Creating Your Own Tropical Fruit Paradise in Southwest Florida

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Some reasons to grow your own tropical fruit

1. To enjoy fruits that are difficult to buy: excellent non-commercial fruits such as black sapote, canistel, or jaboticaba, or rare varieties, or just any kind of fruit that's truly fresh
2. Guaranteed non-toxic growing methods
3. Enrich your connection to nature
4. Ethical or environmental concerns
5. It's fun, healthy, interesting, spiritual
6. Save (or even make) money

Seven key horticultural concerns --- consider these when deciding what fruits to grow and where to plant them

1. **sunlight** -- most fruiting plants need at least a half day of full sun, but as a notable exception, carambola (starfruit) can prosper and fruit in a fair amount of shade
2. **fertility** -- soil fertility will be discussed in detail below
3. **drought tolerance** -- almost no fruit tree can tolerate actual dry soil, but some species are much better than others at finding enough water
4. **flood tolerance** -- avocado trees are notably flood-intolerant, also to some extent stone fruit, loquat and white sapote; don't put them where there could ever be standing water
5. **cold tolerance** -- depends greatly on the species, and within a species, it depends on many factors, especially the trunk diameter of the tree --- small trees are far more vulnerable
6. **wind tolerance** -- especially a problem with bananas and papayas (which at least according to some definitions are not true trees); jaboticabas are blown over easily by high winds; carambola (starfruit) can sustain considerable leaf damage
7. **salt tolerance** -- varies with species, relevant only in coastal areas

Advantages of grafted trees

1. A grafted tree is a branch (the "scion") from a mature tree, fused to a root system of a tree (the "rootstock") that was grown from seed.
2. Important: A grafted tree is *a genetic copy* of the scion tree, so all tree characteristics (fruit quality, disease resistance, tree size and rate of growth, etc.) are reliably obtained.

3. The rootstock may provide additional qualities such as flood tolerance or disease resistance.
4. Important: The scion is already from a “mature” tree, so the grafted tree will produce fruit as soon as it has grown physically large enough (indeed, it might try even before that). Seedling trees must go through a juvenile stage, and may take 5 to 15 years to reach maturity and start fruiting.
5. Also, as part of a mature tree, the scion is (epigenetically) programmed to branch out, as opposed to a juvenile seedling, which is programmed to shoot up rapidly to compete with larger trees for sunlight.
6. There are other ways to propagate genetic copies that are useful for some species (e. g. “airlayering” is generally used to propagate lychee trees, and fig trees are often started by rooting cuttings).

Disadvantages of grafted trees

1. A grafted tree might be a little less hardy than a seedling tree, which has never been cut apart and re-grown.
2. The variety won't come back true to the scion type if the tree freezes to the ground--- it will grow back as (a random seedling of) the rootstock variety. Example: I have chosen to grow my jackfruit trees from seed. Seedling jackfruit generally give decent fruit, and fruit within a few years. Since I am located 4 miles from the coast, my jackfruit trees will likely freeze to the ground some day. So I might as well grow them from seed, to get hardier trees that might regrow more vigorously after a freeze (and they would then be rootstock seedling trees, anyway).
3. For fast-fruiting species that are true to seed--- that is, all seedling trees produce fruit of similar quality--- there may be no benefit at all in having a grafted plant. A good example is the Peanut Butter Fruit tree. Another is *Muntingia*, sometimes called Strawberry Tree, Panama Cherry, or Jamaican Cherry. But for well-developed (i. e. selectively bred over many, even thousands of years) fruits, a high quality grafted tree should always be purchased.

Selecting species and varieties

1. What fruit do you like to eat? What fruiting season do you want? Do rare, exotic fruits turn you on? Can you coordinate with relatives and friends? How much effort are you willing to invest?
2. Because of its many disease and pest problems, citrus has become one of the most difficult fruits to grow. There are many better choices of fruits if you have limited space. If you do want to grow citrus, then lemon, lime, and especially limequat (a hybrid of lime and kumquat) can do well and are still worth a try. Oranges are difficult, and grapefruit seems hopeless these days. New disease-resistant varieties and new treatments for diseases may help citrus make a comeback, but it is likely to remain a difficult fruit to grow.
3. For new growers, and any growers with limited space, I recommend against species that have have challenges: temperamental fruiters (lychees, annonas), poorly adapted temperate-climate or dry-climate fruits (stone fruits, pears, apples, pomegranates), pest and disease-prone species (citrus--- except maybe lemons and limes, guava, peaches, and now, due to the erinose mite outbreak, lychees), and freeze-intolerant species (jackfruit, coconuts, soursop, ...) unless you live right on the coast. Good starting choices in our region, at least west of I-75, and assuming that you like the fruit, include: mango, bananas, longan, starfruit, sapodilla, canistel, avocado, black sapote, jaboticaba, mulberry, and grafted dark Surinam cherry. East of I-75, the most safely cold-tolerant species are loquat, white sapote, jaboticaba, mulberry, cold-hardy varieties of avocado, and perhaps sapodilla. Bananas may die back to the ground in a hard freeze, but will send up more stalks from the root.
4. Consider substitutes: Apples, pears, and tree nuts (other than macadamia) are simply not well-adapted to southwest Florida--- but Giant Thai jujube is an excellent apple-like fruit, and white sapote is

pearlike. Jaboticaba fruit is similar to grapes and cherries and is every bit as good as either of them, maybe even better.

