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NUTS IN RELATION TO AGRICULTURE

THESIS FOR DEGREE OF M. HORT.

CLARENCE ARTHUR REED

1913

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NUTS IN RELATION TO AGRICULTURE.

The cultivation of indigenous plants appeals much less strongly to the average American than does the paying of attention to plants from away or from abroad. By far the greater number of our most familiar species of plants under cultivation in the north temperate zone are of foreign origin. Thus the apple and the ordinary forms of peaches, plums, and pears are all from the old world; the common vegetables such as beans, carrots, celery, peas, lettuce and potatoes are either from across the Atlantic or from Central or South America, and of the common cereals wheat, oats, rye, and barley have been introduced from either Europe or Asia. Among the species of plants used in ornamental work we have a great many introductions, but far less so in proportion to the number of home species in use, than is the case with orchard fruits, vegetables and cereals. Our small fruits, however, show a proportion in favor of native species, for although there have been introductions of the principal genera, so far as the eastern states are concerned, the most common forms of grapes, blackberries, raspberries and dewberries are all of native origin. Varieties of the strawberry, however, are chiefly from South America and most of the varieties of our currants and gooseberries are from European countries.

A subtle but not insignificant reason for this greater interest in foreign than in native plants is that explained by the familiar adages "Familiarity breeds contempt", and "Distance lends enchantment." The fact that a species of plant is already represented in the "back lot" is often accepted by men who are ignorant of the principles of plant breeding as a positive reason why it is not worthy of cultivation. At the same time the keen interest and close attention of this class of men is often attracted by plants with which they are unfamiliar merely because they are of importance somewhere else and are from away.

A more obvious reason for this introduction of fruit bearing plants from other countries, especially from older countries, is because it would be unreasonable to expect that plants bearing fruits at all comparable with those that have been long under cultivation in the old world, could be found growing wild in the native forests of a new country. There is little to encourage the cultivation of wild plants, which, at best, bear fruit of small value when others already improved can be imported and cultivated at no greater expense. Furthermore, it is the natural custom of all people, when settling in a country, to which they are new, to carry with them, in so far as possible, representatives of the fruit producing plants to which they are accustomed.

Brief mention of nut species by writers of old world history indicates that nut trees and shrubs were familiar if not important because of their fruits, at a very early day. Thus Theophrastus, in writing a history of plants about three centuries before the Christian Era, spoke of the almond as being the only tree in Greece that produced blossoms in advance of the leaves, and about the middle of the first century of our era, Columella, a Roman writer, mentioned it as being distinct from the peach, indicating that it was then being grown in Italy. Later history records that it was slowly carried west and northward and that it reached Great Britain as late as 1538 (Hortus Kewensis). According to Pliny, the walnut was introduced into Italy, from Persia, though probably, at a very early date, as it is mentioned as existing in that country by Varro, who was born in 116 B.C. Ovid is said to have written a poem entitled "De Nuxe", in which he pictured the custom of boys, either for pay or for sport, in knocking the nuts from the trees. At marriages, according to the poem, it was customary for the bride and bridegroom to shower nuts among the children as a token of the groom's having cast away his boyish tricks. From brief mentions of the walnut made in later history we are able to trace it, with a fair degree of accuracy, across Europe and its introduction into Great Britain by the Romans, following their invasion into England.

In modern times we find that in many European and Asiatic countries, nuts are staple articles of food. Thus, in France, Italy, Korea, and Japan the chestnut is much in use by all classes of people. In some sections it is the most common article of food and in others, as in Japan, depending chiefly, no doubt, upon the quality of the nuts, they are fed largely to the swine.

Nuts in large quantities have long been imported into this country, and efforts have been made since New England and the Middle Atlantic sections were first settled by the colonists to establish European species of nut trees in this country. Seed of the Persian walnut, the European chestnut, and probably of the filbert, was brought to this country and planted wherever colonies were established. Efforts at introduction were taken up by the United States Government when at about 1853, imported varieties of almonds were distributed by the Patent Office, and tested throughout the greater portion of the entire country. East of the Rocky Mountains the almond proved a failure, but was found to be a partial success in California. Thus encouraged, the people of that state began to experiment, and in about forty years they succeeded in developing it, to a degree of considerable commercial importance, as will appear later in this article.

