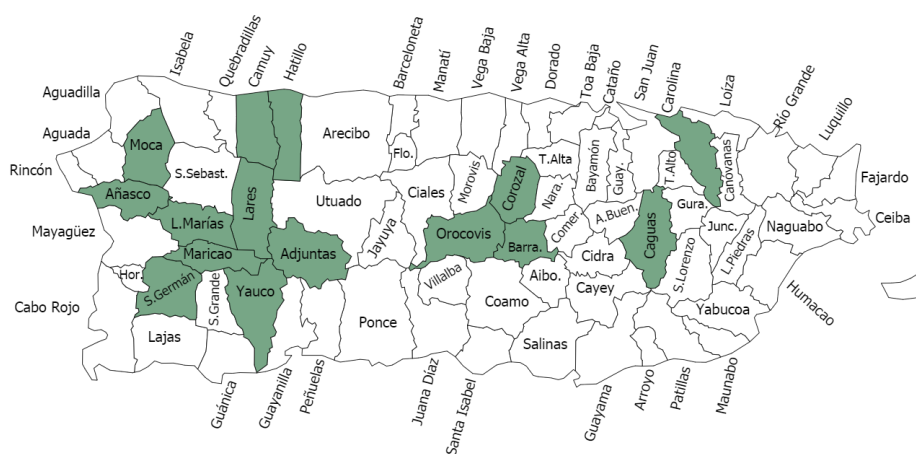


# Agriculture and Food during a Natural Disaster

In the summer of 2019, almost 2 years after Hurricane Maria destroyed 80% of crops in Puerto Rico, researchers from the Harvard TH Chan School of Public Health collaborated with the Bucarabón Foundation to carry out a study on food access, social support, and agricultural recovery among farmers during a natural disaster. The researchers interviewed 30 farmers in 15 municipalities in the central mountainous region of PR about their experiences reestablishing their businesses after Hurricane Maria. The results demonstrated how farming communities collaborated to rebuild and reveal strategies to create more self-sufficient, resilient, and healthy local food systems.

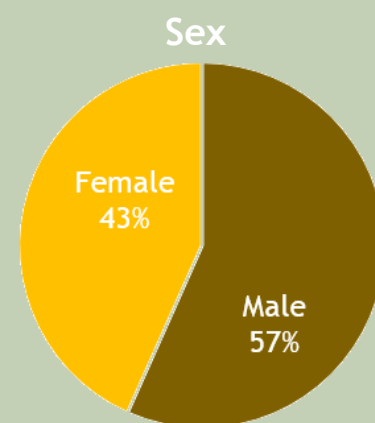


Location of participating farms

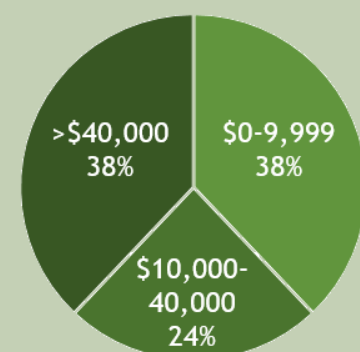
## Farmer Characteristics

Average age: 47.2

Range: 27–76 years



Average annual farm income



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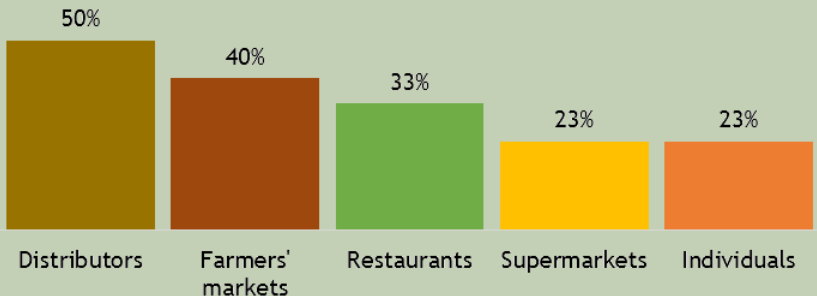
SCHOOL OF PUBLIC HEALTH

## Production Type



Among surveyed farmers, most of the production after the hurricane was composed of land crops. Some also reported mixed or animal production and hydroponics.

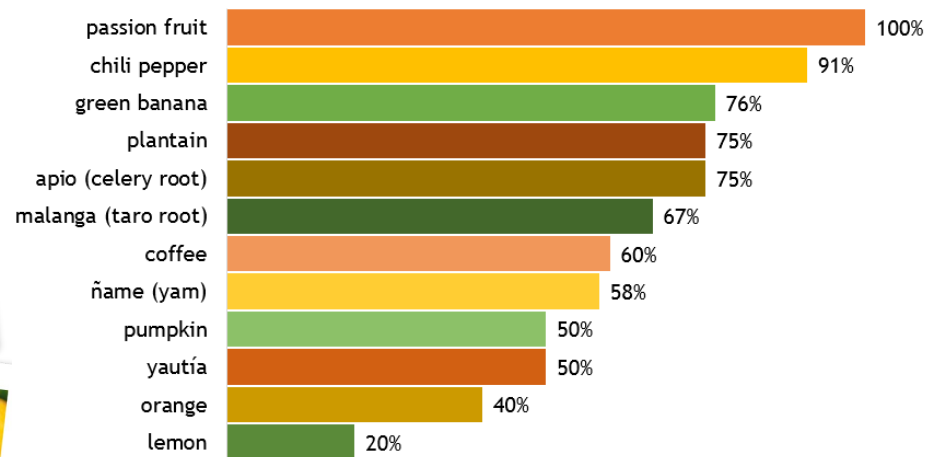
## Major Clientele



Many farmers relied on intermediaries to sell produce. However, a diversity of direct-to-consumer marketing was also observed, including participation in farmers' markets and sales to restaurants and individuals.



