Planting Young Trees & Care

SPECIFIC PLANTING STEPS

By W.H. Brokaw

- Dig a hole much wider than the ball of your tree; 18 inches is an ideal hole. If your soil is good you need not add any soil amendments to the hole. Avoid adding more than 50% (by volume) commercial compost planting mix.
- Adjust the depth of the hole so that the upper surface of the tree ball will be 1 inch above the surrounding ground when the tree is lowered into it.
- Lower the tree into the hole; slice the container open vertically on one side, and backfill with 6" to 8" of loose soil or soil/compost mixture to stabilize the tree before removing the slit container. It is important that the root ball is not moved after the container is slit.
- Pull the plastic tube container out of the hole and away from the tree and discard it. The poly container is not degradable, but may be recycled. This will leave the roots exposed on the surface of the ball.
- Gently tamp the loose soil around the ball immediately. Promptly fill the rest of the hole with loose soil, gently tamping as you fill. Fill it up to the top, but leave the upper surface of the original ball exposed.
- It is important that the loose soil you put back in the hole be free of large clods, as these do not dissolve easily with water and will cause air spaces, which are injurious.
- The upper surface of the ball is left exposed so that you may add water directly to the ball, even after the tree is planted. If you cover this surface with anything, do not let it be soil; use sand, loose sawdust, coarse gravel, or anything through which water will pass very rapidly.
- Build a basin with a three-foot diameter around the tree, sloping the bottom of it so that all water drains to the exposed surface of the ball. The basin should have a capacity of about five gallons.
- Fill the basin with water once. If it drains rapidly, fill again. If it requires two minutes or more to drain, do not refill.
- Reform the bottom of the basin, as the dirt in the hole should now have settled somewhat. Be sure that the top of the ball is still exposed.
- It is a good idea, once the basin has stabilized, to cover the bottom with straw, sawdust, or some other mulching medium.
- If you plan to use drip irrigation, be sure that the emitter is fastened to the exposed ball of the tree with a "U" shaped piece of wire or hook. This prevents the dripper from creeping away from the root ball as the hose expands and contracts. Check your emitters frequently to see that each tree is getting watered; clogged emitters are a common problem.
- Once your tree becomes established and the roots start reaching out into the surrounding soil (usually about 1-2 months after planting), the emitters should be moved away from the top of the ball to a distance of about 6" to 8".
- As the roots extend further outward and downward, you will want to add more emitters and move them further away from the trunk of the tree. A fully mature citrus or avocado (six years old) will often have four to five emitters spaced in a ring around the tree near the drip line.
- Under normal circumstances, water the young tree every 5 to 10 days for a period of 6 to 10 weeks. Two to five gallons of water per irrigation will be sufficient provided the ball itself receives water each time and remains damp inside. Do not allow the soil to remain soggy; a happy medium is mandatory.
- If you plan to plant these trees in an area where trees have died or avocado root rot has occurred, chemical control of this disease may be necessary to assist the establishment of the trees. Ridomil® and Aliette® are suitable systemic fungicides registered for use on citrus and avocados.

Mounding Avocado Trees:
Soil Preparation prior to planting

Mounds can provide enhanced aeration for avocado roots and encourage a quick start for young trees. You should use native soil, free from pre-emergent herbicides. The mound should be incorporated or mixed into the floor of the orchard to eliminate any possibility of an interface that could inhibit water percolation. Build the mound 1 to 1 ½ feet high, at a 4:1 slope. The mound should be settled with water and allowed to dry out somewhat so you are not planting in muck. Dig a hole 18" in diameter and about 15" deep. Place the nursery tree in the hole to check planting height. The soil of the nursery ball should be about 1" above the top of the mound to keep the ball exposed to irrigation water. Cut and remove the bottomless container only after checking and adjusting the planting height. Backfill the tree little by little lightly tamping out air spaces. Do not overly compact the soil. Water the tree right away with 10 to 20 gallons of water to assure no air spaces remain around the root ball.