The walnut has been treated experimentally in much the same way and like the almond, has become of

considerably greater importance to the California section than to other portions of this country. The European filberts have been repeatedly tried throughout the eastern and southern states, but without important degrees of success.

During this period, in which conspicuous interest in foreign nuts has been shown in the northern part of the country, much the same condition has existed in the South with the pecan. Although this species is indigenous to a large area extending from southwestern Texas, north and east across Louisiana, and up the region of the Mississippi River, as far as southern Illinois and Indiana, its native range does not extend along the Gulf, east of the Mississippi River. The species is therefore, not native to any state bordering on the Atlantic Ocean, but by far the greatest amount of attention thus far paid to its development, has been in the states of Mississippi, Georgia, Florida, Alabama and South Carolina.

In the history of our American nut culture, such efforts at the improvement of the species as have been made have been almost without exception, with those from foreign lands, or distant sections of this country.

It is only in extremely few and unusual cases that we find records of long continued and consistent efforts having been made to improve any of the native nuts, such as the American chestnut, the black walnut, the butter-

nut, the hickories or the hazels. Some efforts along this line have been made during the past quarter of a century, especially with the hickories, but the only instance, so far as the writer has been able to discover, in which such attention was paid to the black walnut previous to the Civil War, was that which makes up the history of the variety known as the Gordon. The parent tree of that variety was grown from a nut planted in Bedford County, Virginia, by a Revolutionary soldier, who had lately moved from Loudon County, also of Virginia. The nut is thought to have been of selected stock. Because of the supposed superiority of the nuts from this tree after it came into bearing it was given the varietal name just mentioned. It was called to the attention of the Government in 1893, but has been little propagated or advertised. In this case little has been actually accomplished toward improvement of the species, but scant as were the efforts, they appear to have been more than were ever made in any other instance, toward the betterment of the species for nut producing purposes, prior to the period covered by the past quarter century. At the present time, there are very few recognized varieties of American hickories, walnuts, chestnuts or hazels and none of the butternut. Neither can any important orchards of such trees be found, which have been planted solely for the nuts which they might produce.

This evident lack of interest in nut trees is nothing short of surprising when their cheapness of production and actual food value in comparison with that of other kinds of foods is taken into consideration. In many areas to which certain species of nut trees are indigenous, the only expense attached to them is that involved in the harvesting, as they often bear freely with no attention from man except that of being let alone. In the temperate zone of North America there are no other plant products which in raw condition afford so complete a food as do nuts. According to the following table published by M. E. Jaffa, Professor of Nutrition, University of California, in Farmers' Bulletin No. 332 of the United States Department of Agriculture, ten cents worth of the ordinary uncracked hickory nuts, at nine cents a pound contains nearly three times as much food by weight, as does ten cents worth of porterhouse steak at twenty-five cents a pound; nearly one-half as much as the same amount of milk at four cents a pound; one-third as much as wheat flour at three cents a pound and a trifle more than one-fifth as much, as ten cents worth of potatoes at two cents per pound. At the same prices the proportion of heat units contained in ten cents worth of hickory nuts is about three to one for porterhouse steak, one and two-thirds to one for whole milk; one to four and one-half for wheat flour; and one to one and one-ninth for potatoes. At these prices,

ten cents expended in hickory nuts, will buy slightly more protein, by weight, than an equal sum expended in porterhouse steak, and four times as much fat; slightly less protein and nearly three times as much fat as in milk; about one-sixth as much protein, and over nine times as much fat, as in wheat flour, and about two-thirds as much protein as in potatoes.

(Tables on next page).

PECUNIARY ECONOMY OF NUTS AND NUT PRODUCTS.

