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The hardy Catalpa in Iowa

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The Hardy Catalpa in Iowa

Twenty-year-old Catalpa trees on an Iowa Plantation

IOWA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS

AGRICULTURAL EXPERIMENT STATION
FORESTRY SECTION

AMES, IOWA
SUMMARY

1. The hardy catalpa is one of the best fence post trees that can be grown in Iowa. Page 310

2. Eighteen-year-old trees that have been properly cared for will yield from 2,000 to 2,500 posts to the acre. The gross annual return per acre per year on the Iowa plantations studied varied from $10.77 to $20.34. Page 322

3. Catalpa posts rank next to osage orange and red cedar in durability, provided that they are cut before they become infected with fungi, and are properly seasoned. Page 320

4. Catalpas should be cut by the time they are eighteen or twenty years old. If left longer they are liable to become infected with a fungus which in a short time makes them worthless. Page 318

5. Catalpas do not make satisfactory poles, as they are not large enough by the time they must be cut. Another objection to catalpas for pole production is that the trunks never grow exactly straight. Page 310

6. The hardy catalpa is the only species that can be grown successfully in Iowa. The common catalpa, which has sometimes been substituted for it with unsatisfactory results, can be distinguished from the hardy species by differences in the bark and seeds. Page 311

7. Catalpa seed should be sown as soon as the danger of frost is past. Sow in broad furrows at the rate of 35 or 40 seeds to the foot, and cover one-half inch deep. Page 311

8. One-year-old seedlings are the most satisfactory for extensive plantings. Only No. 1 or No. 2 seedlings should be used. Page 313

9. Good corn soil is best for catalpas. They will grow on any Iowa soil with the exception of gumbo, light, sandy or poorly drained soils. Page 313

10. Trees should not be spaced farther apart than 6x6 feet, or a heavy growth of side branches will result. Page 315

11. Thorough cultivation is necessary for the first two or three years to keep down grass and weeds, and to stimulate growth. Page 315

12. The trees must be protected from rabbits for the first two winters. Wooden shields placed around the stems are the cheapest and most efficient protection. Page 316

13. If the trees are still vigorous when the first cutting is made, a second crop of trees can be obtained from the sprouts in from twelve to fourteen years. Page 318

14. Catalpa posts season best if cut in November or December. If a second crop is desired from sprout reproduction, the first cutting should be made in February or March. Page 319
THE HARDY CATALPA IN IOWA

C. A. SCOTT.*

INTRODUCTION

The hardy catalpa is one of the best fence post trees that can be grown in Iowa. Nearly all the catalpa plantations in the state have been studied by the forestry section of the experiment station. A large majority of them are successful, and seem to be a paying proposition for their owners.

RANGE OF SUCCESSFUL GROWTH

The hardy catalpa is a southern tree, its natural locality being throughout southern Ohio, Indiana and Illinois, eastern Missouri, and southward. Iowa is considerably north of its natural range. In the southern half of the state there is very little danger of winter killing if given a favorable location. In the northern part, however, there has been considerable trouble from this cause. For this reason it is not advisable to plant catalpas in extensive plantations in the extreme northern and especially in the northwestern part of Iowa.

North of the line drawn between Harrison and Monona counties, and continued eastward across the state, catalpa plantations should be protected by a windbreak of hardier trees planted along the north and west sides of the grove. Three or four rows of cottonwoods or willows afford plenty of protection.

FORM AND SIZE

When planted in groves the hardy catalpa reaches its best development in from sixteen to twenty years. Trees in single rows require a much longer time to reach their full development. Closely planted catalpas develop a tall, slender trunk, with very few large branches. The height of sixteen to twenty-year-old trees varies from 30 to 40 feet. The diameter of 35-foot trees, measured one foot above the ground, is about 7 or 8 inches. The trees hold their diameter well, and will usually cut out three 6½-foot posts. As the catalpa continues to grow until late in the fall, the top 6 inches or so does not mature and is frozen. The next spring the growth starts from a bud below the injured portion, causing a slight crook in the trunk. This makes the catalpa undesirable for telegraph or telephone poles. Also, it is seldom that the trees reach pole size without becoming affected by fungus. When used for posts, the trees can be cut before they become affected with the fungus. The slight crookedness does not detract seriously from the value of the posts.