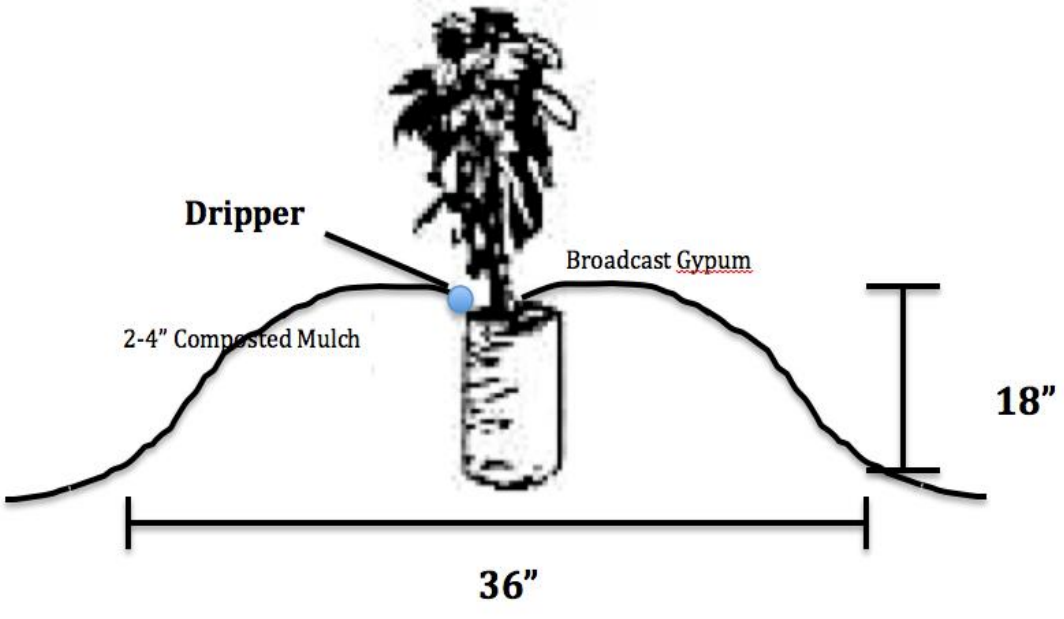
We have seen good results from capping off the mound with 15 to 35 lbs. of gypsum, and then cover the mound with coarse mulch about 4" to 6" thick. Be careful to keep the mulch from piling up around the trunk, it's best left exposed. The calcium in the gypsum inhibits the Phytophythora fungus and the mulch provides an ideal environment for shallow aerated roots to develop.

Phosphide fertilizers have become a critical tool in the California avocado industry to enhance tree health for replants as well as existing orchards.

Trees should be treated every three months with a fungicide to control root rot until the trees are well established.

Decomposed granite or well drained soil	= 10-20 gallons per week
Clay or heavy soil	= 7-10 gallons per week
Silt loam soil	= 10-15 gallons per week

At 2 years planted in the ground change over to sprinklers. Advance water schedule to 20-30 gallons per week, but **do not over water.**



Common Problems

FAULTY WATERING

Almost all difficulties with young avocado trees can be traced to watering practices or soil conditions. Of the two causes, watering practices is the most common. A grower should use a soil probe to test the moisture in and around the tree ball. The soil in both places should always be adequately moist and never soggy for an extended period of time. Common results from faulty watering are salt damage and suffocation as listed below:

SALT DAMAGE

This is normally detected by "tip burn" of the leaves. This is a drying out and dying of the leaves, and especially the leaf tips. Semi-burned leaves are rather small, and often yellowed. They contrast with thick, large dark green leaves of a well watered and nourished tree. The tree bark is often sunburned. The condition often shows up in the winter, but is usually a result of damage done during the previous summer or fall.

All soil and water contain salt and when the soil dries out because of evaporation of moisture, the salts become more concentrated. Thirsty of water, the plant sucks up the concentrated solution and the salts concentrate in the borders of the leaves. Since the salt has no efficient way to escape the leaves, they poison the tissue. The normal remedy of salt laden soil is to leach it thoroughly and wash out the salts, it is usually too late by the time the tree shows the above-described symptoms. The best that you can do is to try to avoid a recurrence of the condition.