## Product Reestablishment



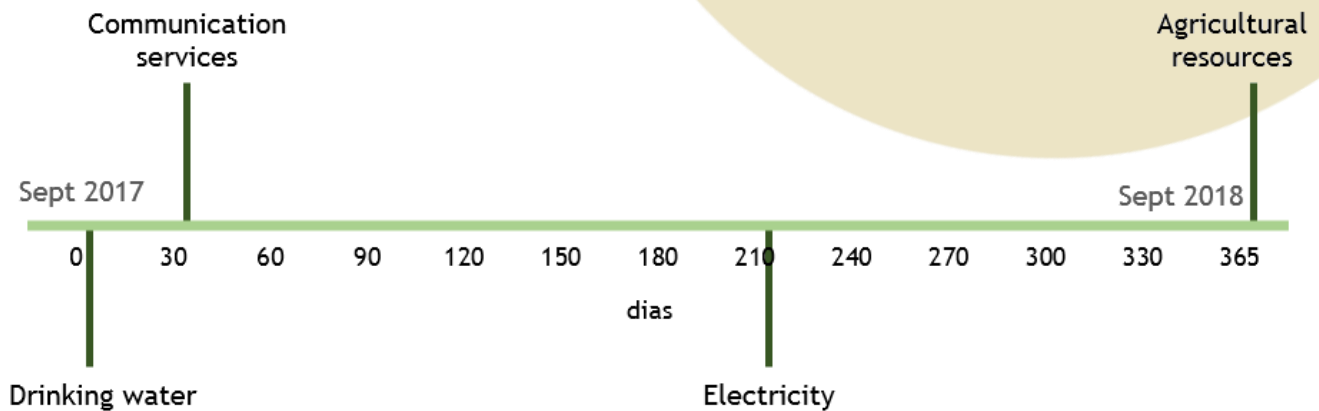
Most farmers were able to restore passion fruit, chili peppers, green banana, plantain, and root crops, which served as food for themselves and their families in the first weeks after the hurricane. On the other hand, trees like lemon and orange were not so easy to reestablish.

## Hurricane Damages

Most of the farmers reported damages to crops and/or animals, infrastructure, and machinery on their farms. More than a third (36.7%) had personnel who left the island permanently, and almost two thirds (60.0%) had no product available for sale immediately after Hurricane Maria.

Many farmers never lost drinking water due to access to personal or community wells and springs. However, delays in accessing agricultural resources typically lasted a year, and some (23.3%) had not yet produced food more than a year and a half later.

### Average days with no access to resources



## Strategies for Resilience

Personal or community seed banks

*Soil conservation practices*

- Contour plowing
- Cover crops
- Drains for water flow

Action plan with farm personnel

Tree trimming

In greenhouses, reinforce tubes with cement; cut plastic covers

Participants identified various strategies to prepare for a future natural disaster:

- **Seed banks** on the farm or co-owned with local farmers can prevent delays in production and decrease dependence on the central government.
- **Soil conservation** strategies—such as contour plowing—can minimize erosion and decrease the risk of landslides.
- Preparing a **farm action plan** can recover food crops sooner and may retain farmhands in employment.
- In the week before a hurricane, **trimming trees** and cutting the plastic covers of greenhouses can prevent damage.

## Crop Diversification

Several farmers discussed current or planned efforts to increase the variety of crops on their farms. Products harvested in months like green banana and chili pepper—or in weeks like hydroponic lettuce and cilantro—can generate more consistent farm income. They also suggested spreading out planting times to harvest more regularly throughout the year.

After a natural disaster, product diversity can also ensure that some, like underground crops, survive while other products like coffee take longer to recover. Finally, having a variety of foods can supplement the diets of farmers and farming communities with fresh fruits, starchy roots, and vegetables.



## Voices in Solidarity

“ A country without agriculture is a country without food. A country without food is a starving country.”

“Within the bad [part] of the hurricane, I had never seen [such] a union of neighborhood and of people. As a farmer—and two or three farmers and neighbors who had different types of businesses—we got together and were able to bring food to other towns. ”

“We have to be organized by town or by area because, maybe, I have a saw and you have gasoline. Uniting as a group is easier.”

“[When] you buy fresh products, products of this country, you promote an economy in solidarity of helping one another.”

Many farmers want to create alliances and promote a agro-food chain that is healthy, cooperative, and resilient to natural disasters.



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