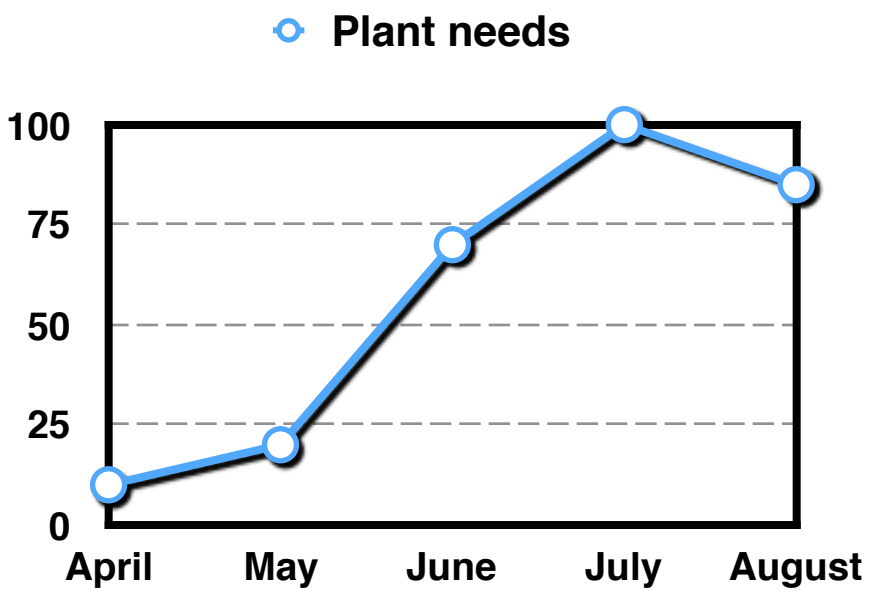
AEA Core Concept #13

Plants invest in their future.

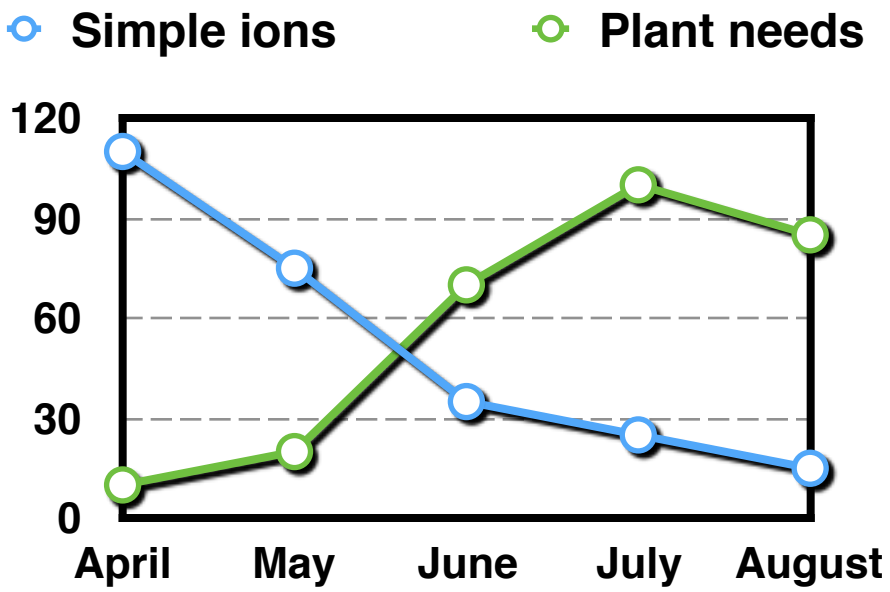
Horst Marschner, in his seminal plant nutrition textbook Mineral Nutrition of Higher Plants, describes how plants sent 70% of their total photosynthates down to their root systems at certain stages of growth, particularly the framing stage when the plant is still in its vegetative state before reaching its reproductive stage. My initial question upon seeing that number was "why would a plant waste 70% of its energy by sending it downstairs?" In reality, rather than wasting energy, that plant is investing that energy against its future needs.

You can think of a plant's total energy requirements over its lifetime as 100%, which is broken down into four, roughly-equal, proportions: 25% of its energy is used to build plant biomass, 25% for root biomass, a further 25% is used to finish and fill the fruit, leaving 25% to be sent through the roots as root exudates to feed soil biology. These things are all happening simultaneously.



The 'investment' that a plant sends through the roots as exudates help to trigger the bacterial digestive process known as mineralization, during which sugars and amino acids are digested. The bacteria and microbes in the soil extract minerals from this new soil mineral matrix to form their own bodies. As that bacterial population cycles, those nutrients are released and made available to plants in a very bio-available form of food.

Provided plants are healthy enough, and planted in soil with good microbiological function, they will send large amounts of sugars downstairs during framing and the mineral availability in the soil will spike significantly. These high levels of nutrition act as a 'reserve bank account' that the plant can tap into throughout the fruit filling stage. Even better, this nutrient flow can happen in very dry soil conditions. This is possible because these digestive processes that produce



nutrition are happening in close vicinity to the root system and because a healthy soil matrix allows the microbial population of bacteria and fungi to access water that plant roots cannot. If we have good soil fertility and microbiology, and plenty of sugars are sent down to the roots early in the growing season, then we can grow healthy plants even later in the growing season without water.