

## **Executive Summary**

From the Food and Agriculture Organization (FAO) of the United Nations:

*“In the first half of this century, as the world's population grows to around 9 billion, global demand for food, feed and fiber will nearly double while, increasingly, crops may also be used for bio-energy and other industrial purposes. New and traditional demand for agricultural produce will thus put growing pressure on already scarce agricultural resources. And while agriculture will be forced to compete for land and water with sprawling urban settlements, it will also be required to serve on other major fronts: adapting to and contributing to the mitigation of climate change, helping preserve natural habitats, protecting endangered species and maintaining a high level of biodiversity. As though this were not challenging enough, in most regions fewer people will be living in rural areas and even fewer will be farmers. They will need new technologies to grow more from less land, with fewer hands.”*

The FEED Group (Food, Energy and Economic Development) will take a leadership position in tackling the problems of our global food system by pursuing two distinct but related goals:

- 1) The development and marketing of advanced Controlled Environment Systems (CEA) for agricultural production and job creation. CEA, dominated by greenhouse hydroponics, is a fast-growing segment of the agricultural technology market and is incredibly water, land and solar-energy efficient, while also providing a safer and less toxic environment for farm workers. Adaptations to colder climates, urban settings and the Third World are the next frontiers for CEA development.
- 2) The establishment of a system for measuring the energy efficiency of food production (i.e. how many units of food energy are produced per unit of non-sustainable input, including water and land?). This method-agnostic measurement can then become the target for a variety of different production approaches. Think of it as the LEED Program for food.

In order to accomplish these ambitious goals, the FEED Group is assembling a trans-disciplinary team of engaged scholars, science experts and key organizational partners in university research and extension, agriculture, architecture, design, engineering, construction, development, finance, and public policy. The facilitation of collaborative work is both strategically important and pragmatically necessary. By addressing the complex problems of food production, the FEED Group is also confronting issues pertaining to water conservation, economic development, job creation, preventative healthcare and environmental protection. The existing policy platform provided by these issues will be employed by the FEED Group to galvanize a consumer education movement and lobbying effort to transform agriculture as we know it.

## Product Development

The FEED Group has the ability to lift groundbreaking concepts off the drawing boards of award-winning architects and designers and into production locally, nationally, and globally. FEED has identified Controlled Environment Agriculture (CEA) as the most promising arena in which to begin research aimed at new product development. Decades of research and experience at agricultural universities like Arizona State, U.C. Davis, Cornell, Purdue, and Oregon State University have led to substantial progress in CEA systems, including greenhouses and hydroponics. It is well-established that indoor space, properly managed, can be up to 20 or even 30 times as agriculturally productive as outdoor space while consuming as little as 5-10% of traditional farming's freshwater. (This remarkable disparity is especially true in the case of new, experimental "aeroponics" systems.) Certain crops are commercially grown today with great success using CEA systems – among them tomatoes, lettuces, strawberries, peppers, and various herbs.

But despite CEA's long history and proven capacity for year-round production, it has remained a minor player in the overall agricultural market because it still relies primarily on natural sunlight to grow crops. This is obviously not possible for certain climates and latitudes. The energy cost of heating a greenhouse during cold months, together with providing the additional lighting necessary for plant photosynthesis on cloudy days, make year-round operations financially untenable. Without continuous operations, these greenhouses cannot exploit the market efficiencies available to year-round suppliers to grocery stores and vegetable markets, enabling them to remain cost-competitive.

However, FEED believes it can develop models wherein CEA can be implemented year-round and be energy positive. One example is creating CEA additions to existing computer server farms. The continuous supply of heated air generated by the servers would warm the CEA unit, while functioning as a heat sink and energy offset for the server farm. Energy saved by not having to cool the computing facilities could power even more servers - a symbiotic arrangement whereby overall productivity increases without additional energy expenditure.

The FEED Group has set two major priorities for the research and development of advanced agricultural systems. The first is to develop pre-fabricated building kits that can be used to either attach greenhouses to existing buildings or for the construction of stand-alone superstructures. This goal would include developing a pre-fabricated curtain wall and interior growing system as well as systems to incorporate water reclamation and waste-to-energy units into the agricultural model. Secondly, FEED seeks to develop modular, self-contained growing systems that could be sold as consumer products. Utilizing similar core technology platforms for controlled indoor environmental systems, these projects allow FEED Group to simultaneously pursue a decentralization of agriculture while developing a flexible, modular system to address large-scale production in both urban and rural areas.

## Creating the Platform

Where food production is concerned, we have yet to see a cohesive movement build around the idea of merging “green tech” and “green jobs” with agriculture. We therefore realize that our long-term advocacy and development goals require us first to spearhead the introduction of new concepts and analyses into the current public policy debate. The FEED Group’s main contribution in the short-term will be creating an interactive research and policy platform that can simultaneously act as a project coordinator, developer, marketer, and lobbyist.

FEED's initial research and outreach efforts will target the careful analysis of energy efficiency in food production, with the intent of formulating a single, basic metric by which any food product can be measured and evaluated. (An analogy would be the use of kilo-Calories/sq-ft as a measure of energy efficiency in the built environment, per the United States Green Building Council.) By focusing on a simple, quantifiable and adjustable metric, FEED will avoid the philosophical and cultural entanglements that invariably accompany the advocacy of one method over another (i.e. soil-based organics vs. conventional hydroponics). This approach sets a level playing field for food producers and encourages open innovation around a common theme and objective.

As a frontispiece of its public outreach campaign, the FEED Group will support and help to finance the production of *Beanstalk*, a feature-length motion picture documentary detailing the future promise and present momentum of the Controlled Environment Agriculture (CEA) movement. Viral online marketing with documentary segments, partnerships with relevant and like-minded groups, and even celebrity endorsements will help draw in documentary “fans” who may then become advocates, partners, and consumers of CEA-derived products.

## The Team

FEED Group has sought team members who share experience and understanding of sustainable agriculture concepts, and are leaders in their respective fields. As the group furthers its CEA research, it will seek out project-specific experts as well as leading corporate partners to help co-develop key products and technologies.

Current team members include:

- Dr. Dickson Despommier (Columbia University)
- Beth Emshoff (Oregon State University)
- Peter Greaves (Principal, Weber Thompson Architects)
- Ian Yolles (CMO, RecycleBank)
- Jesse Lawler (*Beanstalk* Director/Producer, Co-founder FEED)
- Peter Platt (Entrepreneur, Co-founder FEED)
- Forbes Fisher (Entrepreneur, Co-founder FEED)