Kind of food.	Price per pound.	Cost of one pound protein.	Cost of 1,000 calories energy.	Amount for 10 cents.					Energy.
				Total weight of food material.	Protein.	Fat.	Carbo- by drates.		
	Cents.	Dollars.	Cents.	Pounds.	Pounds.	Pounds.	Pounds.	Calories.	
Nuts and nut products;									
Almonds.....	20	1.76	13.0	0.50	0.06	0.14	0.14	767	
Brazil nuts.....	20	2.26	12.6	.50	.04	.16	.02	789	
Chestnuts.....	8	1.48	8.3	1.25	.07	.06	.44	1,196	
Cecuanuts.....	5	1.16	2.7	2.00	.08	.73	.29	3,662	
Hickory nuts.....	9	1.55	7.1	1.11	.06	.28	.04	1,404	
Peanuts.....	7	.32	3.6	1.43	.31	.45	.20	2,767	
Pecans.....	15	2.47	9.1	.67	.04	.23	.04	1,003	
Pignolias.....	25	.74	8.4	.40	.14	.20	.03	1,182	
Pistachies.....	20	.88	6.1	.50	.11	.27	.08	1,124	
Walnuts.....	20	2.66	16.0	.50	.04	.13	.03	633	
Almond paste.....	40	3.17	21.0	.25	.03	.06	.10	475	
Peanut butter.....	20	.68	7.1	.56	.15	.23	.09	1,412	
Peanut candy.....	25	2.42	11.8	.40	.04	.07	.28	845	
Other foods for compari- son:									
Porterhouse steak....	25	1.31	22.5	.40	.07	.07	444	
Whole milk.....	4	1.21	12.0	2.50	.08	.10	.13	815	
Cheddar cheese.....	16	.58	7.5	.62	.17	.23	.03	1,330	
Wheat flour.....	3	.26	1.8	3.33	.38	.03	2.50	5,495	
Beans dried.....	5	.22	3.1	2.00	.45	.03	1.19	3,210	
Potatoes.....	2	1.11	6.4	5.00	.0974	1,550	

In raw condition, nuts have advantages over fruits, in that, being rich in protein, fat, and carbohydrates, they offer man nearly a complete ration. Moreover, they are easier to store, they keep better, and are much less liable to physical injury while being harvested and stored. When buried under the leaves during winter, it is not uncommon for nuts to remain in good condition until warm weather begins the following spring, and very often when held in common storage they have remained in very fair condition for several years. With apples, it is very seldom that they remain in good condition for any length of time, even though well covered with leaves during mild winter weather. Ordinarily, unless placed in artificial storage, they perish quickly. Likewise, if peaches, pears, plums, or grapes are to be preserved they must be attended to promptly.

In spite of the general lack of interest in nut culture that has prevailed throughout much of the country, during the greater part of our national existence, there have been individuals here and there who have recognized the possibilities in this direction and have long experimented with various varieties and different species. Such men have come into touch with each other until associations of growers have been formed and regular meetings held. Thus, in California there are a great many local, yet affiliated associations of both walnut and almond growers.

In the South there is an organization, dominated by pecan growers, but known as the National Nut Growers Association; and in the North a newly organized society called the Northern Nut Growers Association, holds regular meetings for the purpose of inspiring interest in the culture of both native and foreign species.

On the Pacific Coast, where actual production of cultivated nuts has been an important item for a couple of decades or more, associations called exchanges, have been formed for the purpose of disposing of the crops to the greatest mutual advantage of both grower and consumer.

The efforts of these pioneers of nut culture have resulted in the development of a nut industry that is of considerable importance to their localities. According to the last census, there were produced in the United States, during the year of 1909, 62,328,010 pounds of nuts which were valued at \$4,447,674. This was an increase of 55.7 per cent in quantity, and 128.1 per cent in value over the crop of ten years previous.

During the same period we learn that the total production of orchard fruits increased but slightly in quantity, but became 68.2 per cent greater in value, as in 1899, the total production of orchard fruits was 212,365,600 bushels, and in 1909 it was 216,083,695 bushels, while the value for those years was \$83,750,961, and \$140,867.347 respectively.