SUFFOCATION

It is very easy to overwater a young avocado plant and suffocate the roots. The roots seem to need oxygen-laden air in their environment. If it is not present, they simply cease to suck water from the surrounding soil, even though it is thoroughly saturated. The leaves of the plant then wilt; many of them fall off, leaving a weak, sickly, sunburned stem with perhaps a few small leaves on the tips of the branches. Such a tree is not worth saving. Dispose of it immediately.

ZINC DEFICIENCY

Zinc deficiency is sometimes detectable by a blotchy kind of yellowness between the veins of the leaves, but is difficult to definitely diagnose in this way. It is positively diagnosed by the presence of short leaf inner nodes and long narrow small leaves concentrated at the tips of the branches. The fruits will appear small and abnormally spheroidal. The condition may be corrected by a spray application of one pound of zinc sulfate per 100 gallons of water with a spreader added. The timing of this application should be when the new leaves become physically expanded. This is usually in June or late summer. Zinc Deficiency may be corrected by soil applications of zinc chelate, but these applications must be done carefully, as it is easy to kill trees with the material. Apply at the rate of:

Corrective action: 4 ounces zinc chelate per 1,000 gallons irrigation water, one time only.

Constant feed maintenance: 1/3 ounce zinc chelate per 1,000 gallons irrigation water.

CHLOROSIS

Chlorosis is another common problem and is most commonly associated with a deficiency of available iron. Some general paleness may be due to nitrogen deficiency, but is normally of a milder form. Iron is an extremely common element in the universe and most of our soils contain quantities of it. Under certain alkaline conditions it is unavailable for plant use. When this occurs avocado trees become pale yellow, and in severe cases the leaves begin to burn and may even drop. This condition is detected in the early stages because the new growth is normally maroon or rich red; whereas, the tress effected by chlorosis have new growth that is orange-ish or yellow-ish in color. If the condition is not corrected, the tree will be weak, lose its leaves, and be unproductive. Iron chlorosis is usually correctable. Here are two common countermeasures.

Counter measure one is to apply readily available iron. This may be accomplished by the addition of Sprint 138 iron chelate. If you have a chlorotic condition, we recommend as a starter for corrective measure, a one-shot application of one pound of the chelate per 1,000 gallons of irrigation water. For constant feed, use two ounces of the chelate per 1,000 gallons of irrigation water. There may be other chelates that will serve just as well. However, if your tree is chlorotic, we recommend immediate corrective action according to the above formula. Fool around with other brands and types later.

Counter measure two is to stop irrigating so often as to let the root zone dry out more. Often, soggy soil will cause a deficiency to available iron in the leaves. The leaves may contain plenty of iron when analyzed, but for some reason, it is unavailable. Of course, this treatment invites the danger of excessive salt accumulation, as described above. One must simply work around two problems instead of one. Water less often and leach periodically.

The over concentration of soil water may be your whole problem or not at all. In any case, apply counter measure number one and then consider the probability of the soil environment being too wet.

The soil in the ball has been specially formulated-it contains special nutrients and is designed so the ball will readily absorb water that is added directly to its upper surface.

The Sleeve Grown, Fully Leafed Tree
By W.H. Brokaw

A fully leafed, sub-tropical evergreen must be treated differently than the standard, deciduous, temperate plant. Normally, it is planted somewhat later in the year so as to capitalize on the warming spring soil, and special allowance must be made for the plant's high transpiration rate.
Citrus and avocados have tender succulent roots so their earthen balls may not be as physically stable as those of other plants. Therefore:

- Never lift or carry them by grasping the trunk or stake, and
- Be sure the tree is lowered into, and correctly set in the planting hole before you slit the poly container.

WATERING

By W.H. Brokaw

Never let the root ball dry out. Avocados are native to areas where, unlike in California, have daily rains throughout the summer. Their favored soils under these conditions are often acid, sandy and weak; characterized by good internal drainage, which does not allow the soil to remain soggy. Water deeply. We recommend the use of a soil core probe, slanted toward the side of the ball so that it penetrates the ball about 12" below the soil surface. This will determine soil moisture. Apply water according to the needs of the tree.

The tree may be watered by basin for a full year. However, the basin should be broken down during the wet season if water has any tendency to stand in it. After a year you should consider the use of sprinklers or drippers.

