

Recovery from hurricane and tropical storm damage to tropical fruit groves[©]

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Post hurricane practices

- Make a damage assessment of each grove.
- Document the damage in each grove with photographs and brief text.
- Contact USDA-FSA and insurance adjuster to report damage.
- Work with FSA and the insurance company so that hurricane recovery may proceed as soon as possible.
- Keep receipts of equipment rental costs, fuel, etc. and labor expenses.

Post hurricane practices

- Assemble the equipment and man-power for:
 - gaining access to the groves
 - **covering toppled trees**
 - **irrigation system repair** and
 - resetting trees.
- Equipment includes
 - Backhoes/front-end loaders
 - Tractors, water wagon
 - Chain saws, slings, shovels, loppers, hoes
 - Fuel
- **Slings should be made of rope or material and not metal cable or chain. Metal slings will damage tree bark and if snapped can be extremely dangerous.**

Post hurricane practices – sun exposure

- Protecting sun-exposed trunks and limbs

From “sunburn”.

- Dilute white water-based latex paint 1:1 or
- Mix 1 part water, 1 part fine-grade hydrated lime and 1/10th part zinc sulfate (e.g., 1 gallon water, 1 lb lime, 1 ½ oz zinc sulfate). May be diluted further for ease of spraying onto exposed surfaces.
- **Pile brush debris or cut limbs on exposed upper surfaces and roots.**

Post hurricane practices – flood stress

- Symptoms: leaf and stem wilting, leaf chlorosis and desiccation (browning), limb dieback, fruit shriveling and drop, and tree death.
- If you see any symptoms: remove fruit, reduce the size of the tree canopy by pruning, and apply fungicides to the root zone and/or remaining live canopy.

Post hurricane practices - pruning

- Pruning may be part of the debris removal and is part of the preparation for resetting toppled trees.
 - Prune toppled trees to **reduce tree weight** (for the resetting process) and to reduce the potential water loss (from existing leaves). In some cases trees may need to be hat-racked; if possible leaving a nurse limb may speed tree recovery.
 - Pruned limbs may be used as **braces** for propping (resetting) up fallen trees and for shading exposed trunks and limbs.
 - Debris may be chipped and used as mulch.

Post hurricane practices - resetting

Resetting process:

- Prune tree back.
- Prune off heavily damaged vertical and/or lateral roots completely out of the ground.
- Utilize a backhoe or similar machine (plus hoes and shovels) to remove soil from the original tree-hole area so the tree will reset near the same level as before.
- Use a heavy-duty sling to raise the trees to an upright position and then fill in around the root system with the excavated soil. Then brace the tree.
- Caution: When pruning a toppled tree back, make sure no one is on the backside of the root system. The tree may shift upon pruning and is dangerous for anyone working near the root mass or trunk.

Resetting a downed flat-planted avocado tree 2012







Four years later



Post hurricane practices – water and mulch

- Water-in the tree. Irrigate periodically.
- If possible mulch the soil from several inches away from the trunk outward. This will help conserve moisture.
- Do not use more than 6 to 8 inches of mulch because very thick layers may: 1) impede gas exchange between the tree roots and atmosphere and lead to tree decline and; 2) cause excessively wet soil conditions leading to root rot. Keep the mulch 6 to 12 inches from the trunk of the tree.

Organic debris utilization - options

- Stack large diameter wood and tree trunks in-row between trees to decay over time.
 - Place small diameter wood in row middles for bush-hog cutting. Some heavy duty brush shredders may cut slightly larger wood.
 - Chip or shred other woody debris and utilize as a mulch.
 - Placing debris in the right-of-way or along the road is expensive to transport to land-fills.
- *In general debris pickup and removal from commercial businesses including agriculture is no longer paid for by Federal, State, or local governments.