In this connection the statistics for small fruit are interesting by way of comparison, for, during the same ten year period, the total production decreased from 463,218,612 quarts to 426,565,863, or 7.9 per cent, but rose in value from \$25,029,757, to \$29,974,481, or, nearly one-fifth. The total combined value of fruits and nuts taken together in 1909 was but 4 per cent of that of all farm crops. The value of nut crops alone amounted to but one-tenth of one per cent of that value, and is therefore, relatively so insignificant, that the comparisons in this paper are mainly between fruits and nuts.

The Census Office is authority for the statement that the combined value of Persian walnuts, pecans and almonds was about nine-tenths of the total for all nuts, and that the production of walnuts and almonds is mainly confined to California, while three-fifths of the pecan crop is from the State of Texas. Further figures, showing the comparisons between nuts and other staple products of those states are interesting. Thus, in California, the almond crop amounted to 6,992,610 pounds in 1899, but fell to 6,692,513 pounds in 1909 (probably because of an unfavorable season during the latter year). The walnut crop more than doubled during that period, as it rose from 10,619,975 pounds to 21,432,266. The crop of orchard fruits, for the state, increased in quantity from 22,690,696, to 31,501,507 bushels, and in value from \$14,526,786 to \$18,358,897. Small fruits in California

were produced to the extent of 14,581,951 quarts, valued at \$911,411 in 1899, and 26,824,120 quarts valued at \$1,789,214, in 1909. The value of the almond crop of 1909, in California was more nearly equal to that of the cherry crop than to any other orchard product, as its value was \$700,304 and that of the cherry amounted to \$951,624. The value of the walnut crop was about midway between those of peaches and nectarines combined, and pears. The peaches and nectarines were valued at about four and one-half million dollars, walnuts at about three million, and pears at one and one-half million dollars. In Texas, the pecan crop of 1899 amounted to 1,810,670 pounds, but increased to 5,832,367 pounds in 1909. The value of the crop for the latter year is given as being \$556,203. The value for the former year is not given but at the prices then existing, it is safe to estimate it as having been considerably below one hundred thousand dollars. In comparison with other fruits of Texas, the value of the pecan crop in 1909, was one-fourth greater than that of small fruits, somewhat less than one-half that of orchard fruits, about three quarters that of the value of peaches and nectarines, about four times as much as that of pears, and nearly eight times as much as that of plums and prunes together.

The showing made by the census figures is not correct in every respect, and in others, while the figures are correct, the deductions made are apt to be misleading.

In the case of the Persian walnut, it has been found that many growers have been mistaken in the identity of the species and have reported the Japanese walnuts as being Persian walnuts. This is especially true throughout the South Atlantic States, where it is well known that no Persian walnuts are grown. Yet, the census figures report over 66,000 pounds for the year of 1909, from the State of Mississippi alone. Again, as in the case of the pecan, the figures show only the size of the crop actually harvested, while as a matter of fact a great many nuts have been left on the ground ungathered, year after year. When the census of 1900 was taken the price of pecans was so low that only a small proportion of the entire crop was harvested. In 1912, the crop of Texas was very light, being only about 250 carloads as compared with 750 or 800 in a maximum year. As a result, the demand became active, early in the season, and prices reached a figure entirely unknown before. These prices induced the farmers of other pecan states to harvest the crop which in other years had been neglected, or fed to the hogs, and consequently, large quantities from sections hitherto unrecognized as pecan producers were placed upon the market. The retail prices were soon affected, and before the first of January, were down to the level of other years.

Although prices of wild pecans were unusually high during the past season, they have been yearly on

the increase since about 1902 or 1903, and while the high figure of 1912, will probably not be repeated to the producers in the near future, it is quite likely that they will remain at a level which will attract large quantities of nuts from entirely new fields. Moreover, the value of pecan forests as nut producers, is now being recognized to such an extent, that they are being improved by cultivation, and the production from this source is fairly certain to increase greatly in the next ten or twenty years. Again, census figures are only taken once in a decade: They do not show the rise or fall which may occur at any time during the intervening period. Thus, the great interest in pecan orcharding now existing, has largely come about since 1900. But few orchards planted during the period since then, have yet come into bearing, and the production of pecans from cultivated orchards is still a negligible factor, but an indication of what the production of such orchards may become, lies in the census report showing 325,779 pecan trees, not of bearing age, in the year of 1910. It is probably safe to say that at the present time, at least a hundred thousand pecan trees, or one-third more than the total number of bearing trees in the state, in 1910, are annually being planted in Georgia alone. Interest in pecan planting in much the same way, though to a less extent, is now being shown in such other states as Mississippi, Florida,