Warning: Avocado roots are very easily suffocated by excessive water. This problem is most severe between planting and the period when the roots reach out into the surrounding soil. This means that the trees are particularly vulnerable when planted in the fall. Therefore, under no circumstances allow water from rains or other sources to stand around the tree ball or run over the ball for extended periods of time. Such treatment will almost certainly result in rotting roots, and probably in an unsatisfactory tree. If the tree is planted on a slope you may consider placing a diverting trough above the tree in such a way as to deflect any water currents away from it.

Mounding as mentioned above becomes very helpful in heavier soils especially. Plant the trees on 12" to 18" mounds sloping to 5' to 8' bases or plant the trees in raised beds. This allows optimum aeration for the root and assures the proper planting height.

The planting of citrus and avocado trees is much different from deciduous trees. Your new tree has a large number of active, working leaves which must be kept well supplied with water at all times so as to function and not wilt. Since the ball of the tree contains all of the tree roots it must be kept moist to serve as reservoir for the water. When you remove the plastic sleeve from the ball, you will find that many of the roots are concentrated at the outside vertical surface. It is, therefore, very important that the tree be watered immediately after planting since these surface roots will otherwise be unable to function properly.

Leave the upper surface of the ball exposed:

Management of Citrus & Avocado Trees

FERTILIZATION

By W.H. Brokaw

During the first two or three years, your tree should be moderately fertilized to maximize early growth. To apply moderate fertilizer is often viewed differently among people so we suggest that the following rates be used during the pre-bearing years:

Formulation to be applied per 1,000 gallons of irrigation water.

2 lbs. of dry ammonium nitrate or 1/3 gallon of ammonium nitrate solution 20-0-0

1 lb. dry potassium nitrate

1 pint 75% food grade phosphoric acid

NOTE: Dosages are given on the basis of the quantity of water applied to the tree. The most effective way to apply the fertilizer is probably by proportional and continuous addition of the fertilizer to the irrigation water. Since this is frequently impossible, the next best thing may be to add it during alternate irrigations. Be sure to double the amount per application in such a case.

Remember to be careful not to apply all of the fertilizer in one batch while irrigating, but find some manner in which to spread out the application during a large part of the full irrigation cycle.

If you are unable to add the fertilizer to the water, or estimate the correct amount from the foregoing, you may sprinkle a tablespoon of nitrogen-bearing salt (ammonium nitrate, urea or such) over the root area and water in thoroughly. Repeat every three or four weeks. Take care not to concentrate it in one area. Increase the dosage gradually according to the increasing size of your tree. Apply the plant food around the drip line, or in the path of irrigation water.

A fully bearing orchard is usually fertilized at the rate of 1 to 1 1/2 lbs. of actual nitrogen for an average sized avocado tree (one that has a foliage diameter of about 20 feet). This can be taken care of by sprinkling 1 to 1 1/2 lbs. of dry ammonium nitrate on the ground around and beneath the skirts of the tree; two or three times a year. Wash the fertilizer into the ground with a good soaking (2 inches of water). Early spring, summer and fall are good times for fertilizer application, as the avocado roots will be active then.

We suggest, as a special precaution, if you have only one or two trees, that you add also, a half pound of Sprint 138® iron chelate and a zinc chelate to the soil at the same time that you are adding the nitrogen. The chelates will correct many cases of leaf yellowing. For smaller dwarf trees fertilizer dosages should be reduced proportionally according to the area of tree canopy.

FROST PROTECTION

By W.H. Brokaw

Young avocado trees are very vulnerable to prolonged frost conditions. However, there are certain precautions you may follow during the first year or so, which will often save a tree.

Wrap the trunk of your new tree with heavy paper, corn stalks or the special thermal wraps. If this is done to a point above the bud union chances are that you will have a complete budded tree when winter is over even though the exposed parts of your tree are killed.

At the onset of spring, you will be able to unwrap the damaged tree and select a shoot or shoots, above the bud union, so as to renew your tree. Do not remove dead tree parts until new shoots are growing well.

An even more effective insulation to preserve the bud union is a collar filled with sawdust to a point 6 to 12 inches above the union. The collar may be 5 or 6 inches in diameter. It is almost impossible to freeze tissue within this mass of sawdust.

