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CULTURAL METHODS FOR YOUNG PECAN ORCHARDS IN THE IRRIGATED SOUTHWEST

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Young, unproducing groves constitute the largest part of the pecan acreage in Arizona at the present time. With the satisfactory yields and returns that are being obtained from bearing groves, continued planting of young orchards is probable. Accordingly, the problem of bringing young trees into bearing economically and successfully is paramount.

Three years ago the Agricultural Experiment Station of the University of Arizona began trials of various cultural systems in a newly planted pecan orchard on the Yuma Valley station with a view to finding a practice which would cause young trees to make a maximum growth and at the same time would be economical of labor and other costs and would lend itself well to the growing of a revenue crop between the trees. This latter was considered essential as owners of many young orchards must obtain some such returns during the period before the orchard comes into production. From these experiments, and from studies of groves thruout the southwest some information has been gathered on the response of pecan trees to various cultural treatments. Sufficient time has not elapsed for such information to be final or infallible. It is believed to be indicative.

No irrigation plots were established as such, at the time of starting the orchard. The thought then was to maintain an abundant and uniform soil moisture in all plots. However, thru faulty leveling, trees at one end of the orchard were found to be on slightly higher land. During the first two summers these trees did not have constantly moist soil. While they were watered with the remainder of the trees the amount of water received was reduced and the soil dried out between irrigations. These trees did not grow well during the fir t two summers. Before the third summer the land was releveled so that they received as much water as the balance of the orchard. The growth this year has improved but the effects of the lack of sufficient irrigation are still apparent.

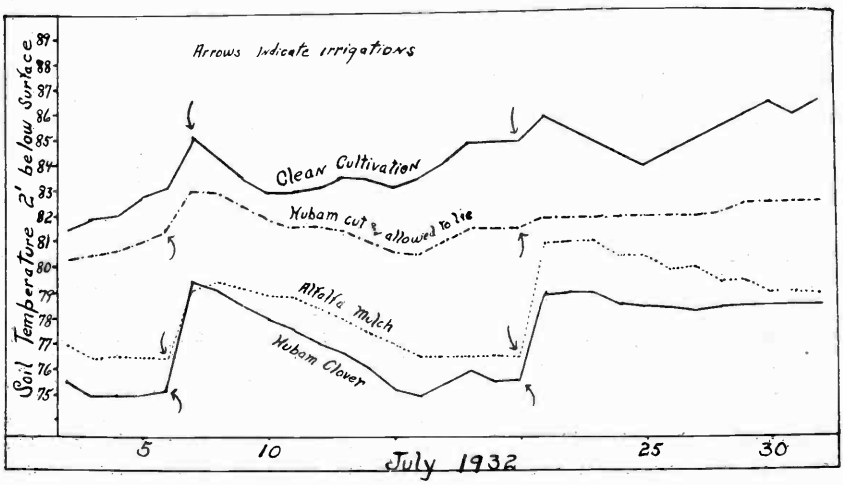
Similar illustrations providing a comparison of the growth of young trees in soil kept uniformly moist and in soil permitted to become dry or to contain only a marginal moisture supply are to be found in every district of the state. All have indicated that better growth results where a high soil moisture content is maintained. Pecan trees should be irrigated by flooding using either a check or basin system and allowing the water to come up to and completely surround the tree. Running the water in small laterals has not been successful.

The extent to which pecans will endure excess moisture has been noted on occasions where breaks in irrigation canals have occurred or where leaching was being done. On such occasions trees have been observed to stand in water for as long as three weeks—apparently without injury. However, the drainage was good and the water did not stagnate. As yet no detailed records of soil moisture in relation to the growth of young pecan trees have been made. They are not believed to be necessary until a more specific problem involving soil moisture is attacked.

Of the various cultural treatments given young trees on the Yuma Valley station the growing of cover crops appears to offer the most promise. Those which have given best results are summer legumes; namely, Hubam clover, sour clover, and Sesbania (wild hemp). The reason trees grow well with cover crops probably relates to the facts that soil temperatures are lower than under clean cultivation

or mulch (see accompanying chart). The cover crop roots penetrate the soil, depositing organic matter deeply when they die and opening the soil for better aeration and water penetration. Large quantities of organic matter from the stem and leaves are incorporated in the soil. (Hubam clover plots returned more than four tons of green manure per acre).