Alabama and the Carolinas. The actual results, therefore, of the interest in pecan growing that has recently come about, will not be fully shown in these reports until the figures of the census for 1920 become available, which will not be before 1921, or 1922.

The interest in nut growing and the uses to which nuts and their products may be put is yearly becoming greater; this fact is perhaps nowhere better realized than in the offices of the Bureau of Plant Industry, of the Federal Department of Agriculture, at Washington, D.C. For many years back this Bureau has been drawn upon for information and advice by first, a dozen, then scores, and now by hundreds of persons, who desire to grow nuts of whatever species or varieties may be best adapted to their localities. This Bureau keeps up a steady correspondence of such character, and gives a great many personal interviews, with individuals who call at the Department offices; also, public addresses are delivered, and publications on subjects relating to nut culture are issued from time to time. In order to obtain the sort of information called for, representatives of the Department make frequent tours of inspection to the nut producing sections where conditions are studied

and recorded. Field experiments are conducted in these districts and specimens of all types are collected. In an herbarium of nuts, maintained and added to each year, by the Department, are perhaps a thousand specimen lots of nuts representing a great many species and varieties.

The general interest in nut matters which has caused the Government to study the problems of nut culture, thus seriously, cannot be described in terms of figures. The growing importance of the principal nuts produced, to several of the other leading horticultural products of the country has already been shown. However, the figures of production only give a part of the tangible evidence showing general interest in units. They only show the interest among growers. What is far more important is the interest among consumers. The following figures taken from the reports of Commerce and Labor, show by comparison the value of fruits and nuts consumed in the United States, during practically the same periods. (The figures of production are for the calendar years of 1899 and 1909, while those of imports and exports are for the fiscal years ending June 30, 1900 and 1910).

PRODUCTION.

Value of nut crop , 1899.....\$ 1,949,931.00
 " " fruit " " 83,750,961.00
 Relative value,nut to fruit crop....2.33 per cent.

Value of nut crop, 1909.....\$ 4,447,674.00
 " " fruit " "\$140,867,374.00
 Relative value,nut to fruit crop..3.16 per cent.

IMPORTATION. (for consumption) Fiscal Years Ending June 30th.

Value of nuts imported,1900.....\$ 3,484,698.85
 " " fruits " " 15,562,448.44
 Relative value,nut to fruit importation...22.4 per cent.

Value of nuts imported,1910.....\$ 12,775,195.65
 " " fruits " 1910..... 24,081,042.82
 Relative value,nut to fruit importation....51.5 per cent.

EXPORTS. (Domestic) Fiscal Years Ending June 30th.

Value of nuts exported,1900.....\$ 156,490.00
 " " fruits " " 11,486,162.00
 Relative value,nut to fruit exportation.....1.36 per cent.

Value of nuts exported,1910.....\$ 156,284.00
 " " fruits " " 15,848,572.00
 Relative value,nut to fruit exportation..... .98 per cent.

Increase in value of nut crop, 1899 to 1909.....128.4 per cent
 " " " " fruit " " " " 68.2 " "
 " " " " Nuts imported,1900 to 1910....266.8 " "
 " " " " fruits " " " " 61.2 " "
 " " " " nuts exported,1900 to 1910.... decrease.
 " " " " fruits " " " " 20.5 per cent
 " " pounds " nuts produced,1899 " 1909..... 55.1 " "
 " " bushels of fruit " " " " slight.