Foliage is more difficult to save under severe frost conditions. Any wrapping around and through it will help. Sometimes bunches of straw are intertwined with the foliage and matted around the branches to serve as an insulating mass. A suspended canvas and wood canopy above the tree will help. Under very extreme conditions, people have erected tents and placed lighted electric bulbs within the structure.

Remember two things:

1. A complete enclosed covering of polyethylene or other non-breathing plastic is often worse than nothing -- especially where it touches the tree.
2. Trees do not survive well in darkness, so the tree must be allowed to see sunlight during the day.

All in all, we recommend the thermal wrap mentioned first above or the sawdust filled-collar.

WEEDS & PESTS

By W.H. Brokaw

If you want good growth, it is imperative that weeds are not allowed to develop near your trees. Keep the space clean for a full six feet from the base of your tree. Do not allow weeds or grass to grow in this area and apply no systemic weed killers that may be absorbed by the tree roots.

Insect pests rarely damage avocado fruit trees. Allows a bit of nibbling. Ants often aggravate citrus pests. Low branches on citrus trees should be clipped so they do not droop to the ground allowing ants access to the tree. If ants can go only up the trunk they can be easily controlled and eliminate many pests.

TREATMENT OF FREEZE DAMAGED TREES

Here is some brief advice on how to care for freeze-damaged trees.

1. We're careful not to over irrigate defoliated trees. Their root systems are easily suffocated. We are equally cautious with fertilizer application.

2. We whitewash trunks and scaffold branches. We use a mixture of Hydrated Lime, water-soluble white paint and water. We spray the mixture on the tree with backpack or spray rig with appropriately patterned nozzle. Upper surfaces and the south sides of the trees are particularly susceptible to sunburn. A mixture we've used is the following:

Tank Mix:

Water 100 gallons
Hydrated Lime 150 lbs
Water based paint 8 gallons

A Single Backpack Dosage:

Water 4 gallons
Hydrated Lime 6.5 lbs
Water based paint 5 cups

3. After the threat of frost, March 15 or so, we remove the trunk protectors on recently planted trees. This encourages new buds to sprout
4. We do not prune branches until spring, and only when new growth is evident. Mulch of the damaged tissue may recuperate. Unlike citrus, brown bark and stained cambium on avocado may not mean the trunk, branch, or stem is dead. The rule with subtropical trees is not to prune too soon. Premature pruning can be detrimental to the tree's recovery.
5. We control the regrowth once new shoots are demonstrably vigorous. Trees in the ground three years or more that have become severely damaged may still sprout from the rootstocks. Trees of this age, if they are otherwise healthy, may be re-grafter at a later date.

Suggestion: Now is a good time, while the trees are devoid of fruits to thin trees that are crowding and to remove low hanging limbs. Your trees that recover will do so rapidly and vigorously. Previously crowding trees will recreate a thicket quicker than we think.

IRRIGATION AND IRON CHLOROSIS IN ORCHARDS

By: Guy Whitney

Heavy winter precipitation in early 2005 in many areas resulted in wetter than normal soils at the start of the growing season. As a consequence, many trees and even entire sections of orchards may be showing symptoms of iron deficiency, which began in early summer.

The signs are easily recognized as yellowing of new leaves (chlorosis) over the entire tree, or in just a few limbs. On closer inspection, the leaf veins normally remain green while the blade itself turns a bright yellow to white color. In the most severe situations, leaves may have burned margins and limbs or trees may defoliate. Iron is required for the production of chlorophyll and so a deficiency results in the absence of this green pigment in leaves.

Iron deficiency in avocado trees is expressed in new growth when a simultaneous restriction in root iron uptake occurs. The absorption of iron has been shown to be limited to the growing root tips of trees and so healthy roots are essential. Any restriction in root growth, such as waterlogged oxygen depleted soil conditions, will result in reduced uptake. It has also been shown that carbonates (HCO_3^-) in the soil restrict the uptake and movement of iron. High levels of carbon dioxide (CO_2) are burned margins and limbs or trees may defoliate. Under conditions of poor aeration, such as in waterlogged soils, CO_2 accumulates from root and microbial respiration. This in turn results in elevated HCO_3^- and restricted iron uptake.