5. Certain species are much less prone to theft by wildlife such as raccoons, possums, squirrels, and birds. These will find you sooner or later. See the *Grove Robbers* section below.
6. Variety selection is *extremely important* for most species. Be sure it's a good variety for Southwest Florida and for your particular needs. For example, Hass avocados are wonderful in California, but are not well adapted Florida's humid climate (although some folks seem to grow them successfully here). There are many excellent varieties of avocados that do very well here, but those that fruit in late summer will be of little use to you if you spend those months in Vermont. And avocado varieties vary greatly in their productivity. An interesting exception is black sapote--- all varieties seem to taste and perform about the same.
7. Do your location and planting site address the key horticultural concerns for the particular species and variety?
8. Certain species require some amount of winter cold (measured in “chill hours”, usually defined as the total number of hours between 32 and 45 degrees) in order to achieve a correct annual fruiting cycle -- for temperate-climate fruits such as blueberry, peach, and plum, you *must* have low-chill varieties adapted to Florida.
9. There are thousands of varieties of mangos, and naturally there are widely differing views on the best varieties to grow. Here is my current recommended list of disease-resistant mango varieties for our region: Fairchild (dwarfish tree, reliable producer of fine fruit with a long fruiting season), Maha Chanok (reliable producer of excellent fruit with long fruiting season, name is sometimes corrupted to Maha Chinook), and Pickering (the only easily obtainable true dwarf variety). Manalita a fine choice, if you can find one. I would also recommend Lemon Meringue (“PPK” to experts) and Lemon Zest; though not as easy to grow as the other recommendations, their flavor is off the charts. Also consider Sweet Tart and Coconut Cream (or M4, reputed to be a better version of Coconut Cream), excellent mangos with unusual and much-admired flavors (but try the fruits first to see whether you will be one of those admirers).
10. To minimize harvesting effort, commercial growers prefer varieties that tend to have most of their fruit ready to harvest at one time (e. g. Kent mango), but home growers prefer production spread out through a longer season (e. g. Nam Doc Mai mango).

Planting

1. Trees in nursery pots can be planted any time of year, though in late fall or winter it's best to wait until March, past any danger of freeze. They won’t grow much in winter, anyway.
2. Utilize microclimates to put each species in its best available location--- moist or dry sites, part shade (carambolas and temperate-climate trees are especially suited to part shade, as are pineapples), freeze-resistant sites such as next to a house or a body of water. If you have a pool cage, consider pineapples and perhaps jaboticabas in containers, to protect against wildlife theft.
3. Plant with adequate horizontal spacing (especially in non-irrigated or full-sun situations), even though it may look silly starting out. You can plant closer if you have irrigation, and even closer if you are williong to be diligent about pruning your trees to control their size. But there’s only so much sun out there to make fruit, so when one tree shades another, there is some cost to production. In addition, dense planting can decrease air flow and promote fungal disease.
4. Consider vertical space--- put taller trees to the north, and don't plant where desired views may someday be blocked. Isolate macadamia from other trees to minimize squirrel routes. Better yet, don’t bother with macadamia--- it’s a challenge to protect them from squirrels.

Planting mounds for jaboticabas: each is about 1 cubic yard of heavy sand. Because these are small, upright trees, closer spacing is OK.

5. Put all trees on mounds, at least a few inches higher than surrounding ground, and when planting, the container soil surface should be a little higher than than the surrounding soil level (as the soil settles from planting, the tree will tend to sink a bit).

   Flood-intolerant species such as avocados are best planted on very large mounds a foot or more in height, if you can achieve that.

6. *Very important*: Many trees arrive "potbound", with bad root systems from too much time in small containers. Use "root pruning" to eliminate circling roots and other bad root structure when planting. In particular, check for any roots that encountered the container surface and then turned back into the root ball--- just cut these at their outermost point. Carefully fluff out the outermost roots from the container shape to encourage rapid spreading of the root system. Aggressive root pruning may actually slow down the growth of the tree above ground at first, but that is because the tree is using its energy to build a healthier root system, which will pay off in the long run. Very often, a tree that is failing to thrive without an obvious reason is suffering from a bad root system, and usually it's best just to start over.
7. When planting in our sandy southwest Floida soils, it's not necessary to dig a hole "three times the diameter of the root ball", as general planting instructions so often advise. That may be necessary in soils with high clay content, but your plant's roots shouldn't have any difficulty making their way through our local soils.

A badly potbound canistel tree; its roots are too dense even after freeing and pruning.

8. Grass is a *very* tough competitor, so clear the area around the tree and cover with mulch (but not leaving mulch touching the trunk, which may promote fungus). Alternatively, consider a ground cover plant such as perennial peanut, or just leave weeds growing if you are OK with that, but don't let grass get going.
9. Give little if any fertilizer when planting –- especially avoid nitrogen, which promotes foliar growth, as the tree needs to grow roots before it puts on more foliage. It's the search for nutrients and water that encourages root growth, so don't make life too easy for your tree. But do consider supporting soil bacteria and fungi with inoculants --- or just add some soil from under a healthy mature tree, preferably of the same species. A healthier ecology is always better. It's best to top-dress with compost, manure, or other soil amendments (i. e. put them on top of the soil rather than mixing into the soil) and then cover with heavy mulch (but not touching the trunk of the tree). This allows the nutrients to enter and spread through the soil slowly.

10. It's OK to add *some* rich topsoil or compost to your planting soil, if you can't stop yourself, but don't create an underground "flower pot" that encourages the roots to concentrate in a small space--- again, it is the search for nutrients and water that induces the roots to spread out and grow a large, healthy root system that will sustain the mature tree. Trying to speed up nature is usually counterproductive.

11. Always stake young trees (or enclose them in protective fencing) to protect against wind and climbing animals--- but try to allow the trunk some movement in the wind so that it will develop its own strength.

12. Avoid planting mulberry trees over driveways or walkways--- their fallen fruit can stain. Starfruit and wax jambu also drop a lot of damaged fruit.