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SELECTION OF SPECIES

The most common cause for failure with catalpas is a mistake in the selection of the species to be grown. There are two native species of catalpa in the United States, the hardy catalpa (Catalpa speciosa Warder) and the common catalpa (Catalpa catalpa Karst). The common catalpa is not hardy enough to be grown successfully in Iowa. Hardy catalpa seeds are very wide, with a broad brush of hairs at each end and a fringe of hairs along one side. Seeds of the common catalpa are much narrower, with a narrow, pointed brush of hairs at each end. Hardy catalpa seed pods are 7 to 20 inches long, with thick, strong walls. There are seldom more than three in a cluster. Common catalpa seed pods are 6 to 18 inches long, with thin walls. From 5 to 15 pods grow in a cluster. The bark on old stems of hardy catalpa is deeply furrowed, but never peels off in scales. That of common catalpa is thin and light, falling off in light scales, but it is never deeply furrowed. The two species of catalpa cross readily. Bees sometimes carry the pollen as much as two miles. Thus it will be seen that great care is necessary in order to obtain pure seed of the proper species.

The seed pods ripen in October. They may be gathered as soon as ripe or allowed to hang on the trees until January or February. When gathered they should be sacked and stored in a dry room. Within a few weeks the pods will split open upon the slightest disturbance and discharge the seed. The seed keeps for several months without loss of vitality if stored in a cool, dry place.

PROPAGATION FROM SEEDS

The catalpa is usually grown from seed. Seed beds should be made as fine and mellow as possible before the seed is sown. Upon this largely depends the success or failure of the planting. The seed should be sown in broad furrows, 3 or 4 inches in width and ½ inch deep, at the rate of 35 or 40 seeds to the foot. The rows should be wide enough apart for horse cultivation. The seed must not be covered more than ½ inch deep or the sprouts will be unable to get through.

The seed should be sown as soon as the ground is thoroughly warm and danger from frost entirely past. The plants grow slowly during May and June, and require the best of cultivation during these months. With the warmer weather of summer their rate of growth increases, and they reach a height of from 15 to 30 inches by the end of the season.

If left to stand in the seed beds throughout the winter a large percentage of the young trees will winterkill down to within a
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Lower Row---*Catalpa Catalpa* Karst (inermicostata, Walt) Seeds, natural size.
few inches of the ground. The following spring they send out one or more vigorous sprouts from their uninjured crowns. Freezing back in this manner can be prevented by taking up the seedlings in the fall soon after they shed their leaves and storing them in a cellar over winter, or by heeling them in and covering the entire stem.

**PLANTING STOCK**

One-year-old seedlings are the most satisfactory for extensive plantings. At this age the seedlings are strong enough to establish themselves readily in their new location and to make a good growth the first season. They can be planted at a much less expense than a year later. The catalpa transplants very readily, and, with proper care, a full stand is easily secured. In nursery practice the one-year-old seedlings are sorted into three grades, according to their size. Grade No. 1 includes the plants ranging from 18 to 30 inches and upwards in height. Grade No. 2 includes those from 12 to 18 inches in height. Grade No. 3 includes all plants under 12 inches in height. The difference in price between grades is from $1 to $3 per thousand. The No. 1 trees are by far the most satisfactory. Trees of grade No. 2 are all right for extensive plantings. Grade No. 3 are the culls of the entire lot, and should be rejected, whether grown in a nursery or at home. The small seedlings do not make as satisfactory a growth as the larger plants. They require more cultivation, and a larger percentage of the trees die during the first and second years after planting.