The growing of cover crops appears to also have certain practical advantages. Bermuda grass and many weeds are choked out accomplishing what would otherwise require considerable time and labor. Cultivations are reduced to one or two a year, again reducing labor and the need for expensive equipment. Once planted, Hubam clover and similar cover crops reseed themselves without effort on the part of the owner—another labor-saving and cost reducing feature.



Soil temperatures near young pecan trees under: Clean Cultivation; Hubam clover cut and allowed to lie on the ground; alfalfa mulch; and Hubam clover allowed to stand through the summer.—Yuma Valley Exp. Farm.

The advantages of cover crops for young pecan orchards seem to be twofold: (1) the trees make a maximum growth, and (2) the cost is low.

Hubam and sour clover seem to be the best summer cover crops yet tried at all extensively. Preference is given to the former because it makes more total growth, grows later into the summer thus shading the soil for a longer period, and because it has a slightly longer root. During the summer just passed biennial sweet clover has been tried and gives promise of equaling if not surpassing Hubam. It has remained green and effectively shaded the soil thruout the hot summer months and no fire risk has arisen as with Hubam and sour clover. Its performance would seem to warrant a trial by growers.

Our experience has been that Hubam, sour clover and biennial sweet clover may be planted successfully in January on a reasonably well prepared seed bed. Sour clover begins growing at once and is in bloom by early April. Hubam and sweet clover are later. Once planted no further care is needed except to irrigate sufficiently to germinate the seed and get the young plants started. After that and thruout the summer irrigations should be timed to keep the soil nicely moist as the trees and cover crop may require. If any small trees become shaded by the clover it should be tramped down around them. With larger trees even this small amount

of attention is unnecessary. The sour clover will go to seed and be dry by the first of July and the Hubam a month later depending on date of seeding. With the maturing of the clover a fire hazard may arise, necessitating disking it down at that time, otherwise it should be allowed to stand and shade the soil until the hot weather is passed. It can be knocked down satisfactorily by going over with a light disk before and after an irrigation. This also prepares the seed bed from which the seed germinates the following late winter or spring. Twelve months elapse before another disking or other similar operation is necessary.

Sesbania has been quite satisfactory, but makes so rank a growth if planted in early summer that it is difficult to work into the soil by fall and if worked down in mid-summer the shading effect is lost for the balance of the hot weather. If planted during mid-summer this effect during the early summer is lost. What appears to be an excellent program is the growing of sour clover in the spring and early summer followed by Sesbanisa in the middle and late summer. By this method trees have maintained a good growth into the late summer and no fire risk arises.

Alfalfa when grown strictly as a cover crop has been only moderately successful in that the trees have not made the best growth. The length of the new shoot growth is reduced. The bark frequently becomes slightly reddish in color and the

Hubam clover plot at Yuma Valley Station, photographed September 1, 1932. This plot had no attention, other than irrigation, from planting to late September when the clover was disked down. The clover reseeded and no further attention was given other than irrigation and pruning until September, 1933. The trees have made an excellent growth.

leaves are smaller and instead of a deep green are often a bit yellow. These symptoms in the tree indicate that somehow it is not getting enough nitrogen. It is believed that alfalfa uses the nitrogen of the soil excessively or in some way makes it unavailable to the tree. When alfalfa is grown as a hay crop in the orchard the young trees grow even less thriftily.

Experiments with clean cultivation and with mulching have indicated that these treatments do not offer the promise of commercial success that the use of cover crops does. While young pecan trees have consistently responded well to the use of organic matter such as spoiled alfalfa hay or cotton hulls placed around

them as a mulch, the mulch accomplishes nothing that is not done equally well by the cover crop. Thru decomposition on the under side of the mulch the soil is probably enriched. However, any considerable amounts of organic matter are not added to the soil very far below the surface as is the case with cover crops. Bermuda grass seems invariably to work into a mulch so that some steps to eliminate it are necessary each year. This involves some labor or expense each season and if neglected can become a real problem and a menace to tree growth. Similarly, the mulch itself must be renewed from time to time.

