomass WUE over the season. Typical curves of both of a young and mature block are presented in the image below.



If you have additional suggestions for FruitLook, feedback, questions etc., feel free to contact us via info@fruitlook.co.za. We hope to welcome you again soon on FruitLook!

The FruitLook Team

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