**SOIL REQUIREMENTS**

The hardy catalpa does well on any Iowa soil with the exception of gumbo, light sandy, or poorly drained soils. Almost any good corn soil is all right for catalpas. The catalpa is well adapted for planting on bottom lands that are subject to overflow. Occasional floodings do not injure the trees unless their entire tops are covered.

**PREPARATION OF PLANTING SITE**

To insure a full stand of living trees and a good growth the first year, the ground in which the trees are planted must be free from sod and brush, and in the best possible physical condition. When planted on such soil and given thorough cultivation, the trees will make a growth of from 3 to 6 feet the first summer.

**TIME OF PLANTING**

The trees may be set out any time from the time the ground is in workable condition in the spring until the middle of May.
FIG. 2. Seedling Catalpas. grade No. 1, 24 to 30 inches in height. The tops have been injured by freezing. This is the best size for commercial planting.

Seedling Catalpas. grade No. 2, 12 to 18 inches in height. Quite satisfactory for commercial planting.

Seedling Catalpas. grade No. 3, below 12 inches in height. Entirely too small for any kind of planting.
They should be planted before the leaves begin to unfold. Fall planting is not advisable. The trees are liable to winter kill, and they will need protection from rabbits one year earlier than if planting had been delayed until spring.

**SPACING**

The most satisfactory spacing is 6x6 feet or closer. The spacing in the plantations examined varied from 3x6 to 6x10 feet. Fairly close spacing is necessary in order to force the trees to develop tall, straight trunks rather than heavy branches. Even spacing makes cultivation easier.

Under intensive conditions the trees may be spaced as closely as 3x6 feet and every other one in the row cut out after eight or ten years. At this time each tree cut out will make one post and considerable firewood. There are three advantages to this plan. First, the crowding forces the young trees to grow up straight without large branches. Second, the dense shade keeps out bluegrass and weeds, and reduces the amount of cultivation needed. Third, the litter from the trees provides a mulch that helps to retain moisture. The sprouts from these cut-off trees will not grow much on account of lack of sunlight.

**CULTIVATION AND CARE OF PLANTATION**

Thorough cultivation is necessary for the first two or three years, until the trees are large enough to shade the ground com-
Catalpas can not compete successfully with grass and weeds. Rapid growth is stimulated by a loose, mellow soil.

The only care that the trees require after cultivation ceases is protection against injury by fire or live stock. The danger of injury by fire is not great unless there is a growth of grass or weeds on the ground. Cattle, horses and sheep are especially harmful on account of packing the soil about the trees.

**PROTECTION AGAINST RABBITS**

For the first two winters rabbits are the most destructive enemies of young catalpa trees. One of the best methods of protection is a light wooden shield placed around each stem. These shields are inexpensive, costing about $6 per thousand. They are easily and quickly put on, and they give perfect protection. They are serviceable for three or four years, and may be used on two lots of trees. Another method of protection that has proved successful where tried is that of enclosing the young plantation with a woven wire rabbit-tight fence. This method is more expensive than protecting the trees with shields, and not always as effective. The trees are perfectly safe from attacks of rabbits after the second winter.

**CUTTING BACK**

Some catalpa growers practice cutting the trees back to stumps level with the ground when two or three years of age. This is done to secure a straighter growth. On the farm the advantage will hardly pay for the extra work. If cutting back is practiced, it should be done in March or April, after the trees have grown two years in the permanent plantation. The stumps will send out from three or four to a dozen sprouts, all of which must be cut off except one of the strongest. Under favorable conditions this one sprout should attain a height of from 6 to 10 feet the first season, and by the end of the second season the sprouts will exceed the height of five year old trees that were not cut back. If one trimming of the stump sprouts would answer all needs, the care of the sprout growth would be a simple matter, but the stumps persist in sprouting and it is usually necessary to go over the plantation two or three times to keep the stumps free from undesirable sprouts.

