Lessons from Efforts Supporting Small Farmers and Community Organizations in Puerto Rico after Hurricane Maria

Presentation by- Phal Mantha, Director of Agriculture and Sustainability
Hurricane Maria made landfall as a category 4 storm in Puerto Rico on September 20th, 2017. The powerful winds ripped the roofs off of homes, uprooted trees and brought down power lines leaving 100% of the island and her 3.5 million residents, without power, potable water or communication.

While some residents were blessed to have their homes and personal property spared, many people have suffered crippling losses from the storm.
Introduction - Immediate Effects of Hurricane Maria

- Power generation and distribution infrastructure destroyed
- Water Treatment and distribution infrastructure destroyed/severely damaged
- Massive Fuel shortages, many homes destroyed, flooded, and severely damaged
- Roads unmotorable due to massive amounts of debris, landslides, and flooding.
- Hospitals seriously damaged, unable to operate and facing serious shortages of fuel and operational materials
- Complete lack of any means of communication
- No food on shelves in grocery stores leading to looting in many areas
Immediate Effects of Hurricane Maria on Food Systems and Farmers

• Huge shortage of food almost instantly, people waiting in lines for hours only to find grocery store shelves empty

• Spoilage of massive amounts of perishable food in grocery stores due to lack of power and fuel for generators to run

• Food distributors put out of business due to damage to trucks/infrastructure and no business for months.

• Restaurants, even some profitable high end ones, forced to close due to supply chain interruptions, damage to buildings, and lack of demand and tourism.
Immediate Effects of Hurricane Maria on Food Systems and Farmers

• Vital production infrastructure damaged
• No power for irrigation, cold storage, post harvest operations
• Most crops in the ground destroyed
• No access to vital production inputs
• Many small farmers ineligible for assistance
Dependence vs. Resilience

Cases of Plastic bottles spoiling in the sun Ceiba

Renewable and Resilient Infrastructure
Resilient Solutions Part I- Rainwater Catchment, Storage and Purification

Rainwater Storage for Apoyo de Mariana- Community Center/Kitchen
Rainwater Storage for Apoyo de Caguas- Community Garden/Kitchen
Resilient Solutions Part I- Rainwater Catchment, Storage and Purification

Rainwater Storage for Finca Siembra Vida, Rincon- Farm to Table Restaurant
Gravity Driven, Rainwater Wash Stations for Food Safety

Sana Farms, Cabo Rojo

Finca Siembra Tres Vidas, Aibonito
Resilient Solutions Part II- Mobile Independent Cold Storage Systems
Resilient Solutions Part II - Stationary Independent Cold Storage Systems - Small farms as “Hubs of Resilience”

Grid Independent Cold Storage Systems in Aibonito, Ponce, Patillas
Finca Siembras Vida, Finca Reverdecer, and Desde mi Huerto- The only organic seed producer in Puerto Rico
Resilient Solutions Part III- Appropriate Technology to Boost Production Efficiencies- Electric Harvesters

Javier of Sana Farms in Cabo Rojo with his new quick cut harvester
Resilient Solutions Part III - Appropriate Technology to Boost Production Efficiencies - Precision Seeders

-Seeder capable of precision singulation (inter and intra row)

- Versatile- allows for the sowing of most crops commonly grown in production agriculture

- Precision spacing eliminates need for thinning, and allows for inter row cultivation reducing dependence on herbicides

- Very robust, manual seeder-requires no external energy source
Cheapest method of Controlled Environment Production

Can be assembled/ taken down in a few hours

Can be used for the production of a wide variety of crops-compatible with insect exclusion netting, shade cloth, and various types of plastic

Reduced losses due to weather, insect/disease pressure

Provides season extension, allows for the production of heat sensitive and speciality crops
Resilient Solutions Part III- Appropriate Technology to Boost Production Efficiencies- Production of High Quality Organic Fertilizers From Waste Streams
Resilient Solutions Part III- Appropriate Technology to Boost Production Efficiencies- Impacts of Appropriate Technology

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Efficiency Multiplier</th>
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<tbody>
<tr>
<td>Greens Harvester</td>
<td>~$600</td>
<td>5-9x faster</td>
</tr>
<tr>
<td>Jang Seeder</td>
<td>~$600</td>
<td>10x faster and more precise than hand seeding; reducing weeding costs by 80-90%</td>
</tr>
<tr>
<td>Caterpillar Tunnels</td>
<td>~$1,200</td>
<td>2 - 3x more production</td>
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<tr>
<td>Off-grid refrigeration</td>
<td>$5,000 - $15,000</td>
<td>Storage for 2-6 weeks --Less spoilage and better condition of produce Ability to still function after a hurricane or tropical storm (not connected to grid)</td>
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• Resilience through collaboration!

• Key production inputs and infrastructure should be independent and decentralized

• Agricultural production should be anticipatory instead of reactionary