



Food and Climate – The Coming Crisis

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There are points in our society where needs intersect. One such place is the nexus of food, water and energy. Taken singly, these three areas might seem to be very separate. Nothing could be further from the truth. In fact, many well-intentioned, individual initiatives launched to conserve and purify water, or grow healthy food or provide clean energy are not sustainable and they fail. And they fail because the owners of these initiatives do not always consider how these three elements intersect and reinforce each other. They often think too much “in silos” and do not consider the crossover benefits of food, water and energy.

Cost-effective energy for water usage and food production is vital. This is true whether food production is occurring via traditional farms, Controlled Environmental Agricultural (CEA) facilities, fish hatcheries, urban gardens or small greenhouse planting. The combination of economical water use and energy use is vital to producing food that is environmentally sound, healthy and affordable. The affordability issue is critical in a world that is becoming vastly more populated and experiencing greater hunger.

Environmentally, our food system is a major carbon polluter. The system is composed of multiple activities including processing, packaging, consumption and others. But the two most critical aspects of the system are food production and food transportation. The food system is also a large land user. This is true not only in terms of physical space, but literally in the way land is being consumed. Large mono-crop production is lacing farmland with high levels of nitrates, pesticides and other chemicals. The soil of today is not the same soil plants were grown in a hundred or even fifty years ago.

These methods of growing are largely dominated by industrial food crops like soybeans and corn. America’s vast farmlands are not being used to produce food for human consumption. The major use for soybeans is animal feed. Corn is also used for animal feed, but roughly 40% of it is used to produce ethanol.

Transportation and distribution of food is another large carbon producer. Approximately \$13.5 billion of the food consumed in the Western Atlantic Food Shed (WAFS) comes from a 1000-2000 mile distance, according to the Center for Transportation Analysis Freight Analysis Framework tool. Further, according to a formula provided by the Environmental Defense Fund, carbon output from the transportation industry bringing food into the WAFS can be estimated at 1,853,154 metric tons per year.

One way we suggest increasing regional food production is by developing a series of CEA facilities at key points throughout the Food Shed. The base CEA constructed by InCity Farms is approximately 7.5 acres underroof. Each facility annually will produce a yield of 5,000 acres of traditional cropland. So, 10 CEA facilities could add 50,000 highly productive “acres” to the current WAFS farm acreage of roughly 6.9 million. In addition, these facilities would be driven by aquaculture, annually producing approximately 700,000 pounds of fish per site.

The plants in these facilities would not be at the mercy of heat or cold, drought or heavy rains. They would not be threatened by runoff from other fields carrying fertilizers, herbicides or

pesticides. The nutrients for the plants, processed from the fish on site, would be natural and environmentally pure. These entire, contained eco-systems will produce food that is among the purest and healthiest in the world. They will be systems existing beyond the contamination dangers that even organic farms sometimes suffer.

The carbon output of these facilities would be negligible compared to traditional plowed, planted and harvested acreage. Water usage would be 75% less. Each CEA facility would be heavily dependent on electricity. However, we would steward the production of energy via highly efficient Combined Heat and Power (CHP) engines. The natural gas used in the engines might be from local utility pipelines, farmers' gas wells, landfill gas, coalbed methane, biogas or combinations of these sources. In addition, the Western Atlantic Food Shed possesses a number of small dams that can be retrofitted with mini-turbines (low-head hydro) and some facilities could be powered solely through water energy. All renewable energies would be considered in the power mix for each facility.

CEA is one of the greatest tools available to fight the hunger of an increasingly overpopulated world. But it is not enough. Fortunately, our traditional farms can join this effort as we help to establish a new regional supply chain. Farms in the Western Atlantic Food Shed are in decline. According to the USDA, the average age of all US farm producers in 2017 was 57.5 years, up 1.2 years from 2012. This continues a long-term trend of aging in the US producer population. Family farms accounted for 98% of US farms in 2018, but this number is also declining, and 2019 found small farms pummeled with a trade war, severe weather associated with climate change, sinking commodity prices, political polarization, and an entire generation of young adults going to college and moving off the farm. 2020 introduced supply chain and processing challenges related to COVID-19.

Food21 seeks to bolster small farm economies. One of our strategies is developing new supply chains for farmers' produce. Small farmers are unable to participate in the continental transport of their food to distant markets. But regional CEA facilities can introduce new markets for them by aggregating their crops into a larger shipment. There are many crops that could never be grown cost-effectively within a CEA facility. There are others that could be added to a CEA's output, increasing overall food production.

In this way, there is a natural marriage between CEA growing and traditional farming. But both ways still have to marshal methods that are environmentally sound and combine the best practices of energy, water and food to develop a sustainable system for the future.