Carbonates are also formed in high pH calcareous soils, which are common in some fruit growing areas of the West Coast. Orchards grown on these soils are likely to exhibit iron deficiency symptoms, particularly under wet conditions. Excessive lime applied to raise the pH of soils may also result in iron deficiency. The term "lime induced iron chlorosis" is frequently used for symptoms on trees grown under high soil pH conditions.

While all of this may sound complicated it boils down to a few main points. Under excessively wet conditions root growth is restricted and HCO_3^- accumulates. Both of these factors result in restricted iron uptake. Any growth occurring at this time will likely show iron deficiency symptoms.

Foliar and soil applications of iron rarely reduce the severity of deficiency symptoms and are considered only temporary measures. The application of inorganic iron salts to the soil is generally ineffective because the iron is rapidly oxidized and becomes insoluble. Foliar applications of inorganic iron salts are also generally ineffective. Sequestrene iron chelate has been shown to be effectively taken up as a soil dressing, but is generally an expensive remedy. Soil applications of EDTA iron chelate have occasionally been shown effective, but because of poor stability this form of iron may rapidly oxidize and become unavailable to the plant.

IRRIGATION AND IRON CHLOROSIS IN ORCHARDS (Continued)

By: Guy Whitney

The best way to manage iron deficiency is to manage irrigation and soil pH. Excessive soil moisture resulting from heavy winter precipitation or spring irrigation is most often the cause of a temporary iron deficiency. If excessive irrigation is applied every spring chronic iron deficiency will result and production will suffer. Where soil pH is high, the use of acid fertilizers particularly ammonium fertilizers, can lower the soil pH, improve iron availability and depress deficiency symptoms. Remember, however, the uptake of other nutrients may be restricted if the pH becomes too low. Always check soil pH before embarking on an orchard nutrition program. Avocados generally prefer a soil pH of 6.0 to 6.5. Mulching trees with well-composted organic material will improve root health and soil aeration and so may also provide some remedy where iron chlorosis is a chronic problem.

FERTILIZER DOSAGES FOR DRIP IRRIGATION

For Young Citrus and Avocado Trees

The following are recommended fertilizer rate tables for liquid and dry formulations to be injected into drip irrigation systems for young trees. It is a balanced program designed to produce optimum tree growth during the first three years of an orchard's life.
The rates are generous and represent maximum amounts to be applied under normal or average conditions.

Any particular soil may not require all the nutrients included in both of the tables. It is designed to take care of an orchard with varied soil conditions, such as occurs on hillside plantings with little topsoil. We think it is a good starting point. For more precise custom evaluations, see your soil advisor.
If growth has been successful during the first three years, the fourth year should be a good bearing year and the dosages may be reduced. Beginning the fourth and fifth year you should be guided by leaf and soil analyses rather than simplified tables such as these.

FERTILIZER RATE TABLE 1

Form	Material	PPM	Vol./1000 Gal. Of irrigation water	Wt./1000 Gal. Of irrigation water
Liquid	20-0-0 (Ammonium Nitrate)	93N	.37 gal.	2.22 lbs.
Dry form (mix as a slurry before adding to injector)	Supplementary **Iron** Chelate (Sprint 138) 8% Fe			
	a. One shot quick corrective	9.6 Fe	3 cups	1 lb
	b. Constant feed	1.36 Fe	6 Tbs	2.28 oz.
	Supplementary **Zinc** Chelate			
	a. One shot quick corrective	4.26 Zn	¾ cups	4 oz.
	b. Constant feed	0.36 Zn	1 Tbs	1/3 oz.

FERTILIZER DOSAGES FOR DRIP IRRIGATION (Continued…)

For Young Citrus and Avocado Trees

Based on the table on the previous page, lets suppose that you start out by applying only the liquid Ammonium Nitrate (20-0-0) through your drip system by means of a small injector tank. If you have, as an example; 674 trees each with one gallon per hour emitters and you plan to irrigate for six hours then your total amount of irrigation water would equal 674 trees times 6 hours= 4044 gallons of water.