Trees on the clean cultivated plots have not made the best growth. As observed over the state, trees growing with clean cultivation also are not making a maximum growth. They frequently display symptoms of a nitrogen deficiency. Protecting the soil from sunlight appears to be a fundamental principle in the successful growing of pecan trees in the southwest. In addition to retarding the growth of the trees, the cultivation is costly. Cultivation of young orchards should be practiced only to prepare a seed bed for a cover crop, to work in a cover crop or possibly to kill out Bermuda.

No sod culture plots have been tried on the Yuma Valley station, but observations of trees in sod in various parts of the southwest indicate that they do not grow well unless supplied with large amounts of a nitrogenous fertilizer. Sod, like clean cultivation and alfalfa, seems to limit the nitrogen supply available to the tree.

The use of commercial or other forms of fertilizers on the Yuma Valley planting has not been extensive. This is because the trees at no time have shown symptoms of a need for additional fertilizer. Young trees in cover crop or mulch plots having main limbs each making two to six feet of growth and having large, dark green leaves and a green bark color are not judged to be in need of fertilizing. Moreover, the application of three pounds of ammonium sulfate with each irrigation thruout the growing season has produced no effect on two year old trees. It is believed that in the southwest young trees will not generally need any of the ordinary fertilizers if grown with cover crops. The appearance of the tree will offer the best index as to its requirements in this regard.

Summarizing the results of the various cultural treatments; it is our experience that a satisfactory growth of young pecan trees can be obtained by, (1) irrigating abundantly and (2) growing cover crops. Many growers will at once ask, "How can I grow cover crops and at the same time grow an intercrop from which to obtain cash returns?"

We know of only one way to accomplish this satisfactorily. It consists of placing a border on each side of the tree row. Three feet on each side is sufficient for small trees and the distance can be increased as the trees grow larger. A cover crop should then be planted between the borders with the trees allowing the seed to fall close up to the trees. This area is then handled as described for irrigating and covercropping. In the area between the tree rows and not included in the borders with them the desired cash crop, as, cotton, alfalfa, melons, strawberries, hegari or others may be planted. By this arrangement, the trees receive the benefit of the cover crop and of independent irrigations. By it trees have responded practically as well as when planted solidly to a cover crop.

Trees thruout the southwest have not usually done well when planted solidly to one of the cash or revenue intercrops. There seems to be no intercrop which has exactly the same irrigation requirements as pecan trees or whose culture permits their best growth. Alfalfa, for example, is usually over-irrigated if the trees are irrigated sufficiently for their best growth. Often seeding or harvesting of the intercrop necessitates delaying irrigations of the trees and in consequence their

growth is checked. A burning and dropping of leaves from young trees due to withholding irrigation water while an alfalfa intercrop is being harvested is not an uncommon experience. Injuries to the trees from plows, cultivators, rakes, mowers, and other implements invariably occur. The net result of such a practice is to delay the time at which the trees come into profitable production. Therefore, the growing of young pecan trees in fields of alfalfa, cotton or other crops is not recommended.

A view in the Ewing pecan grove near Glendale, Salt River Valley, photographed June, 1933. Hubam clover is grown between borders with the trees. A cotton intercrop is grown between the tree rows.

The foregoing discussion of results and observations on cultural methods for young pecan groves is given in the light of our experience to date. It must be recognized that such knowledge is cumulative and that in a few years new facts will have been gleaned. At present the Agricultural Experiment Station of the University of Arizona suggests the following:

1. Irrigate young pecan groves by flooding and irrigate abundantly.
2. Grow summer cover crops as Hubam, sour clover or Sesbania. Plant these either solidly in the grove or (if cash crops are grown) between borders with the trees.
3. If revenue crops are to be grown, separate them from the trees by borders.
4. Do not cultivate young pecan trees.
5. If the above practices are followed, fertilizing is probably unnecessary.