Fertilization

1. The best long-term fertilizer is *mulch* --- over time, its breakdown will supply nutrients and organic matter to build a rich soil ecology –- *feed the soil, and it will feed the plant*. Wood chips are a great all-around choice, also pine bark, pine fines, and dead leaves. I'd be a bit concerned about toxicity issues with cottonseed hulls, since the pesticide regulations on non-edible agricultural crops are much less restrictive-- I wouldn't necessarily avoid them, but I wouldn't load them on as my only mulch. Top dress mulch (i. e. put it on top of soil, not in the soil), since decomposing bacteria may lock up soil nitrogen. And in general, we want to make changes to a plant's enviornment slowly over time, giving it time to adjust.
2. Mulch has certain imbalances. In particular, its ratio of calcium to other nutrients is low, and over time, it may require supplementation with calcium. The correct amendment is gypsum (calcium sulfate dihydride), as (unlike lime) it does not raise soil pH, and additionally it provides the beneficial nutrient sulfur. Gypsum is non-toxic and inexpensive.
3. Organic soil fertilizers support the soil ecology, and work slowly over time. Besides mulch, they include: compost and composted manure, and commercial organic fertilizers, often available at Southern Ag in Palmetto. For minor elements: Azomite (pelletized is preferable to powder) and sul-po-mag (langbeinite), also available at Southern Ag, are good choices. All such amendments should be used as a top dressing, and in granular rather than powdered form when there is a choice. Over time, rain and the action of soil life will move them slowly into the soil and disperse them. Trees are perennials, not annuals, and don't adapt easily to sudden changes.
4. Liquid kelp and fish emulsion are excellent "foliar" fertilizers--- sprayed on the leaves of the tree. Kelp

seems to have many benefits, perhaps acting as a tonic as well as a broad-based fertilizer rich in minor nutrients. Spraying should only be done when the sun is low, either morning or evening. These can also be used as soil "drench"--- mixed with water and poured onto the ground to soak into the soil. They are also good as drench for container plants, but liquid kelp should be preferred in exposed areas, since fish emulsion may result in digging by hungry wildlife.

5. As previously mentioned, consider inoculation with microorganism supplements. These go underground, in contact with the roots. Generally they are used only when planting--- just smear them onto wet roots and then plant. Or just add some soil from around a healthy mature tree of the same species.
6. Balance is important, as too much of one nutrient can interfere with plant's uptake of another. Vary the fertilizers--- a *little o' this and a little o' that* --- both soil and foliar, to average out nutrient imbalances.
7. There are amendments that improve the soil in other ways, such as biochar (which becomes a permanent soil component that increases its ability to retain nutrients--- it compensates for the absence of clay particles in our sandy soil), mycorrhizal fungi (attaches to roots and helps the plant absorb nutrients), humic acids (support soil ecology), sulfur (acidifies), worm castings (fertilize while improving soil ecology and texture). Some may be expensive or difficult to obtain, and if cost or convenience is a concern, one can certainly get by without them.
8. Chelated minor element foliar fertilizers, while not technically organic, have no significant environmental impact, and can be very helpful in addressing micronutrient deficiencies. In my experience, they can benefit a languishing tree.
9. Especially with chemical fertilizers (as opposed to organic), overfertilizing is more common than underfertilizing. If you use them, select high-quality slow-release fertilizers. An NPK of, say, 8-3-9 plus minor elements is generally a good choice in phosphorus-rich southwest Florida. Many people, including me, avoid fertilizers containing “biosolids”, i. e. sewage, not because of concern about bacteria but because these might contain heavy metals or endocrine disruptors. I’m not so worried about these substances getting into the fruit--- trees are generally very selective as to what they absorb. But I don’t want to be in physical contact with endocrine disruptors, which can have physiological effects even at extremely low exposures, or trace amounts of highly toxic non-evolutionary chemicals.
10. In general, young trees do best with frequent, light application of balanced fertilizers. Mature fruit trees should receive less fertilizer, mostly minor elements (nitrogen promotes growth of foliage, but you want to harvest fruit, not prune trees). Trees that produce more calories (e. g. avocados, jackfruit, and bananas) generally need more fertilizer (and sunlight). For citrus, experts recommend regular, generous fertilizing, both foliar and in the soil (because the devastating and very widespread “citrus greening” disease interferes with nutrient transport within the tree).

Water

1. Most fruit trees, once established, can get by without irrigation, especially if kept clear of competition from grass. Indeed, a bit of water stress encourages more root growth. However, automated irrigation and/or extra hand watering help avoid extreme stress that can set back or damage a tree.
2. It is fairly easy to install PVC pipe underground (or just on top of the ground, if the area is going to be mulched on an ongoing basis), connected to flexible PVC pipe on the surface and ending in “bubblers” that release water at a fixed rate. Expert installers are very fast and relatively inexpensive, or you can do part or all of it yourself following online demonstration videos.
3. Most trees should have extra water when blooming and forming fruit, otherwise they will tend to drop their young fruit, anticipating insufficient water to bring it to maturity. Also, periods of dryness may cause young fruit to lose skin elasticity, leading to fruit splitting near maturity, so make sure that trees carrying fruit get enough water (especially during the hot, dry Florida spring).

Pruning

A Well-Pruned 8-foot Mango Tree

1. Most fruit trees should be pruned regularly, *and aggressively*, to control their size and shape, to harvest fruit and work on trees easily and safely (ladders are *dangerous*, *even more so in the soft ground of groves*). Dooryard growers want more, smaller trees, but commercial growers are also moving to smaller trees.
2. Most fruit trees actually *benefit* from aggressive pruning –- pruning stimulates growth of young, efficient leaves (because the tree will try to equalize its root and foliar systems), and frees up energy and nutrient reserves for fruiting.
3. For most species, the most important objective is to control the height --- 15 feet maximum, and lower if you can. For most species, the ideal size is 8 feet tall and 15 feet wide, with a thick trunk, thick, strong major branches, and a fairly open interior.
4. The easy part: Although tree pruning is an art, much of it involves minimal decision making. Start with these more-or-less mechanical steps:

    - Remove dead branches. Address broken branches: Either remove the broken branch entirely, or make a clean cut rather than leaving a jagged edge that is easier for insects and diseases to invade.
    - Remove “suckers”, i. e. unwanted small branches sprouting from the trunk near the ground. These are especially a problem for certain species such as pomegranates, which require almost constant removal of suckers (another reason, beyond their lack of production of good fruit, not to grow them here). It’s especially important to remove any branches that begin below the graft union of a grafted tree, as these will be genetically the root stock and will sap the resources of the scion portion without producing good fruit themselves.
    - Consider removing “water sprouts”: low quality branches that start in the middle of larger branches and grow straight up. These are especially common on citrus. They can produce fruit if allowed to grow, but in general are not a good structural feature.
    - Remove crossing branches, that is, branches that start at one side of the tree and cross over to the other side. These are another poor structural feature. In general, branches that grow toward the interior are undesirable.
    - Consider removing branches that create “narrow crotches”, that is, that are nearly vertical and meet the trunk at a small angle. These are prone to splitting and causing major damage to the trunk.
    - “Skirt” the tree--- remove lower branches touching or close to the ground. Mangos especially should be pruned so that leaves are at least 3 or 4 feet above the ground, as the fruit hangs on long stems and its weight will pull branches down. Ants are not helpful in trees, and love to climb branches touching the ground.
    - In general, downward-growing branches are undesirable, with the major exception that of trees with a “weeping” habit, such as starfruit, jujube, and mulberry fruit more heavily on downward hanging small branches.