During the first year after cutting back, the sprouts are often split from the stump by the wind. To shelter the sprouts from such injury it is advisable when cutting back the seedlings to leave four rows uncut along the side of the plantation to serve as a windbreak. If the plantation is of considerable size, strips of four uncut rows should be left at regular intervals to protect the interior of the grove. When the sprout growths are two years...
old the five year old seedlings that have served as windbreaks can be cut back. The sprouts arising from their stumps will be protected by the older sprouts.
Catalpas are susceptible to injury by a fungus disease, *Poly- porous versicolor,* which attacks trees in groves, though usually not until they are past eighteen years of age. The fungus makes the wood worthless. The only way injury can be avoided is to cut the trees before the disease has progressed far enough to affect seriously the strength of the wood. The fungus gains entrance through the lower limbs that are killed by the shade from the upper part of the tree, gradually eating its way into the trunk. Within a very few years the wood of the entire trunk is affected and the tree soon dies. The presence of this fungus is easily detected by the appearance of brackets or punk knots, often spoken of as toad stools, on the surface of the infected parts, also by the occurrence of broken limbs. In the advanced stage of the disease the trunks of the trees are usually covered with a growth of brackets, which are the fruiting organs of the fungus. The trees infected are often broken off in wind storms, at heights varying from 2 to 10 feet from the ground.

**LENGTH OF ROTATION FOR THE CATALPA**

A careful study of the catalpa plantations within the state indicates that the catalpa must be handled on a sixteen or eighteen year rotation. At this age the trees are still sound, and are large enough to cut two posts each. The trees do not reach their full growth at this age but any further increase in growth is not enough to balance the risk of losing the crop by an attack of fungus.

**SECOND CROP**

If the trees are cut while they are in a thrifty condition, vigorous sprouts will arise from the stumps and yield a second growth of posts in about twelve or fourteen years. This second crop of posts will practically equal the first cutting in number and value. They will be straighter and have fewer limbs than the posts of the first cutting, and will be every bit as durable.

To secure a good growth of sprouts the trees should be cut in February or March. The stumps should be left not more than 6 inches above the ground, and cut smooth with the slant all in one direction. A low cut stump produces a more vigorous sprout. Early in June the sprouts should be

thinned to one to each stump. The sprout that is left to grow into the future tree should be the strongest and best arising from the stump. In July or August it may be necessary to make a second thinning to cut off all sprouts that start after the first thinning. After the second thinning the plantation will need but little attention until the trees are ready to cut for posts.

A profitable second crop cannot be obtained if the trees of the original planting are allowed to grow until they become infected with fungus. Where the trees have been affected
with the fungus a second crop should not be planted in the same ground for some time. The spores retain their vitality for several years.

**TIME OF CUTTING**

Posts cut in November or December and piled in open ricks will dry slowly without severe season checks. By the next summer such posts will be thoroughly seasoned and ready for use. If a second crop is to be grown from the old stamps, better sprouting will be obtained if the trees are cut in February or March. The posts cut at this time will be ready for use by fall. Midsummer is not a good time to cut posts as they check severely in seasoning. These checks sometimes extend to the pith, weakening the post and making a place where rot can start readily.

**SEASONING**

To air dry posts and poles thoroughly will require from six to nine months' time, depending upon the season and also upon the size of the posts. The posts can be seasoned quickly and satisfactorily by placing in an open pile in alternating tiers or 3 and 7 posts each. This order of piling admits an abundance of light and a free circulation of air. The bark of the catalpa is quite thin and does not interfere to any great extent with seasoning. It clings tightly to the seasoned wood and is not objectionable on the post.

The reason for thoroughly seasoning posts or poles before setting them is that drying the wood increases its durability. Destructive bacteria and fungi require moisture for their development, and cannot injure a post that is thoroughly dry.

**DURABILITY OF CATALPA WOOD**

The catalpa wood is very durable, second only to osage orange and red cedar. In spite of this fact many complaints have been received to the effect that the posts are short-lived and not satisfactory. An investigation of several such criticisms has shown that in such cases the posts were either set before they had been seasoned, or the trees were infected with fungus and the strength and durability of the wood seriously injured before the trees were cut.

