

SolAgra® Farming Solar Arrays

Agrivoltaics and Construction Techniques to Minimize Soil Compaction During Construction

AGRIVOLTAICS

Agrivoltaics – the symbiotic combination of agriculture and photovoltaic solar power generation on the same land. This is a multi-faceted task that requires innovative technologies supported by sound agricultural and engineering judgment. The SolAgra® Farming Solar Array™ is a unique, patented system that is designed to economically elevate photovoltaic solar arrays to allow farming operations beneath, using traditional farm equipment such as tractors, harvesters, and combines.

True agrivoltaics has equal focus on efficient and improved agriculture simultaneously combined with financially viable solar power production. Previous attempts at agrivoltaics have focused on maintaining or in some cases improving agricultural production beneath solar panels by manipulating the solar panels to allow adequate sunlight to the crops growing beneath the arrays, but these solar arrays have been large, bulky, expensive to build at elevations of 15 feet above the ground, and most have low solar power output because the panel manipulations required to allow crops to grow, do not support the production of sufficient electrical power. These projects show proof of the agricultural concept but are not financially viable and are therefore not scalable.

NO LADDERS, NO SCAFFOLDING DURING CONSTRUCTION

SolAgra® solves these issues by a building agrivoltaic solar arrays that are assembled at ground level with all components including single-axis trackers, solar modules, power and control wiring installed - and then the array is hinged into the elevated operating position.

Panels Mounted at Ground Level

The SolAgra Solar Platform is assembled and solar modules are mounted at ground level. Each segment connects easily to the next. This is much safer, faster and more cost effective.



Most sunlight passes through the spaces between solar panel rows while each row tracks the sun to produce full electrical power. When necessary, CounterTracking™ can be used to provide additional sunlight to crops. With SolAgra Farming™, all crop-growing areas under the array are provided with a specified amount of sunlight each day, by DynamicShifting™ - a patented technique that shifts the arrays laterally from east to west to “move” the sunlight and sun shadow the length of each solar panel in each row. During DynamicShifting™ the rows of solar panels continue with normal tracking and full electrical power production.

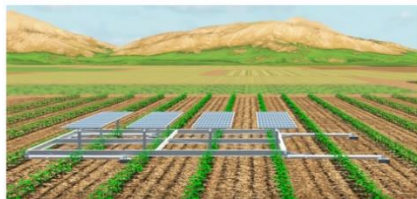
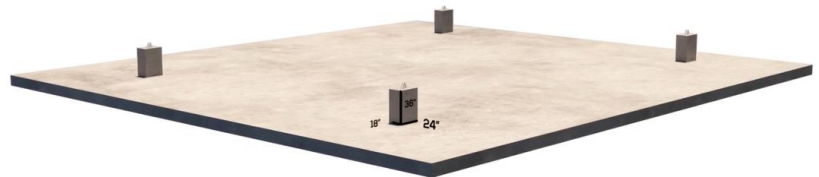
LIMITED SOIL COMPACTION

One of the most pressing issues using traditional ground-mount solar arrays in an agrivoltaic environment is the frequency of steel piles that support the arrays and the compaction of the soils on the farm when the piles are driven during construction. Typical pile spacing can be on a 10' x 10', grid so that a high percentage of soils that will later be farmed are

compacted by pile drivers and other heavy equipment. **SolAgra® uses no driven pilings.** The building block of our system is a "Segment". Each Segment is 35' (north-south) x 45' (east-west). The columns of the SolAgra® Farming Array™ are supported by drilled concrete piers. The piers vary in diameter depending on the structural competency of the soils, but average 16" to 18" diameter. These piers are drilled using a low ground pressure track mounted drill rig. For example, solar arrays with 4 segments that are 2 Segments x 2 Segments, only have 9 piers. All piers except one in the center of the array would be drilled from outside the rectangular footprint of the array. The 8 rows of solar panels are supported by posts that are mounted on the SolAgra® Solar Platform that is 12' to 15' above ground after erection. There are 40 posts on the array. If this was a conventional solar structure, all 40 posts would be driven into the ground by a pile driver which would compact most of the area to be later planted with crops.

Foundations

- Foundations have a small footprint to allow space for crops and agricultural equipment like tractors
- Foundations are 1.5' x 2' and 35' x 45' apart.



Solar Platform Hinge Design

- The solar platform hinge design enables several features that improve not only install time, but also improve the ability to grow crops.



When piers are ready for mounting columns, the columns are lifted with a small crane located outside the array footprint and pinned into place on each column footing. Columns start out in the horizontal position. The process is continued by mounting the beams, spars, posts, torque tubes and then the solar modules are placed by hand, all at ground level.

Solar modules weigh 51 pounds each, so two workers can handle them easily. When the system is ready, it is hinged up into position (columns are now vertical) using cranes that work from outside the rectangular farm area. The DynamicShifting™ actuators are pinned into position and the solar array is static with very limited heavy equipment traffic ever compacting the soils in the farm area.