5. Keep the interior from getting too thick: Airflow through the interior combats fungus, light needs to reach lower branches or they will die off, and a dense tree is more vulnerable to high winds and more inviting to squirrels. Interior leaves don't collect much sun, anyway, so they are giving a poor return to the tree's investment of water and nutrients.

6. For most species, try to select and maintain "scaffold" branches --- a few major horizontal branches at wide rather than narrow angles to the trunk --- evenly spaced in different directions and separated vertically. This especially goes for stone fruit trees, which are fast growers and require careful pruning to be kept in their proper "vase" shape.

7. Controlling tree height can be challenging, but is extremely important. Look for "vigorous uprights"-- branches that are shooting higher and enlarging the tree canopy. (For a shade tree, one wants a "central leader" to make the tree grow tall and send out shade branches-- fruit trees are exactly the opposite.) Removing these will force branching and a bushier shape (this is the same principle as tip pruning, see below). Don't be the least bit afraid to remove large upward growing branches that are getting out of control. Trees grow fast in Florida. Your goal is a tree that is wider than it is tall.

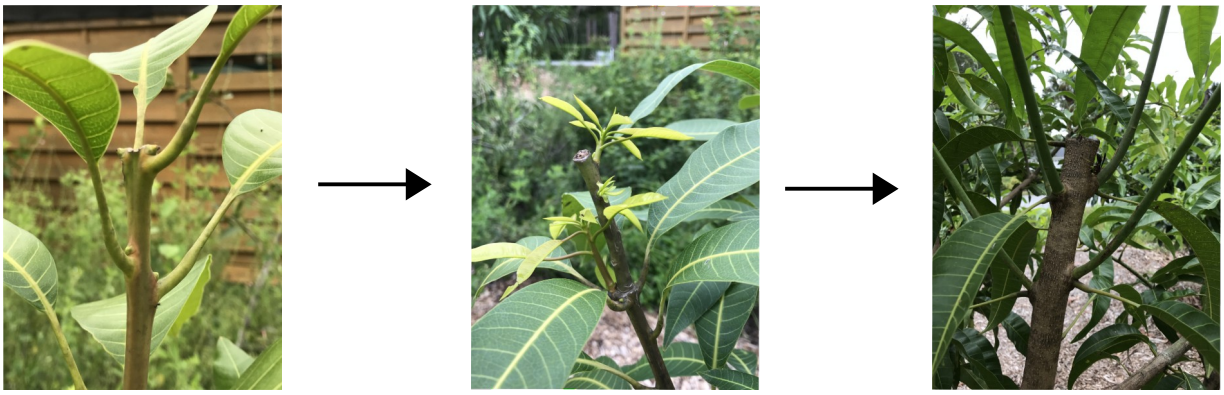
8. When a branch is cut, the ensuing new growth vigor is greatest near the new endpoint. In general, clip a branch a short distance above an outward-directed side branch. This encourages the wider, shorter shape that is your goal.

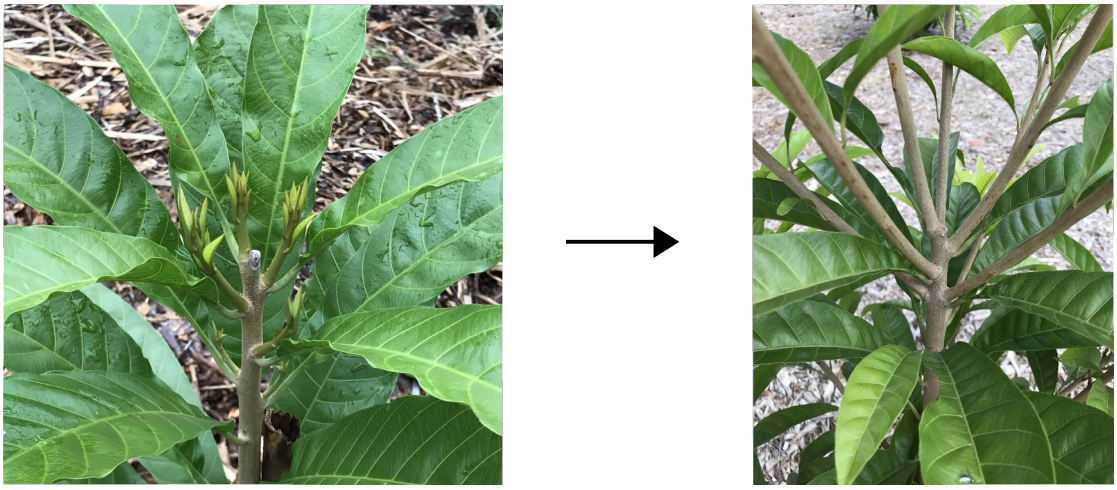
9. Reducing the size of a tree that has reached a very large size (i. e. a tree whose height has been allowed to get out of control) is usually a job for an expert. Just chopping off most of the tree ("hat-racking") can result in a profusion of wildly growing small branches that are difficult to manage. The usual procedure is to formulate a multi-year plan, removing part of the tree each year. A rule of thumb is not to remove more than 1/3 of the foliage at a time.

10. Light pruning is OK any time. For heavier pruning, the best time of year depends on the species --- usually it's right after fruit is harvested, and generally not in fall or winter (we don't want to stimulate growth going in winter, and a freeze might do some winter pruning for you anyway).

11. Trees with a "weeping" habit such as mulberries and carambolas can be grown with less pruning, as the weeping branches bring a lot of fruit down to eye level. (On the other hand, aggressive pruning can also be a good approach to mulberries--- they are vigorous growers that fruit on first-year growth, so can be cut back drastically without costing fruit the next season.)