Organic debris utilization - options



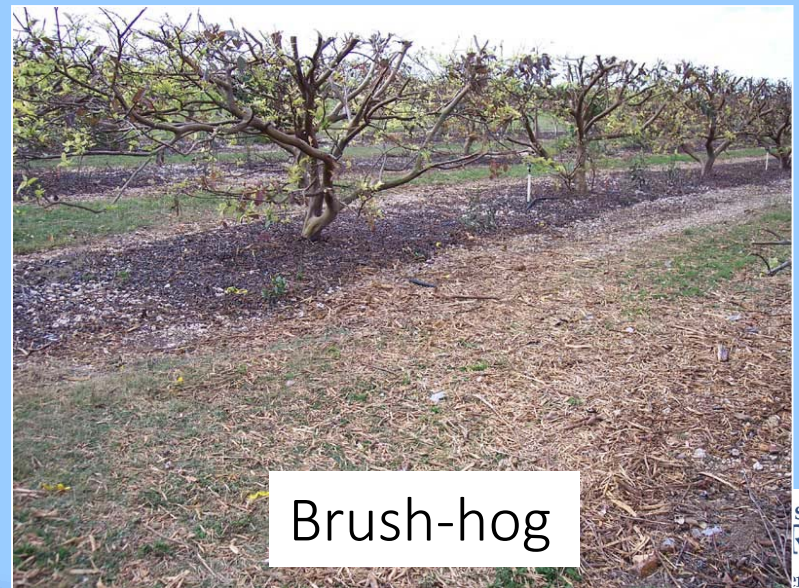
Road-side pickup



Stacking



Mulch



Brush-hog

Post hurricane irrigation practices

- The sooner the irrigation system can be repaired or provision for temporary irrigation can be made (e.g., high volume guns) the better.
- Trees with some remaining canopy should be irrigated 1-2 times per week until trees become re-established. A long, good soaking is better than constant small amounts being applied – the soil profile needs to drain off for good gas exchange – soil kept excessively wet may lead to root rot.
- Wind-blown salt spray may cause foliage damage (leaf marginal necrosis, leaf drop) and stem dieback. Unless the salt-spray can be washed off immediately (a few days of the storm) there may be no way to prevent this.

Post hurricane fertilizer practices

- Obtaining fertilizers and distributing them may not be immediately possible and/or be of secondary importance immediately after a storm.
- However, major fertilizer elements should be applied when new growth begins to prevent nutrient deficiencies after stored reserves in the trees are depleted.

Post hurricane fertilizer practices

Tree damage	Recommendation
Large limb loss and/or previously toppled trees	Reduce the fertilizer rate in proportion to the amount of tree damage.
Mainly leaf and twig damage (loss)	Increase the fertilizer rates slightly.
<ul style="list-style-type: none">• In general, frequent small applications of fertilizer may insure a steady supply of nutrients and aid in rapid recovery.• Micronutrients such as Mn and Zn and Fe should be applied as trees refoliate.	

Post hurricane weed control practices

- Increased sunlight exposure of the soil surface will increase weed pressure. Weeds will compete for nutrients and water.
- When possible mow and herbicide.
- Mulching may help decrease weed pressure (unless it contains weed seeds).
- Important that the ability to irrigate be re-established not only for optimum tree recovery but to reduce the fire hazard organic debris and dead weeds pose during prolonged dry periods post storm.

Post hurricane observations by crop

- General comment:
 - Trees under a tree size management program withstand hurricanes much better than trees allowed to grow tall.
 - Expect some additional limb breakage post storm.
 - Trees with fruit at the time of the storm tend to have more tree damage than trees with no fruit.
- Atemoya and sugar apple: Generally do not reset nor recover well from moderate to severe damage. Replanting may be a better option if slow tree decline occurs.
- Avocado: Generally, reset and re-grow well post storm. Historically have resumed production in 1-3 years. Flooding may cause decline and/or death.
- Banana: In general, most pseudostems toppled, especially those with fruit bunches. Historically, regrowth post storm from underground corms was good; production resumed 12-18 months later.

Post hurricane observations by crop

- Carambola: Generally, re-grew well post storm. Historically resumed production in 6-9 months.
- Guava: Generally withstood the storm (low profile) well. Historically have resumed production in 6 to 9 months.
- ‘Tahiti’ lime: Historically grafted trees that withstood the storm and/or were reset refoliated well and resumed production 6 to 12 months later.
- Longan: Historically, longan trees generally, reset and re-grow well post storm. Resumed production in 1-2 years.
- Lychee: Historically, ‘Mauritius’ lychee trees were heavily damaged. Those trees remaining refoliated well but took 1 to 2 years to resume production.

Post hurricane observations by crop

- Mamey sapote: Historically, mamey sapote trees generally, reset and re-grow well post storm. However, those trees with major limb damage did not resume production for 4 to 5 years.
- Mango: Resetting resulted in very mixed results, some declined, others re-grew well. Trees appear more susceptible to sunburn than avocado trees.
- Papaya: Historically, papaya trees were left leaning and toppled, especially those with a lot of fruit. Regrowth post storm very variable. Replanting may be a better option.

Summary

- Preparing a plan for grove recovery ahead of storm season includes a potential grove damage assessment and equipment needs.
- A tree size management program is the best insurance of limiting potential storm damage.
- Post hurricane practices are aimed at tree recovery/rejuvenation and resumption of fruit production.