The relative value of nuts to fruits produced,
 rose from 1 to 43, in 1899, to 1 to 31, in 1909. During

the same time, the importation for consumption increased in ratio from 1 to 4.5 in 1900, ~~and~~ to 1 to 1.8 in 1910, while the value of the exports shows a slight decrease.

This increased consumption is due to several causes, but probably more especially to the invention of cracking machines, which render the edible portions of the nuts capable of being easily extracted from the shell in unbroken half or whole kernels. As a result of invention, the kernels of machine cracked pecans, Persian walnuts, filberts and brazil nuts are now upon the market throughout the entire year. Almond, hickory^{-nut}, black walnut, and butternut kernels, are likewise upon the market, but these nuts are all cracked with hammers and not by specially designed machines.

A second, but perhaps equally significant cause for this increased consumption of nuts, lies in their being more intelligently used. A decade ago, nuts were largely used for dessert purposes, and being highly concentrated, they caused considerable distress to subjects who had already partaken of a hearty meal. At present, chopped nut meats are coming more and more into use as regular ingredients of breads, cakes, puddings and ice creams. In certain foreign countries, chiefly those in southern Europe and southwestern Asia, from which a large portion of our imported nuts are obtained, nut flours form an important part in the diet of inhabitants, in that

they are used in the making of breads, soups, pastries, &c.

Aside from the recognized value of nuts for food, much has been said by theorists and others, but with perhaps less truth than they intend or could support, regarding the advantages of nuts over other kinds of foods especially meats. It is argued that meat savors of savagery, and that those who eat it are more brutal and quick tempered in their dispositions than are those who avoid it, but unfortunately for that argument, the people of the earth have always subsisted largely upon meats and civilization has gone on at the same time. A strong argument in favor of the use of nuts in preference to meat is, that when properly handled, they are less liable to contain disease germs, which are communicable to the human system. In spite of the federal meat inspection laws and the precaution taken by the retailer and housewife, there is always a possibility that the beefsteak, the fried chicken, or the roast lamb may be from a tubercular animal; that during its preparation it may be infected with typhoid germs by the common house fly; or, that it may have been otherwise contaminated. However, unless properly handled, nuts are by no means free from the possibility of conveying germs, as it occurs with far too great frequency, that after being cracked in large houses, they are "farmed out" in boxes and barrels,

to laboring people who take them to their homes, where they separate the kernels from the shells and return the "halves" and "pieces" to the cracking house. These homes may be sanitary, as laboring people are not necessarily unclean in their manner of living, but there are grave possibilities of unsanitation, and until special health laws governing such practices are passed, the buyer of nut kernels should insist upon being given proof that they have been handled only under healthful conditions. Otherwise, before using, he should thoroughly wash the kernels in hot water, in order, as far as possible, to eliminate the danger of contracting tuberculosis, diptheria, typhoid fever, or any kind of infectious disease, the germs of which may have lurked in the quarters where the kernels were separated from the broken shells. Incidentally, the hot water will be useful in any case as it will materially freshen such nuts, as may be slightly rancid or stale.

With nine-tenths of the nuts grown in the United States, coming largely from the seaboard states which border on the Atlantic Ocean, south of the 37th degree of latitude, the question naturally arises, as to what importance nut culture is destined to become in the other thirty-seven states.

Apparently nut culture will not soon become of importance in such northern states as Maine, Vermont,

Minnesota, North and South Dakota, Montana, or Idaho, nor such western states as Wyoming, Colorado, Utah, Nevada or New Mexico, as the product from those states is so small as not to be separately listed in the census report. Altogether, the value of the product from those states amounted to but \$22,373 in 1909. Of the remaining states, Pennsylvania was first in importance as it yielded \$90,447 worth of nuts, which was over \$16,000 greater than the crop from its nearest competitor, New York State.