12. Use “tip pruning”: on young mangos and many other species: take off last ½ inch or so of branches to induce more branching --- you want a mango *shrub*, not a mango tree. *See YouTube videos on mango pruning by Richard Campbell*. These sequences show the effect of tip pruning:





Removing fruit

1. Strip young fruit (once it is fully formed) from young trees, as fruiting will waste their energy and stunt or distort their growth. You aren't sacrificing anything, as a small tree doesn't have enough energy to make good fruit anyway. Especially on mangos, though, don’t remove the fruit until it is 1/4-to-1/2 inch in diameter, otherwise the tree might re-blossom and try to make fruit again.

2. Allow a young tree to fruit only after it has a thick, strong trunk. The longer you wait to allow it to begin fruiting, the more fruit you will have in the long run.

3. Thin (that is, remove) some of the young fruit on heavy-fruiting species (longans, loquats, and stone fruit especially, and, interestingly, Sweet Tart mangos and some avocado varieties suh as Day), to produce larger fruit and to protect the tree from broken branches, or too much energy spent on fruit.

Again, you sacrifice nothing-- the tree can only make a certain amount of fruit , and you want fewer, larger fruit rather than many fruit, each without much flesh. Since developing fruit draws nutrients locally within the tree, thinning should be uniform throughout the tree rather than, say, just removing all the fruit from from some of the branches. For longans and loquats, just clip off the outer portion (half or more) of each cluster of fruit. For peaches, a typical approach is to thin until the fruits are at least six inches apart.

Diseases, insect pests, fungus, and weeds – nature is a no-holds-barred street fight

1. The best defense against any kind of competition is a healthy tree. A perennially plagued tree indicates something wrong. Usually it's either:

   (1) A failure to address one of the key horticultural concerns, or

   (2) The tree has a bad root system, probably from being in a container too long.

2. Avoid or minimize toxic agents --- *they can set up a chain reaction of damage to the ecology.*

3. 99% of insects are either neutral or beneficial. Insect pest problems usually stem from *too few* insects-- that is, a weak ecology-- rather than too many. *Use native plants and insect-friendly landscaping to diversify the ecology.*

4. For the few insect species that are pests, use integrated pest management to find the minimum ecological damage that achieves the control you need:

   Step 1: Select pest-resistant species and varieties.

   Step 2: Build a rich soil and insect ecology using mulch, soil-building amendments, native plants and other insect-supporting techniques.

   Step 3: Do nothing (let the predator insects find them, and predator insects need to eat, too).

   Step 4: Manual removal (fingers, hose spray, shake pest bugs off the tree into soapy water, etc.). To euthanize an insect, it's best to tear the head off rather than squash the body.

   Step 5: Non-toxic methods such as repellents (e. g. neem oil), insecticidal soap (smothering, especially effective on aphids), all manner of home remedies.

   Step 6: Biological controls such as Serenade (*Bacillus subtilis*).

   Step 7: Minimally toxic pesticides (e. g. organic pesticides such as Bt, Spinosad) --- *identify pests and research all pesticides before using to make sure you are using them properly and for the right purpose, and avoid spraying pesticides when bees are out.*

   Step 8: You may be growing the wrong tree in the wrong place, or the tree is not healthy enough to fight off pests (often because it has a bad root system) --- figure out why, or just remove it and try something different. Personally, I put this step before Step 6 above.

A nice writeup of integrated pest management produced by IFAS is online at https://gardeningsolutions.ifas.ufl.edu/care/pests-and-diseases/pests/integrated-pest-management/

5. Disrupt the life cycles of pest insects: Collect fallen fruit from under trees and recycle its nutrients by composting or burying. Heavy mulching seems to disrupt the life cycle of root-and-leaf-eating pests such as Sri Lankan weevils and Diaprepes.

6. Fungus is usually not a problem for healthy trees, except on susceptible species. Mango trees are especially subject to anthracnose fungus and to powdery mildew, and an increasing number of other diseases as more people grow mangos. These generally do not harm the tree, but may cause severe fruit damage or loss. Susceptibility depends on the variety, so selecting fungus-resistant fruit varieties is an excellent start. Pruning so that air can flow through the tree interior may help. When outbreaks are a problem, consider fungus-suppressing bacteria like *Bacillus subtilis* (Serenade), and non-toxic fungicides such as potassium bicarbonate or micronized elemental sulfur for powdery mildew. Copper is a very effective, organic funigcide, but personally I avoid it, fearing toxicity if it accuulates over time. Extensive information on fungicides is available online.

7. It's important to rotate fungicides, so that resistance doesn't develop. Keep a record of applications, and set up a rotation of several different kinds.

8. Weeds grow rapidly during the hot, rainy months. If you can peacefully coexist with them (but not grass, and you won't want weeds that make burrs), consider that option. Ground covers (like perennial peanut) or cover crops may be feasible. For strong control, mulch helps a lot, although once it starts breaking down it becomes a weed-friendly growing medium. The best approach, of course, is to pull weeds frequently and stay in control. There are non-toxic herbicide sprays, such as horticultural (30% concentration) vinegar. These only kill above-ground growth, so they are much more effective on very young weeds that have no reserve energy stored underground. Roundup and other herbicides, properly and minimally used following all safety requirements, are likely not as dangerous as some believe. Although I personally avoid them, they are not unreasonable when used minimally for difficult infestations.

Cold Protection

1. Sooner or later, most growers will face damaging cold weather, and cold protection is a complex subject. There are many techniques, depending on the amount of protection needed and the grower's willingness to invest time, money, and effort.

2. Large trees are *far more* resistant to cold than small trees. Protection during cold snaps is essential for young trees of cold-sensitive species, while mature trees may sustain little damage, or may defoliate and leaf out again in spring.

3. Hydration is beneficial. Between 24 to 48 hours before a cold snap, water the ground thoroughly under the entire canopy.

4. Wind protection can be very helpful. Planting windbreaks is one useful method when feasible. Interestingly, the benefit from a permeable windbreak, such as close-planted bamboo, extends much farther (perhaps ten times the height of the windbreak) than a solid barrier such as a wall or solid fence.