When the trees are cut while they are in a perfectly healthy condition and the posts thoroughly seasoned before they are set, the wood makes very durable fence posts. It is light, but strong enough to resist the required strain of the fence, and it holds staples very satisfactorily. The posts are clean, smooth, and neat in appearance.
For general repair work on the farm the catalpa is very serviceable. It has been used with entire satisfaction for sweeps on horse powers, for tongues on all sorts of implements and vehicles and for double-trees, single trees and neckyokes.

The following statements from catalpa growers throughout the state show the value they give the tree for the various purposes mentioned:

The catalpas have done fairly well for me, because I planted them on good corn ground and gave them thorough cultivation and trimmed them while young. I think the hardy catalpa is the best post tree to grow in this section of the state. However, I know of several other plantations in this vicinity that have been failures because the trees were not cultivated and the grass sod practically choked them out. A year ago I sold two acres of my grove to a neighbor for two hundred dollars. He did all the work of cutting and hauling and was well satisfied with his bargain. He used the trees for posts and poles.

At this rate my catalpa grove has paid me $5 per acre per year for the use of the land. I had in addition to this the benefit of protection afforded by the trees, which I valued quite highly. The sprouts from the stumps made a remarkable growth last summer, many of them exceeding 12 feet in height. I now believe we will have a better grove of trees in eight or ten years than we had before cutting.

(Signed) GEORGE S. WALLER,
Pioneer, Iowa.

A short time ago when visiting at my old farm I looked the catalpa trees over for the first time in years, and was surprised at the rate of growth they have made. Some of the largest measure 42 inches in circumference and are tall and straight. My son has cut posts from this grove for the past eight years, and says that he believes the catalpa posts to be as good as white oak posts, if not superior.

For general farm purposes I think the catalpa the best timber I know.

The hardy catalpa does not succeed on light sandy soil, but on better land I consider it the best tree that we can grow for post production. Catalpa posts last fully as long as the burr oak or white oak posts.

Of course, you will sometimes find a burr oak post that will stand for twenty-five or thirty years, but their average life is much less. The experience we have had with the catalpa posts leads me to believe that they are on the average equally as durable as the oak.

(Signed) GEORGE MEINEMANN,
South Amana, Iowa.

I consider the hardy catalpa the best tree to plant in this part of Iowa for posts and poles. I value it very highly for general repair work on the farm, such as making eveners, singletrees, tongues, blocks for underpinning, etc. I like it especially for repairing farm machinery, because it combines considerable strength with lightness. I have some posts still standing. These have been in the ground at least nineteen years. They were peeled and charred without being allowed to season before they were set. From observations I believe, however, that if the posts are seasoned one year or longer before setting they will last longer than when treated as above mentioned.

(Signed) THEO. C. BLUME,
It is an easy matter to grow the trees as they require but little cul­tivation or other attention.

I am an osage orange enthusiastic, but I believe my half acre of catalpa trees will furnish all the posts and poles needed on the farm for the next generation.

(Signed)

REUBEN REDMAN,
Oskaloosa, Iowa.

YIELD OF POSTS AND THEIR VALUE

To give the readers an idea of what returns may be ex­pected from a catalpa plantation, the results obtained in some of the plantations studied are given herewith:

<table>
<thead>
<tr>
<th>County</th>
<th>Number Grove or Plot</th>
<th>Age of Trees Years</th>
<th>Spacing</th>
<th>No of Posts per acre</th>
<th>Value per acre</th>
<th>Annual Return per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Webster</td>
<td>28</td>
<td>3 x 6 ft.</td>
<td></td>
<td>2114</td>
<td>$356.36</td>
<td>$12.73</td>
</tr>
<tr>
<td>Mahaska</td>
<td>1</td>
<td>28</td>
<td>4 x 6 ft.</td>
<td>2265</td>
<td>407.70</td>
<td>14.65</td>
</tr>
<tr>
<td>Mahaska</td>
<td>2</td>
<td>28</td>
<td>3½ x 6 ft.</td>
<td>3663</td>
<td>569.66</td>
<td>20.34</td>
</tr>
<tr>
<td>Iowa</td>
<td>1</td>
<td>25</td>
<td>4 x 8 ft.</td>
<td>1796</td>
<td>269.40</td>
<td>10.77</td>
</tr>
<tr>
<td>Iowa</td>
<td>2</td>
<td>24</td>
<td>6 x 10 ft.</td>
<td>1723</td>
<td>310.00</td>
<td>13.00</td>
</tr>
</tbody>
</table>

In determining the value of these plantations the No. 1 posts were valued at 18 cents each and the No. 2 posts at 10 cents each, this being the present market value. Some of the plantations were not a full acre in extent while others exceeded an acre. In each instance the figures given are reduced to the basis of one acre. A more detailed account of each of these plantations follows.

WEBSTER COUNTY

This plantation is on well drained rich prairie soil. It occupies about four acres of ground and the general appearance of the plantation indicates that the trees were well planted and cared for when small. The growth of the trees has been remarkably good, the stems are straight and clear of limbs for a height of from 20 to 25 feet. The average height of the trees is between 25 and 40 feet and the average diameter breast high is 6 inches. The class I trees in this plantation will cut four posts per tree while trees in classes II and III will cut two posts each.

The stumps in this plantation show that half the trees were cut out when twelve years old, leaving the stand 6x6 feet. Since that time the cutting has been haphazard. In some places only the best trees have been cut and in others all have

*Breast high diameter is 4 ½ feet above the surface of the ground. Measurement is made at this point to avoid the excessive diameter near the ground.

†In studying the plantations the trees were classified according to their grade, as class I dominant trees; class II intermediate trees; class III suppressed trees.
been cut. At present only about one-fourth of the original stand is left. The figures given are based on a stand of 604 trees per acre.

There is no reproduction by sprouts from the stumps, the shading having been too dense. The ownership of this plantation has changed hands several times in recent years and the trees have received no attention whatever since the first transfer. The fungus disease mentioned is quite common in this plantation and unless the trees are cut in the very near future the loss from it will be serious.

**MAHASKA COUNTY--PLANTATION NO. 1**

This plantation occupies an area of .55 of 1 acre. The soil is rich black up'and loam. The drainage is good and the trees have made an excellent growth. The average height of the dominant trees is about 40 feet and their diameter breast high varies from 6 to 15 inches. The average diameter is 7 inches. The trees in class I will cut four 6½ foot posts and the Class II trees will cut two posts each. The boles of the trees are straight and clear of limbs to a height of 25 feet. This plantation received good care during the early years of its development, but in recent years it has received no attention whatever, except to keep out live stock.

Ten years ago about one-third of the trees were cut out and used for various purposes. Fifty of the posts from this cutting were used in a division fence on the farm on which the plantation is growing. A close inspection of each post in this fence showed that after nine years of service only two of the fifty have rotted off. Some others are failing but the majority of them will last for several years yet. These posts show from six to twelve rings of annual growth at their upper ends. This indicates that they were cut from trees that were from nine to fifteen years of age, figuring that it took three years for the tree to grow the length of the post. The fungus is common in this plantation and unless the trees are soon cut the entire crop will be a loss.

**MAHASKA COUNTY--PLANTATION NO. 2**

The area of this plantation is .38 of 1 acre. The soil is a rich black prairie loam, well drained, and the site slopes gently to the north. The plantation has received the best of care and cultivation at all times and is in an absolutely perfect condition at the present time. The close spacing, 3½ by 6 feet, provided sufficient shade from the time the trees were two years old to keep out all undergrowth, and at the same
time shaded off the lower limbs before they reached an objectionable size. The trees have developed straight trunks clear of branches to a height of 25 feet. One very noticeable feature of this plantation is the healthy condition of the trees. Not a sign of the presence of fungi was observed. Another condition noticed in this plantation in striking contrast to conditions found in other plantations was the entire absence of dead and decaying trees lying on the ground. Each year the dead material accumulating in this plantation has been carefully gathered and utilized or destroyed. This care has held the development of the fungus in check.

