

DRAFT Tomato, Pepper, and Eggplant Producers Guide to Preparing for and Recovering from Hurricanes in Georgia and North Florida

This is a draft of guidance being developed by the USDA SE Climate Hub to help tomato, pepper, and eggplant producers prepare for and recover from hurricane damage

This section will focus on:

- Pre-event steps to minimize loss due to a hurricane even in pepper and tomato crops.
 - Short term recommendations for reducing loss of pepper and tomato crops after a hurricane event.
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I. Pre-Hurricane Planning – Long-term Preparedness

Initial Site Planning

Hurricanes or severe tropical storms pose a threat to all vegetable production in southeast US. Strong winds can blow fruit off or even defoliate the entire plant. High precipitations may lead to flooding, runoff, or soil erosion. Therefore, when planning for long-term preparedness the growing site should be evaluated. Specifically, is the site on an elevation (more susceptible to wind damage), near surface water (susceptible to flooding), or near coastal waterways (susceptible to storm surge). It is unlikely that all risks can be avoided. For example, an elevated site may be more open to wind damage, but more protected from rising flood waters. Surface water access may be necessary for an irrigation source. The majority of peppers and tomatoes in Georgia are grown using drip irrigation and ground (well) water. The negatives of an elevated open site are likely less than those associated with low lying areas susceptible to flooding when planning a site with resilience for hurricanes.

Site Establishment

When establishing a growing site and/or packing facility some initial considerations may be made for increasing resilience to hurricane events. Land should be gently sloping with adequate drainage. Steeper slopes should be terraced if possible. If land is elevated and unprotected, wind breaks may be appropriate along field edges to help reduce damage from lower category storms.

In previous storms, irrigation systems were rendered inoperable due to a lack of electricity. This resulted in high indirect losses due to being unable to irrigate after a storm. Hurricanes typically occur in early fall in south Georgia, when day temperatures can easily exceed 90 °F. Irrigation is usually required shortly after a storm passes to maintain a crop. Locating irrigation pumps in elevated areas may help with reducing flooding risks to the pump, and installed with a backflow prevention device to avoid contamination in cases of power loss. In addition, having a clear access road to the pump may help with bringing in generators or diesel powered pumps after a storm to facilitate irrigation.

Packing sheds should also be located in somewhat higher ground to prevent flooding. Site preparation for packing facilities may include sloping land away from the shed to allow for drainage and

in some cases construction of shallow berms to prevent minor flooding from penetrating a packing facility. Destruction of farm facilities in recent hurricanes have resulted in some of the largest losses compared to immediate crop damage. Electricity supplying coolers must also be maintained during and after a storm.

Seasonal Considerations Outside of Hurricane Season

During slow periods of the year ensure that backup generators and supplemental pumps are in good working order. Test generator and backup systems every 3-4 months.

- Areas of the farm that are prone to flooding may be regraded to improve drainage.

Monthly Considerations During Hurricane Season

During hurricane season additional fuel supplies should be maintained on farm in elevated tanks protected from flooding. This could even be in trailer or truck mounted diesel tanks. Wind damage may be minimized by utilizing annual cover crops near plot edges. Areas between beds of plastic (particularly near the end of rows) could be seeded with low growing cover crops to reduce potential erosion if a storm even occurs.

Collect soil samples from growing areas to establish a baseline for chemical or heavy metal contamination. If flooding does occur, soil samples are a useful tool to determine when previously flooded fields may be safe for replanting. A baseline from previously collected samples will assist with pre-planting risk analysis to determine if flood waters may have introduced chemical hazards into the soil.

Additional inventories of fungicides and bactericides should be maintained in the event of storm so that crews can apply them as soon as the storm passes to protect from diseases. It is likely that infrastructure may be significantly damaged; therefore, the farmer should have enough agricultural chemicals on hand to be self-sufficient for at least one to two weeks post-storm. Keep in mind diseases are a major secondary cause of yield loss after hurricane events.

Additional stakes and nylon string for eggplants, peppers, and tomatoes should be on hand to allow for crews to re-stake fields that have been blown down in a storm. Significant damage in prior hurricanes occurred due to sun-burn from plants laying down in the field as the trellising system had broken. Without access to additional plant stakes growers could not quickly prop up plants.

Annual Considerations

- Meet with your crop insurance and/or FSA representative to make sure you are signed up for eligible programs.
 - See seasonal considerations (above).
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II. Pre-hurricane Planning – Short-term Preparedness

When a Hurricane Is Forecast to Impact Your Area (1 to 7 days before)

- In the week before a forecasted hurricane event be sure to stockpile any chemicals you may need, including sun burn protectant and maintain adequate fuel resources on hand. Given the size of the farm it may also make sense to give certain farm workers areas of responsibility as it may be too much work for one or two people to handle.
- In the fields begin moving pivot/lateral irrigation to edges of the field that may be more protected and complete any temporary grading activities to facilitate improved drainage or to protect sheds/buildings from flooding. Cut limbs or remove any low hanging trees that could damage buildings in a storm.
- You should also fill empty and cleaned fertilizer tanks as well as additional tanks with potable water. Washing lines require potable water and if county/city water is the primary source of water for a packing shed be sure to have water on hand if municipal water is unavailable.
- Shortly before a forecasted storm you should pick any mature tomato or pepper fruit and store in coolers and/or ship. Even if fruit appears to make it through the storm in the field, experience has shown that postharvest disease rates in these fruit greatly increase. Growers have picked fruit in the immediate aftermath of a storm only to have it deteriorate in storage or transit, resulting in additional costs and losses.