5. Heavy mulch, for all its many benefits, actually allows more rapid cooling overhead. Consider clearing mulch from under the canopy before a cold snap. Note, however, that it may also be possible to mound mulch over the lower part of the tree to keep the trunk from freezing. As long as part of the tree above the graft survives, it will generally grow back rapidly, using energy stored in the root system.

6. Freeze damage typically does not appear immediately, and may take up to 2 weeks or more to become visible. In any case, do not prune until spring, because: 1) Branches that look dead may leaf out. 2) Additional freezes may do further damage. 3) Pruning will stimulate new growth which could be damaged even by a mild streak of cold weather.

Grove Robbers

1. Birds, squirrels, raccoons, and possums can be a real problem. They are intelligent, capable, and relentless. They reproduce at enormous rates, and their populations will quickly expand to whatever the available food supply will support. The sad truth is that few even make it to adulthood. There are some species of fruit (see the next paragraph) that generally aren't bothered by these animals. But for many fruits, wild creatures can subtract a lot from your harvest.

2. Some fruits can be harvested before they are ripe enough to attract pest animals. These include sapodilla, canistel, white sapote, black sapote, avocados, citrus, and, if you harvest as soon as the fruits are mature, mangos. Jujube appears not to be attractive, and starfruit may attract some interest, but is so productive that there is generally enough for all to share. Another option may be "green" mango varieties, such as Pim Seng Mun, Nam Doc Mai, or Keitt, which are fairly sweet and very tasty, with an appealing crunchy texture, before they fully ripen.

3. An online search will produce many ideas for deterring wild animals, such as various repellents, firecrackers, hanging old CD's on strings, scarecrows, fake hawks, urine, ultrasound, etc. These may work to some extent, but you will need to use them sparingly--- only when fruit is ripening--- and rotate several such methods, or else over time they will become ineffective. They will probably become ineffective anyway. Wild animals are hungry and not stupid.

4. Bagging can be fairly effective. Organza bags and more durable specialty bags can be purchased in quantity online, and it doesn't take long to bag quite a few mangos, loquats, peaches, and so on. Also, reusable clam shell protectors are sold by a local small business, bumperfruitprotector.com. Several local growers have given these enthusiastic reviews,.

A Mango Tree With Bagged Fruit

5. Many cats and dogs that have active hunting instincts can be helpful with squirrels. Some breeds of dogs, such as rat terriers, have been bred specifically to make the lives of rodents miserable, and might be an especially good choice. Older dogs and cats, however, may prefer to relax in the shade rather than chasing squirrels.

6. Be aware that many bird species are insect eaters and won't bother fruit at all, indeed they may even help control pest insects and drive away fruit-eating birds. To deter fruit-eating birds, scare devices such as reflective plastics, fake predator birds, and the like may help, but as mentioned above they must be used judiciously and rotated so that birds do not learn to ignore them. A well-known South Florida grower swears by Bird Gard, a sound system that broadcasts alarm calls for specific species, but I haven't tried this myself. Bagging or other physicial protection is effective against birds for many fruits. Fairly effective, but more difficult is covering trees with bird netting, which is very cumbersome to work with. Wherever it touches mulched ground, pieces of mulch will adhere to it and will eventually required tedious cleaning. Also, birds and occasionally snakes (good guys, on our side) become entangled and usually can't be removed while alive without seriously injuring them, and perhaps yourself, in the process. If you do use bird netting, please have a pellet gun available for euthanizing hopelessly entangled small wildlife.
7. Keeping your trees short and, if possible, just being out and about in your grove areas frequently (for example, to move water sprinklers around) can help deter daytime pest animals. Squirrels and birds want to be safe, and they don't like to be close to the ground and near humans.

8. If you are willing to invest more time and energy, an electric fence can be an effective way to protect your fruiting plants. We will discuss them in the next section.

Electric Fences

Farmers and gardeners usually just improvise their electric fences, and there doesn't seem to be an authoritative source detailing the designs and specifications that are actually needed to protect against different types of wild animals. That would be a useful contribution for tropical fruit growers. I can only share my own limited experience, basically with two attempts: a minimal (and unsuccessful) effort about 10 years ago, and a recent (successful, but almost surely more than necessary) one.

The best approach for most home growers is to use a pulsating electric fence charger to electrify a wire or wires. The animal must be grounded when it touches a "hot" wire, that is, touching either the earth or some metal that is connected to the earth. Then, the pulse moves through the animal, administering a very brief, high voltage but low amperage shock that deters the animal without actually harming it (or anyone else). Obviously, there must not be any alternative route to the protected area, either under the fence or overhead through trees.

There are numerous brands and models of chargers, many of which appear to be overpriced. For what it's worth, I have had good luck with the Vevor brand. Some chargers must be powered by a regular 120-volt circuit or an external battery, others contain solar cells and rechargeable batteries, and some can use either option. The solar chargers from 10 years ago were quite heavy and not very durable. Battery technology has come a long way since then, and the current models are much lighter and, I would expect, longer lasting.

The pulse rate for different chargers varies from 1 to 2 seconds, and is often difficult to determine from online sellers. I prefer the shorter intervals, especially since I use AC-powered units and don't have to worry about running low on battery charge, but longer intervals are probably sufficient. Animals are cautious in unfamiliar situations, so they are not likely to be moving fast the first time they encounter the charged wire. Ideally they develop a fear of it, and simply avoid it rather than experimenting further.

The "energy" of a charger is measured in joules; there are tables recommending the number of joules for different sizes of animals. One joule is ample for small animals like raccoons, and less than that is probably sufficient.

The fence design depends on the types of animals being excluded. For large animals such as deer or livestock, several horizontal hot wires a foot apart are often used. The animal is grounded by its own contact with the earth. According to the internet, the same approach using three strands of wire at 4", 8", and 12" heights works for raccoons and possums. I am skeptical of this (indeed I think that *my* raccoons would have a good laugh over it), but I could be wrong. If you try this approach, please let me know how well it works.

