



Empire State
Greenhouses

COVID-19 Has Revealed Multiple Fault Lines
in Our Food System

This is ESG's Action Plan

Building the Future of Agriculture Today

240 East 47 Street | Suite 20D | New York, NY 10017 | ©2020 Empire State Greenhouses, LLC



BEYOND
NET ZERO
–
CARBON
NEGATIVE

COVID-19 Has Revealed Multiple Fault Lines in Our Food System

Vulnerabilities in our food supply chain as exposed by COVID-19 must be addressed to support greater food safety and security.

In all aspects of our planning, Empire State Greenhouses has placed great emphasis on hygiene, packaging and processing. ESG's Biosafety Design includes MERV-17 air filtration, implementation of Biosafety Levels (BSL), and operational practices including the use of automation/AI to augment workers to maintain hygiene, personal protective equipment, automated processing and packaging.

The manner in which food is packaged is one of the key factors to minimizing the potential spread of pathogens like COVID-19, as well as preserving freshness and flavor. We will use all biodegradable packaging, including biodegradable plastics.



BEYOND
NET ZERO
-
CARBON
NEGATIVE

COVID-19 Has Revealed Multiple Fault Lines in Our Food System

- Before Covid-19, grocery stores accounted for 50% of US food sales with the balance being sold through wholesale channels to restaurants, schools, and institutions. This behavior has shifted to in excess of 70% of food sales through grocery stores, but the supply chain has been unable to shift packaging and distribution from wholesale to retail;
- The lack of availability and affordability of food is still currently evident by long lines at food banks/pantries and some grocery stores. During the early stages of the pandemic, images of long lines for food could be seen juxtaposed with images of rotting food being dumped by growers due to inability get their products to distributors;
- Transportation links all aspects of the food supply chain. Weakness in food transportation is exacerbated by increased demand and the vast distances food must travel, coupled with measures intended to prevent the spread of the virus.



BEYOND
NET ZERO
–
CARBON
NEGATIVE

COVID-19 Has Revealed Multiple Fault Lines in Our Food System

- The production of food has been severely impacted as farm workers face risk of infection. The closure of Smithfield Foods, a pork plant in South Dakota, represents 5% of the total US pork production. 783 of its employees contracted Covid-19 as of late April 2020.
- Labor shortages along every link of the food supply chain, particularly a shortage of truck drivers, impacts the entire food supply chain, as does the pandemic's distancing and infection restrictions.
- In the early months of the pandemic, Covid-19 paralyzed global food production and distribution as ports were backed up and some even shut down for a period of time. The delays were exacerbated when there were an insufficient number of workers to unload cargoes, creating a log jam of containers and havoc at global ports. Fifty five percent of fresh fruit and ~31% of vegetables were imported, according to U.S. Department of Agriculture's Economic Research Service as of 2017.*



BEYOND
NET ZERO
–
CARBON
NEGATIVE

The Nexus Between COVID-19 and ESG's Safety Program.

- Whether imported from abroad or transported ~2500 miles from the West coast, the ability to grow food locally in biosafety-designed facilities will ensure access to out-of-season produce, reduce dependence on elongated national/global supply chains and result in a more sustainable operation.
- John Catsimatidis, owner of the largest supermarket presence in Manhattan, said recently in a Wall Street Journal article: “Ten years ago your produce departments did 7% of store sales and your meat departments 17%. Now they have flipped. Produce and vegetables are way up there; meat products are way down.”
- Hygiene and packaging will be key factors in a post-pandemic food system environment. From the farm to the supermarket, there will be a greater emphasis on less handling of food from the beginning to the end of the supply chain so that the facility, the materials and the methodology in which food is packaged will become key factors in minimizing the potential spread of pathogens such as COVID -19.
- ESG is confident about our focus and the timing of our project. We anticipate a heightened interest in food security, and a long-term advantage in the marketplace with investors and governments, given their heightened awareness of: the vulnerability of the food supply chain; the importance of hygiene incorporated in biodegradable packaging (corrugated cardboard and biodegradable plastics); processing in Biosafety Designed facilities; and the advantage of proximity (local as opposed to transporting food from the West coast or abroad)