When the trees were eleven years old one-half of them were cut out, which left the remaining trees spaced 6x7 feet. Since that time a considerable number of trees have been cut out to supply the demands of the farm. The trees that were cut out when eleven years old were used for posts as far as their size would permit. The posts were thoroughly seasoned and the butt ends soaked in a solution of salt brine before they were set. These posts after seventeen years of service are almost as good as when set. The salt solution has probably helped to some extent in preserving them. However, salt is readily soluble in water and soon leaches out of wood that is placed in moist ground.

The trees at present average about 40 feet in height with clean straight boles 6 to 10 inches in diameter breast high. In thinning this plantation the inferior trees have been removed and practically every tree now in the plantation is a No. 1 tree. The estimated annual return of $20.34 per acre, based on the present value of the posts that can be cut, is practically a net return. The posts that have been cut up to the present time have fully paid the cost of establishing and caring for the plantation. At this figure the catalpa is a very profitable crop, but these returns can only be secured by good care and proper management.

**IOWA COUNTY**

This plantation is very irregular in outline and the total area was not determined. The original plantation covered approximately 15 acres, but on account of the unsuccessful growth of the catalpa on the more sandy parts, the ground has been cleared and planted with white pine, which is making an excellent growth. The site of the original catalpa plantation is a hill top with a gentle slope in all directions. The soil at the top of the hill is a light, loose sand that is too light to produce farm crops. Down the hillside the soil improves and at the base of the hill is a rich sandy loam. Two
representative areas in this plantation were selected, No. 1 as near the top of the hill as possible, and No. 2 at the base of the hill. The description of each follows:

Plot No. 1. This plot includes one-fourth of an acre. The soil is light and very sandy. The site begins at the top of the hill and slopes to the north. The trees on this site have made a very poor growth, partly on account of the unfavorable soil and partly on account of the wide spacing, 4 x 8 feet. They are full of large limbs from the ground up and the boles are very short. The trees in this plot will average only two posts, and these will be rough, crooked, and undesirable. No cutting has been done in this plot, and 96 per cent of the trees of the original planting are still on the ground. The estimated annual return of $10.77 per acre is the gross return.

Plot No. 2. This plot includes .95 of 1 acre and is located on a gentle south slope at the foot of the hill. The soil is a rich black sandy loam. The trees are uniform in height, averaging between 45 and 50 feet. The average diameter breast high is 7 inches. They have made an exceptionally fine growth. The poles are straight and clear of limbs to a height of from 30 to 35 feet and they hold their diameter well. Many of the trees in this plot will cut good 30 foot poles with 6 inch tops. The best returns from this plot can be secured by cutting the larger trees into 24 and 30-foot poles and the tops and the smaller trees into posts.

Trees have been cut from this plot from year to year as demands required and an estimate of the present stand would give a wrong idea of the yield of posts and the value of the plantation. The present stand of trees was measured and the number of posts they would cut determined. The average cut was four posts per tree. By going over the ground carefully it was found that 194 trees had been cut from this tract during the winter of 1908-9. These were, no doubt, average trees and would cut four posts per tree. This added to the yield of the present stand gave the results shown in the table. The trees on this plot have made by far the best growth of any plantation seen within the state, but the wide spacing, 6 x 10 feet, reduced the number of trees per acre to such an extent as to cut down materially the producing power of the land. The soil within this plot is entirely strong enough to grow double the number of trees that were planted upon it. This would have increased the returns very materially.

The fungus disease is seriously injuring the trees of this plantation and unless they are cut within the next two or three years the crop will be an entire loss.
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Scott: The hardy Catalpa in Iowa