Michigan stood eighth in the importance of its nut crop. An analysis of the status of nut culture in that state will therefore be fairly applicable to the entire group of interior and northern states. There are no nut orchards in this state; the product is wholly from native trees, comparatively few of which receive any attention other than that of being let alone. The crop of 1909 was shown by the census report for that year to have been \$18.956, which was an increase of 154.9 per cent in ten years. The total production in terms of pounds was given at 961,137, an increase of 102 per cent. In comparison with other products of the state during the same year, we find the value of the nut crop to have been about three-hundredth that of apples; one ninetieth that of peaches; one eightieth that of grapes; ~~one~~ one thirtieth that of pears; less than one tenth that of plums; but \$2,000

greater than the value of the quince crop. In comparison with the nut crop, the wheat of Michigan was worth about nine hundred times as much; corn nearly two thousand; oats about one thousand; and potatoes more than five hundred times as much. The buckwheat raised during the year was worth about three times as much as that of the nut crop. Thus, it is apparent that the nut industry of Michigan is now an entirely negligible factor. That the nut species have received practically no attention from the horticulturists of the state is evident from the published reports of the State Horticultural Society. A review of the transactions of that organization, to as far back as 1876, reveals the fact, that since that time, but one paper, devoted entirely to nut culture, has ever been read before that body. This was prepared in 1894 by Mr. Wm. A. Taylor two or three years after he had moved from the State. Once before, Mr. Charles Garfield, when Secretary of the Society, feeling that some instructions regarding nut culture should be contained in the yearly report, wrote to a former classmate, whom he remembered as having planted a group of nut trees in his boyhood days, asking for an article which he might publish, and, as a result, the report for 1883, contained a paper by Prof. James Satterlee, then of the agricultural college, on "Growing Nut Bearing Trees."

Since the paper by Mr. Taylor was read, the only reference of nut problems in the state appear to have been in connection with reports of variety and species tests at the South Haven Sub-Station.

It is quite probable that a review of any of the other states of this latter group, would reveal quite as little interest among farmers and horticulturists in general, but here and there local interest is being aroused and active steps are being taken to preserve and encourage the best individual trees, for the value of their nuts, and sometimes, as parent stock from which to obtain scions for propagation. In this way one of the best varieties of black walnut, yet found, has been located near Lamont, Ottawa County, Michigan; and several valuable hickories have been found about the country and are now being propagated. For a number of years the pecan forests of southern Indiana have been searched for the best individual trees, and already, several nurseries are propagating budded and grafted trees of selected varieties, which are hardy in that section. Present indications are that pecan orcharding will eventually become one of the recognized industries in that part of the state. If this should be the case, the industry will probably spread to other states in which suitable soils and climatic conditions exist.

The native species of nut trees, which at present, promise the most in the area now under discussion, are the shagbark hickory, (*Hicoria ovata*); the black walnut, (*Juglans nigra*); the pignut, (*H. glabra*); the chestnut, (*Castanea Americana*); the shellbark hickory, (*H. laciniosa*); the butternut, (*J. cinerea*); and the hazels, (*Corylus Americana* and *C. rostrata*); probably in much the order named. The foreign species which now appear likely to become of importance in this area are, the Persian walnut, (*J. regia*); the Japanese chestnut, (*C. Japonica*); and the Japanese walnuts, (*J. cordiformis*), (*J. sieboldiana*) and (*J. mandshurica*.)

Nut bearing trees offer certain inducements to culture, which, when fully considered by land owners, will doubtless have much to do with increased planting. Among such are the facts that the roots of the trees alone, are of great value in the prevention of erosion, and if the tops are not of importance because of their nuts, the bodies of well formed trees will be valuable for timber purposes. If planted about the home grounds, nut trees may be used very effectively as ornamentals, and when by the roadside, are very serviceable for shade. If set in orchard form, other crops may be grown between the trees until the productive period begins.

When once of bearing age, the roots of the trees will absorb a large portion of their necessary food and moisture supply from a depth beyond the reach of surface crops. Again, nut crops are easy to harvest, and not difficult to store, and may be kept in good condition for periods of many months, in ordinary cool temperatures. Furthermore, the value of all nut products is steadily increasing and the demand becoming more active each year.

When the pleasure and profit of growing nuts; the value of nuts as food, and the great number of species known to be adapted to at least certain sections of the entire United States, are fully realized by the American people, it is safe to predict, that nut culture will then become one of the most general and important industries.

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