The minimal effort approach that I tried about 10 years ago was the Intellishock system, a brand of so-called poultry netting. It is a flexible netting that contains both hot wires and ground wires. One advantage is its portability; it can be put up when fruit is near harvest and vulnerable to theft, then removed when not needed. But the rolls of fencing are a bit heavy and awkward to work with. And for me, at least, the system was not very effective. Over time, raccoons seemed to learn how to get through it. But it might work for you, and might be a good solution, especially with the far better chargers of today. The Vevor brand now sells a lighter and far less expensive poultry netting that I would try first.

In January, 2026, after years of losing almost all my jaboticaba crop to raccoons and possums, I decided to construct a permanent 220-foot fence enclosing my twenty or so jaboticaba trees. I wanted a very durable fence, able to exclude squirrels as well.

I am fortunate to be able to afford a maximalist approach. We (my very capable worker and I) used 4-foot high wire mesh fencing, forcing the animals to climb and be grounded when they reach the hot wires, though less height would probably work. Most wire fencing has 2-by-4 inch mesh, which raccoons and possums cannot penetrate, but squirrels can pass through it easily, requiring either chicken wire or a small enough mesh. We used 1-by-2 inch mesh. It is expensive but durable, and effective. It was attached using stainless steel clips to 7-foot steel t-posts, inserted to about a two-and-a-half feet depth, at 4-foot spacing (so approximately 55 posts were needed). To withstand rust, all outdoor metal must be either coated steel, stainless steel, or aluminum.

The options for the hot wires are polywire, polyrope, or polytape, successively thicker and stronger options. For this relatively short fence (compared to, say, a cattle ranch), the cost differentials were relatively small. We used a Zareba polyrope with pvc-coated fiberglass strand rope containing 6 aluminum hot wires. It is very strong and easy to work with. Zareba manufactures a number of options for plastic mounting posts. We used two chargers, one for the hot wires at 2 feet and one for those near and at the top of the fence. The mounting posts allow one to hold the rope at 2 inches or 5 inches from the fence, ideal for squirrels or raccoons respectively. There is a single polyrope for the hot wires at 2 feet and another for the hot wires at the top.

Designing an entrance gate that is easy to use takes some effort. Fortunately for me, my worker knows how to weld, and constructed a nice aluminum gate. Its hot wires connect to the main ones using flexible wires seen in the second photo here:

Attaching the clips and plastic posts to the t-posts was not an easy task. The actual construction took us days to complete, in addition to considerable time spent researching and purchasing components and materials. I am delighted with the result, but I definitely recommend trying easier approaches first. One of my friends, a retired engineer, built a far cheaper chicken wire version about two feet high, which seems to be effective. See the photos on the next page. I recommend starting with that or some other relatively easy approach, perhaps a small test fence around a mango tree, before going the maximum route.

As of this writing, I haven't seen any sign of wildlife, other than birds, in my sacred jaboticaba area. It looks like I no longer have anything to worry about except hurricanes and freezes.

The Last Resort

If none of these work well enough for you, then as a hobby grower you can decide to just share a portion of your fruit with wildlife. Or, you can move to the more rigorous option of direct population control.

When other means don't meet one's needs, many people's first idea is to humanely trap pest animals, then transport and release them at some out of the way location. Please be aware that *it is generally illegal and always a bad practice to transport and release wild animals. All locations already have maximal populations of these species, so either the relocated animal (exhausted after a night in a trap and a panic-filled ride in a vehicle) or some animal already living at the target location will starve or die from one of nature's often cruel correctives for overpopulation. In addition, relocated animals can spread parasites and diseases. And if you do manage to increase the population in the relocation area, you are just offloading your problem to its local farmers , who already have enough to worry about without adding your pest animals.*

Poisoning wild animals may sometimes be a financial necessity for commercial growers, whose only other option is to go out of business, but in my opinion it cannot be justified for home growers. Besides being inhumane and indiscriminate, poison in animal carcasses can enter the ecology's food chain and may do further damage. Squirrels, generally known to fruit growers as "rats with bushy tails", can be extremely destructive. They will sometimes take single bites out of fruit, damaging far more than they consume. They are also much more difficult to trap than raccoons or possums. I have been fairly successful controlling them using a single-shot pellet gun with a good scope. Just firing in their direction might scare off squirrels for a while. Or, you can assume the population control responsibility of the predators that we humans have killed off. Unfortunately it can happen that the first shot only disables the squirrel, and a second shot is needed to euthanize it. Or worse yet, the squirrel may be injured but still escape, in which case it won't survive long but it will suffer. Sad, but life is tough, especially for prey species with enormous reproduction rates. The good part is that after a few squirrels have been killed, the others will clear out--- squirrels are super-intelligent when it comes to being squirrels, and are far too clever to frequent an area where they might get shot. They are also far too clever to stay away forever when there might no longer be a hazard, and a few scouts (teenage males, no doubt) will return to test from time to time. I have found that after an initial terror campaign, just an occasional reminder example, or even just a couple of near-miss shots, will give quite a bit of deterrence.

If other methods are truly insufficient for your needs, then for raccoons and possums, Have-a-heart trapping and a single lethal shot is the most humane approach.

Technical details for shooting trapped animals (***Warning*:** Please skip this paragraph unless you are going to trap and shoot animals. It is very graphic and has been included only for those who actually need the information.): Raccoons and possums have thick skulls and it is best to use at least a .22 revolver with fast subsonic (1,050 ft/sec) bullets to reliably achieve a one-shot kill. Of course you must first check the laws for your location before discharging any kind of firearm. Avoid agitating a trapped animal by moving the cage or otherwise interacting with it any more than necessary. Wait for a clean shot of the head so that the animal loses consciousness immediately--- for slow-moving possums this is easy, while for raccoons it may require patience. If you do trap squirrels, they are always in a panic; try not to follow them around with the end of the weapon, which panics them even more, but instead wait until they move into the location you need. A pellet gun is quite sufficient to euthanize a squirrel (or an injured or trapped bird). Carcasses may be buried near fruit trees to recycle their nutrients. To prevent them from being dug up by dogs and other animals, you can cover the space with a heavy stepping stone for a few days, then mulch heavily. In sufficiently rural settings, carcasses can be left out for buzzards to consume. The presence of carcasses may or may not be a minor deterrent--- but in any case, buzzards need to eat, too.