BEYOND
NET ZERO
–
CARBON
NEGATIVE

The Food System Supply Chain: Imported and Transported Produce

- Despite the explosion of farmer's markets and farm-to-table phenomenon, an increasing percentage of the fruits and vegetables available in US grocery stores is coming from abroad.
 - Over 55% percent of fresh fruit and just under 33% of vegetables in the U.S. were imported according to the U.S. Department of Agriculture's Economic Research Service as of 2017.*
- Produce from the West to the East coast travels ~2500 miles. The average meal in the US travels ~1500miles from farm to dinner plate, according to the Center for Urban Education about Sustainable Agriculture.**
- The transportation of food across the country negatively impacts its quality.
 - Food being picked while unripe must be ripened upon arrival at destination by gassing it;
 - If not gassed, then the food is processed in order to keep it stable using preservatives, irradiation, or other means;
 - Genetic modification experimentation aims to reduce perishability.
- Covid-19 has exposed weakness in food transportation and logistics which have been exacerbated by increased demand given the vast distances food must travel. Transportation links all aspects of the food supply chain.**
 - Labor shortages along the entire food system, particularly a shortage of truck drivers, impact the entire food supply chain in real-time.

*<https://www.timesunion.com/business/article/Yes-more-of-the-fruits-and-vegetables-you-re-13762595.php>

**<https://cuesa.org/learn/how-far-does-your-food-travel-get-your-plate>



BEYOND
NET ZERO
–
CARBON
NEGATIVE

The Food System Supply Chain: Grocery Stores and Supermarkets – The Devil Is In The Details

- Produce typically arrives at grocery stores unwashed and on large pallets and goes right onto the shelves. There is no way of knowing if the food is contaminated or who handled the produce.
- The most accessible food is typically the least fresh: Produce undergoes a rotation while at the store. Most stores locate the freshest produce at the back or bottom of a shelf and rotate the less fresh produce to the top/front.
- The average grocery store apple is ~fourteen (14) months old: Yes, you read that right. Since the ripening period for many fruits in the US is very short (August and September), fruits are often treated with chemicals and put in cold storage.
- Store management and employees can be lax in enforcing health policies, including gloves, masks, hair-nets, and frequent hand washing.
- Customers can spread germs. You have seen it countless times: kids grabbing the produce, people squeezing the avocados, someone sneezing or coughing, all which can contaminate the produce.
- For economic reasons, most grocery stores tend to buy from one or a few trusted sources that can supply product all year round rendering the idea of “in-season” products a myth.
- Grocery stores routinely mark up prices to match those of local farmers. Given the embedded costs of energy and food, high rents and labor, many large grocery stores increase produce prices relative to what is available locally.
- Older greens land on the salad bar:
- Consumption of certain fruits and vegetables can be risky due to high pesticide levels: Not all consumers practice scrubbing produce such as strawberries, apples, peaches, melons and celery, which can all hold bacteria.

Source: Delish.com

<https://www.delish.com/food-news/a47986/dirty-secrets-of-supermarketproduce-departments/>



BEYOND
NET ZERO
–
CARBON
NEGATIVE

Action Plan for Safety in ESG Facilities:

- **Biosafety Design Considerations:** Biosafety levels (BSL), or Pathogen/Protection levels, are biocontainment precautions intended to isolate dangerous biological agents in an enclosed facility such as the ESG's greenhouses, packaging and processing facilities. ESG can establish BSL level 3 and will have BSL level 2 at launch.
- **Design Features:** The design features or characteristics are set according to the guidelines established by the Centers for Disease Control and Prevention (CDC) which establishes BSL lab levels in order to demonstrate individual controls for the containment of microbes and biological agents. Practically, a BSL lab level builds upon on the previous level ensuring a compounding effect as levels are added to previous level.
- **Operational Practices:** Each space in the facility where biohazardous materials are used is assigned one of CDC established BSL. The biosafety level is determined by the degree of risk related to the biohazardous materials and the activities taking place with those materials.
- If you wish to learn more about 4 BSL levels, please follow this link provided by Consolidated Sterilizer Systems (CSS): <https://consteril.com/biosafety-levels-difference/>



BEYOND
NET ZERO
–
CARBON
NEGATIVE

Safety in ESG Facilities: Biosafety Design Considerations in ESG Facilities

Design Features:

- Minimum Efficiency Reporting Value (MERV) 13 or High Efficiency Particulate Air (HEPA), which is MERV 17-20 air filtering of greenhouse air. HEPA is a designation used to describe filters that can trap 99.97 percent of particles that are 0.3 microns. HEPA filtration & overpressure of lab, access and grow room air.
- Ultraviolet (UV) air filtering. Short-wave ultraviolet light (UV-C light) is used to inactivate airborne pathogens and microorganisms like mold, bacteria and viruses in labs, access and grow room air.
- Use of vestibule two door entrances into the building and /or air curtains to control temperatures and prevent insects from entering the facility.