One Day Before a Hurricane is Forecast to Impact Your Area

- Disconnect power from buildings that may be flooded.
- Temporarily store machinery at higher elevations and move chemicals to protected areas as well.
- Turn off power to wells and properly waterproof cap

II. Post-hurricane Recovery

In the aftermath of a hurricane take detailed notes of fields damaged with accompanying photographs of each field demonstrating the losses. This may be critically important later on. When inspecting fields determine if a crop has enough fruit remaining to save or to be terminated at this point. For hurricanes occurring early in the season be sure to check if newly set fruit are damaged or if flowers have been destroyed. If fruit is not set in a timely fashion then delayed losses may occur. **For food safety purposes, any fruit that is in contact with floodwater cannot be harvested. Take an accurate assessment of which field(s) may be flooded and where fruit can no longer be harvested. In case of flooding, destroy all products contacted by flood water, and keep documentation showing that the**

crop did not enter the food supply. Floodwaters may contain elevated levels of not only pathogenic bacteria but also chemicals, which cannot be removed from a food once contaminated. The Food and Drug Administration considers all human and animal foods contacted by floodwaters adulterated, and such foods must be destroyed.

All water should be tested prior to use for drinking, cleaning food contact surfaces or produce, and for production activities. **Ground water sources should be submitted for microbial and chemical testing regardless of whether the wellhead was flooded to ensure the aquifer was not contaminated.** This is particularly critical for drinking water and food contact water. Some growers on municipal water systems, particularly those a substantial distance from the distribution center, may be advised to submit a microbial water test (after boil water advisories are no longer in effect) to verify the integrity of the distribution line to their farm or operation. If a surface water source was flooded, microbial and chemical testing should occur prior to reuse for production activities. If microbial levels exceed acceptable levels, a water treatment system (e.g., UV light, peroxyacetic acid) may need to be used until subsequent tests indicate the levels have stabilized. Examine the source and distribution system to address any issues that wind or flooding may have caused and remove any debris that may have accumulated in the water source during the storm.

Within a Week Following Hurricane Impacts

Due to high temperatures likely to be encountered in the fall, make sure irrigation is functioning. Excess floodwaters (those not contacting fruit) need to be drained from fields within 2-3 days or plant roots will be subjected to anaerobic conditions and the plant will likely die. Recent storms in southern Georgia have resulted in far more wind damage than flood damage

If a crop is to be saved, prop up/trellis stakes/plants that may have blown over and apply both a shade protectant and preventative fungicide/bactericide spray. Defoliated plants can also result in sunburned fruit. Complete recommendations for pesticides labeled in Georgia for disease prevention can be found in the Georgia Pest Management Handbook

<https://extension.uga.edu/content/dam/extension/programs-and-services/integrated-pest-management/documents/handbooks/2019-pmh-chapters/Vegetables.pdf>

If harvesting, it is encouraged to store that fruit for several days before shipping. Due to high winds causing damage to the cuticle on peppers and tomatoes, **many fruit that were harvested in the aftermath of recent hurricanes appeared to be acceptable only to be rejected due to bacterial soft rots (*Erwinia sp.*) in pepper and sour rot (*Geotrichum candidum*) in tomato.** Both diseases only showed symptoms after shipping resulting in large losses for growers. In eggplant, phomopsis blight (*Phomopsis vexans*) is easily spread by driving rain and early symptoms can be difficult to detect, often displaying themselves during shipping. Affected eggplant fruit are unmarketable and will be rejected by buyers.

Within a Month Following Hurricane Impacts

- Visit with crop loss adjusters, structural insurance adjusters, and your local Extension Service to make sure losses are documented. A link to county extension agents can be found at: <https://extension.uga.edu/>
- Regularly scheduled pesticide applications can be resumed.
- The Food and Drug Administration recommends a 30-60 day wait period before previously flooded land should be replanted with fresh produce crops. This is to allow sufficient time for the reduction of bacterial contamination within the soil. Chemical contamination may require a longer waiting period depending on the chemical and the level of contamination.
- Soil samples throughout the flooded portion of the field should be collected and tested for known contaminants, or for general chemical contamination (which can be compared to the baseline established prior to flooding if already established).
- Prior to reuse, all food contact equipment and food handling environments that may have become contaminated during the storm should be thoroughly cleaned and sanitized. This two-step process involves first the physical removal of dirt or debris (cleaning), which can be done using a brush or with water and a detergent. Sanitizing is done only after the surface has been thoroughly cleaned and uses an antimicrobial chemical to reduce microorganisms on the equipment surface.

This draft guidance was developed by subject matter experts from the University of Georgia