If these measures seems harsh, well, they are, but please consider that *any* food you buy commercially also had to be protected from wild animals --- and generally by the cheapest rather than the most humane and ecologically responsible approach. There is lethal competition for all resources in nature.

I used this method of population control for a couple of seasons, and it worked well enough, but after a couple of seasons, I gave it up. I'm not a commercial grower, and euthanizing and then disposing of the carcass of a wild animal is a lousy way to start your day. I know, though, khat keeping animals away from food using my electric fence is not any kinder, indeed it might be more cruel--- because in the end, more animals starve. Nature, for all its wondrous beauty, is not the least bit humane.

Growing in containers

1. Container growing is an art, and to be done well, it requires skill and ongoing effort.

2. Containers can be a very good option for blueberries and many other small fruiting shrubs (miracle fruit, Eugenias, garcinias, others). But with few exceptions, trees do not grow well in containers.

3. Among the best tree choices for containers: jaboticabas (especially the dwarf and very productive Red variety), limequats, and for skilled growers, figs.

4. Plastic pots are not as pretty, but are lighter and hold water much better. If weight is an issue, you can try growing in 1/3 peat moss, 1/3 vermiculite, and 1/3 perlite, but you will need to water more often.

5. If the container will be exposed to wind, anchor it with rebar or some other method.

Buying trees

1. Do your homework before you shop--- know what species of fruit tree you want, and have at least a good idea what varieties you will accept. You can call the nursery and find out what varieties they have available, and look up info on them before going. Or ask them to order a specific variety for you. It's better to wait a few weeks than to settle for a second choice for the rest of your life.

2. An excellent basic reference book, clear and concise, is *Florida's Best Fruiting Plants* by Charles Boning, now in its second edition. For most species that can be grown in Florida, it tells the plant's growing region and horticuiltural needs, its fruiting season, fruit harvesting and uses, and much more. But be aware that its information on varieties is not up to date. For general information about how plants work, *The Nature of Plants* by Craig Huegel is thorough and information-dense, but highly readable.

3. Look for a strong trunk and healthy-looking graft, also a tree that's not overly large relative to its container (too long in the container produces a bad root system). Prefer low branching since your long-term goal is a compact, shrubby tree. Trees in containers larger than "3-gallon" are more likely to have distorted root systems, which can be a permanent impairment, and they usually take longer to establish themselves after planting. Trees grow fast in Florida, and your 3-gallon tree will be a pruning nuisance before you know it.

4. Fruitscapes LLC on Pine Island (about a 90-to-120-minute drive from Sarasota) is a huge wholesale and

retail fruit tree nursery with many species and varieties on hand. They also sell fresh tropical fruit. John Painter on Cubles Road, a short distance south of Fruitscapes, sometimes sells excellent fruit from his porch, but don't hope for bargains.

5. Tree sales put on by local fruit tree clubs are a great place to buy trees. At multi-vendor sales, you have many more choices, and in any case, you will be supporting a local non-profit fruit tree club and small local vendors. In our area, the annual Manatee Rare Fruit Council Tree Sale (see mrfc.org for details) allows you to shop from more than a dozen vendors at one stop (full disclosure: I am an officer in the non-profit Manatee Rare Fruit Council).

Great Books

1. An excellent basic reference book, clear and concise, is *Florida's Best Fruiting Plants* by Charles Boning, now in its second edition. For most species that can be grown in Florida, it tells the plant's growing region and horticuiltural needs, its fruiting season, fruit harvesting and uses, and much more. But be aware that its information on varieties is not up to date.

2. For the fascinating science how plants work, *The Nature of Plants* by Craig Huegel is thorough and information-dense, but nontechnical and highly readable.

The internet is a marvelous source of information, sometimes accurate

1. For internet searches, it's oftern a good idea to put "florida" at the end of your search strings, as info from other regions (especially dry-climate California) may not apply in Florida.
2. growables.org has much info specific to our region; note especially the fruiting season calendars. Please consider donating to it.
3. IFAS has a lot of information online, though sometimes it is oriented toward commercial growers.
4. Tropical Fruit Forum's discussion boards can be useful for info on varieties and uncommon species, though you may have to wade through a lot of blather to find it.
5. Youtube has many useful videos, especially on pruning and grafting.
6. And, of course, the SweetSong Groves website sweetsonggroves.com, where the latest version of these notes is always a free download.

Fruit tree clubs

1. Local clubs feature monthly meetings with an informative speaker, tasting, plant exchanges, a social network, and perhaps most important, an opportunity to connect with local growers with experience specific to our area.

2. The Manatee Rare Fruit Council (mrfc.org), of which I have been volunteer treasurer since 2013, is an active club in the Sarasota, Bradenton, and Palmetto area. We hold a large multi-vendor annual sale each spring. It's worth a visit just to look at all the plants. We also maintain a demonstration collection of more than 80 fruit trees at Palma Sola Botanical Park in far west Bradenton.

3. The Tampa Bay Rare Fruit Council (rarefruit.org) is a large, active group with a long history.

Trees are not pets

1. You can love your trees (indeed I do!) but know when to say goodbye: a tree that can’t stay healthy or produce the way it should is using the resources of one that could. Plants can’t feel pain*. Just respectfully remove it and put in something that might be better.
   *Being mobile, animals must decide where to go and what to do, and we need a pain system to tell us what to avoid. Since plants are not mobile, a plant spending energy and structural resources for such a system would be evolutionarily outcompeted by plants not doing so. In short, nature doesn’t waste resources providing something that’s not needed.

2. By the same token, don't be afraid to try transplanting a tree that's not where you want it to be. Often it will prosper. Maybe it will die, in which case you can plant a new one.

Takeaways

1. *Research species and varieties before buying and planting*.

2. *Plant correctly, prune aggressively, mulch heavily, and fertilize conservatively.*

3. *A plant is an adaptive system and is part of an ecology. Promote healthy ecologies above and below ground*.

4. *Be patient and don't be discouraged by mistakes and failures. Farmin' ain't easy!*