

Go With the Flow: The Energy Cycle

Discussing the Ecological Processes

Energy Drives Living Systems

It takes growing plants to create energy flow in living systems. The more sunlight we are capturing, the better for our cash crops and the quality of the land being stewarded. Energy flow begins with sunlight being captured by plants through the process of photosynthesis. In this document, we will look at two areas where land managers can influence energy flow into their systems by increasing photosynthesis:

- extending the growing season (i.e. the number of days/year when plants are photosynthesizing) by using cover crops
- increasing the photosynthetic capacity of individual plants.

Maximizing Photosynthesis Through Ground Coverage

Often when we think of our growing season, we think of the four months or so it takes to produce our cash crop. The reality is that plants in nature are growing in the spring and fall as well. We've all seen green grass poking through the snow as the first hints of spring arrival. Here are some finer points on the issue:

- Soil organisms work 9+ months a year, many summer annuals photosynthesize (and produce the exudates that feed soil microbes) for less than 4 months a year.
 - Keeping the soil life well fed keeps the (eco)system running.
- Primary photosynthesis happens in the plants during their vegetative state.
 - This is the period between germination and flowering where the plant is busy photosynthesizing and accumulating the resources needed for flowering and reproduction.
- Maximized photosynthesis is a driver for profitability.
 - Increasing the system's overall health creates compounding health benefits for plants and microbes and drives higher yields.
- Planting fall/winter cover crops is a great way to extend the photosynthetic days in your fields.
- Intercropping and Polycropping: Use timing to ensure cash crop is above the other plants to gain more light and the intercrop to gain more days spent photosynthesizing.
- Ensure forage crops are not overgrazed.
 - Overgrazing hurts the plant, setting back its health and in effect, its photosynthetic ability.
- Maximum energy can be utilized through rotation strategy and crop coverage.
 - Increasing the overall health of the plants also increases the photosynthesis.

Maximizing Photosynthesis of the Individual Plants

Did you know that it is common for plants to operate at between 15%-20% photosynthetic capacity? Did you also know that this can be increased to 60% by applying a number of management strategies? Although creating the right environment for increased photosynthesis is a multifaceted issue, there are some considerations to make:

- Are the plants receiving enough CO₂ (carbon in soil)?
 - More CO₂ for the plant increases photosynthesis ability.
- Is there adequate water?
 - Both the plants and the microorganisms in the soil need water.
- Is there enough usable manganese for the plants?
 - “Managing manganese is a critical requirement for maximizing photosynthetic efficiency” – John Kempf
 - Plants primarily need manganese to photosynthesize.
- If manganese levels are good, how are the magnesium, iron and nitrogen levels?
 - These are secondary nutrients used by the plant to photosynthesize.
- All the principles of regenerative agriculture play a role in creating healthy plants which can have cascading effects on photosynthesis.
 - In a holistic practice, what is done in one area affects the whole system.