

Water Requirements

Water, particularly where nut quality is concerned, has more of an effect on pecan production than any other factor. Drought stress affects nut size and filling, as well as leaf and shoot growth. Adequate soil moisture is important at bud break in order to stimulate strong, vigorous growth, from bloom through shell hardening for nut size, and during the nut filling stage for optimizing kernel percentage. If trees do not receive adequate soil moisture levels late in the season, shuck split and energy reserves are affected.

Pecan trees extract most of their water from the upper 32 inches of the soil profile. Though they are deep-rooted, most of the deep water available to the tree is survival water and is not useful for fruit production. The deeper the available water, the more energy the tree must expend to obtain it. As energy is diverted from the leaves and nuts, the tree will shed leaves, drop nuts, or only moderately fill the pecans.

The nut sizing period normally occurs from May 1 through August 15. Although, not a critical water use stage for the pecan, serious drought conditions during this period can affect yield. The most common visible effects of an extended drought during this period are excessive nut drop at the two and three leaf stage and "shell hardening" on small nuts. Additionally, lack of sufficient water during the nut sizing period causes small nuts and may lead to physiological split of the nuts resulting from a sudden influx of water during the nut filling stage in some varieties.

The nut filling stage occurs from August 15 to the first week of October. The most critical period for water use is during the first two weeks of September. Lack of sufficient water during the nut filling stage will lead to poorly filled nuts, which will result in poor nut quality.

Reports from other areas of the country indicate that as much as 350 gallons of water per day can be required by each tree during the nut filling stage. Based on this recommendation, if an orchard has a plant density of 12 trees per acre (60' x 60' spacing), then 4200 gallons per acre per day may be needed. For a density of 20 trees per acre (46.5' x 46.5') 8400 gallons per acre per day may be needed.

Therefore, pecans can have high water requirements, using as much as 48 inches of total water (including rainfall) during the growing season. Drip irrigation system design capacity for a mature pecan orchard should be 3600-6000 gallons of water per acre per day. The difference between the amount of water needed by the tree and the amount supplied by rainfall is its supplemental water requirement. This requirement will vary depending upon the type of irrigation system used and the orchard's canopy density. Because of evaporation losses, solid-set sprinkler irrigation can require as much as 3 times more supplemental water as drip or micro-irrigation. Solid set irrigation systems should have a design capacity of 1.5–2.0 inches per week.

There is obviously a trade-off between how much water the irrigation system can apply and the economics (initial cost) of the system. Growers should make certain that they know the limitations of their irrigation system and how the system should operate in order to minimize the system's weak points. Solid set irrigation systems obviously have different limitations than drip irrigation systems.

Whether an orchard is irrigated with solid-set sprinkler, drip, or micro irrigation, an irrigation schedule that meets the needs of the pecan orchard will be required. There are several ways to schedule irrigation. Tensiometers, which are based on available soil moisture, and evaporation pans, which are based on evaporation rates, are the two most common scheduling methods. For solid-set systems, either method can be used but pan evaporation is the most common. Where drip or micro irrigation is used, tensiometers are the most common method. Solid-set sprinkler irrigation will allow moisture levels to fluctuate between 50 and 100%, whereas drip and micro irrigation maintain relatively constant soil moisture levels near the emitters.

Systems should be in operation for 12 hours (or less) per day in order to prevent water logging and oxygen depletion in the root zone. Roots thrive best when water is present in the soil as a liquid film covering each soil particle, while leaving soil interspaces filled with air. Growers should be aware of their system's delivery rate and adjust their operation times accordingly. At the maximum rate, the system should have the capability to deliver the required gallons per acre per day or inches per week.

Proper scheduling of the irrigation system during the year could save money in operating costs. If a system is designed to operate 12 hours per zone during peak water usage, then it could be used at only a fraction of that time during the early part of the season due to the tree's requirements at that stage in the season. Depending on the irrigation system design, as little as four hours per zone operating time may be sufficient during the first part of the growing season. The operating time should be increased monthly until reaching the maximum 10-12 hours during peak water demand in late summer.

A general operating schedule is provided in the following table for both solid set systems and drip or micro irrigation systems.

GENERAL OPERATING SCHEDULE FOR PECAN IRRIGATION

MONTH	DRIP % cycle	SPRINKLER Inches/A
April	60	0.5"
May	70	0.75"
June	80	1"
July	90	1.25"
August	100	1.5"
September	100	1.5"
October	90	1"
November	60	0.5"