BEYOND
NET ZERO
–
CARBON
NEGATIVE

Safety in ESG Facilities: Biosafety Design Considerations in ESG Facilities

Operational Management Practices:

- Daily cleaning practices with bleach or sanitizing chemicals for all harvesting, processing, work and access areas & equipment.
- Daily inspections of labs, access and grow spaces.
- Removal of diseased plants from growing systems.
- Physical access control to greenhouse, mushroom and processing facilities.
- Good Agricultural Practices/Hazard Analysis and Critical Control Points (GAP/HACCP practices per USDA)
- Hand washing and sanitizing.
- Personal Protective equipment (PPE) worn by all personnel in labs, harvesting, processing, access and grow spaces.
- Use of automation/AI to augment workers and maintain hygiene by automating the processing and packaging – thereby minimizing the number of hands touching the produce.
- Each space in the facility where biohazardous materials are used is assigned one of CDC established BSL. The biosafety level is determined by the degree of risk related to the biohazardous materials and the activities taking place with those materials.



BEYOND
NET ZERO
–
CARBON
NEGATIVE

Safety in ESG Facilities: Same Day Harvest, Processing, Packing, and Delivery to Customers

- With increased consumer demand for fresh, nutritious fruits and vegetables, growers and processors must maintain high safety standards in order to ensure safe and hygienic produce for the consumer. ESG will work with suppliers to take advantage of developments in the latest processing technology and biodegradable packaging to ensure the delivery of hygienic produce in top condition while eliminating their carbon footprint.

Growing Support:

- **Growing Media Preparation:** Growing media are materials that plants grow in and specifically designed to support plant growth.
- **Water Filtration:** Filtering out unwanted contaminants and reuse irrigation water.
- **Seed Starting:** The incorporation of a methodology for the usage of specific seeds or mix of seeds for indoor usage.
- **Certification / Compliance**
- **Accounting**
- **Training**



BEYOND
NET ZERO
–
CARBON
NEGATIVE

Safety in ESG Facilities: Same Day Harvest, Processing, Packing, and Delivery to Customers



Processing:

- Washing: Post harvest washing and cleaning of produce.
- Mixing: Produce preparation such as mixed salad green.
- Drying: Maximize and effectively dry indoor crops using drying racks, incorporating good airflow, and controlling heat and humidity to decrease chances of mold, mildew and disease.
- Freeze Drying: This is a low temperature dehydration process involving freezing the product, lowering pressure, then removing the ice by sublimation; in contrast to dehydration by most conventional methods that evaporate water using heat.
- Extraction of Essential Oils: Oils isolated from plants when introduced to solvents and are liquefied



BEYOND
NET ZERO

–

CARBON
NEGATIVE

Safety in ESG Facilities: Same Day Harvest, Processing, Packing, and Delivery to Customers

Packaging:

- **Boxes:** Standard packaging boxes range from 3 lbs. to 60 lbs.
- **Clamshells:** The biodegradable thermo formed trays are filled, atmosphere added, and covered with a sheet of plastic.
- **Bagging:** Two sheets of biodegradable plastic that form the bag, atmosphere added, and sealed.
- **Labeling:** Private label, labeling for different products or packages printed on demand.

Distribution:

- **Cold Storage:** In addition to packaging and processing, ESG will maintain state of the art cold storage with fully racked pallet positions, cold chain compliant transload and humidity control.
- **Load Aggregation:** ESG can also package and aggregate products from partner farms in any combination of products and in any volume.
- **Trucking:** ESG will offer both FOB and CIF sales to distributors, grocery stores, restaurants and retail customers.



Building the Future of Agriculture Today

Beyond net zero – carbon negative

Renewable energy powered

Certified organic crop factory

Focused on food security and sustainability