The ratio of ammonium nitrate that would be used can be expressed as:
1000's Gal. of water used x .37 = (or) 4044 x .37 =1.5 gal. of Ammonium Nitrate (20-0-0)

So, 1.5 gal of ammonium nitrate would be put into your injector tank to be dispensed during the six hour irrigation period at the slowest rate possible.

Should it be inconvenient to use liquid Ammonium Nitrate you could substitute 9 lb or granular Ammonium Nitrate thusly:

gal. of water used x 2.22 = (or) 4044 x 2.22 =9lb.
1000 gal. 1000

CAUTION: Be sure that your lines are charged with pure irrigation water before you begin injecting. Otherwise the fertilizer may rush to specific areas of your orchard causing severe damage to some of your trees.

Lines 2 and 3 in FERTILIZER RATE TABLE 1 suggest two dosages each of Iron chelate and Zinc chelate. The dosage listed in each case as "One shot corrective" is for cases of pronounced chlorosis and/or other deficiency symptoms. The other dosages as noted are a constant feed dosage to be used at each irrigation along with the Ammonium Nitrate.

FERTILIZER RATE TABLE 2

Form	Material	PPM	Vol./1000 gal. of Irrigation Water	Wt./1000 gal. of Irrigation Water
Liquid	75% Phosphoric Acid (food grade or technical)	16.8	6 fl. oz.	----
Solids dissolved in 500 gals of solution	750 lbs. KNO_4 (Potassium Nitrate) 10 lbs $CuSO_4 5H_2O$ (Copper Sulfate)	19N 52K 0.5 Cu	.79 gal.	1.2 lb KNO_4 0.25 oz. $CuSO_4$

This table includes an optional suggestion for the grower who may want to provide these additional nutrients. If phosphoric acid is mixed with Iron Chelate it may form a precipitate, which could clog emitters. For this reason it may be wise to inject these two at different intervals during the watering cycle.

DRY NITROGEN FERTILIZER DOSAGE RATES
For Young Avocado Orchards

The following table is a recommended fertilizer rate sheet for hand application of dry nitrogen-bearing fertilizer for young avocado trees. It is a kind of compromise between conventionally recommended rates and the dosages we at Brokaw Nursery believe to be suitable. Our idea is that copious quantities of fertilizer should be added during the first three years for fast tree growth. We believe that in nearly all cases the fourth year will be a good bearing year and the dosages will thereafter be more conservative.
Beginning with the fourth and fifth year you should be guided by leaf analysis rather than by a simplified table as such.

With this table we are recommending nitrogen rates only and the formulations include only two sources of nitrogen. Under special soil conditions you may find it more useful to use other nitrogen carriers. Also, you may not want to utilize bearers of micro-nutrient elements such as Zinc and Iron. All of this will depend on your water and soil composition. All computations assume approximately 110 trees per acre.

Year	Frequency of Application	Total Weight/Tree/Year			Total Weight/Acre/Year			Approx. Amount per Tree per Application	
		N*	Urea 45%N	Amm. Nit 35%N	N*	Urea	Amm Nit	Urea 46% or	Amm Nitrate
1st	1/month	1/8 lb	4.4 oz	5.7 oz	12.5 lb	28 lb	36 lb	¾ Tbs	1 Tbs
2nd	6x/year (Feb, Ap, Jn, Jl, Aug, Sep)	¼ lb	8.9 oz	11.4 oz	25 lb	55 lb	71 lb	3 Tbs	4 Tbs
3rd	4x/year (Feb, May, July, Sept)	½ lb	18 oz	23 oz	50 lb	111 lb	143 lb	.6 Cups or 9.5 Tbs	.8 Cups or 12 Tbs
4th	2x/year (Feb, June)	½ lb	18 oz	23 oz	50 lb	111 lb	143 lb	1.3 cups	1.6 cups

*N signifies elemental Nitrogen

Be sure that you add the fertilizers with sufficient water to dilute them. Place them in areas where they will soon be carried into the soil by rain or irrigation water. When the water is spread over a large area such as by rain or by sprinklers, broadcast the material over root zone so that it is not concentrated in one spot.

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