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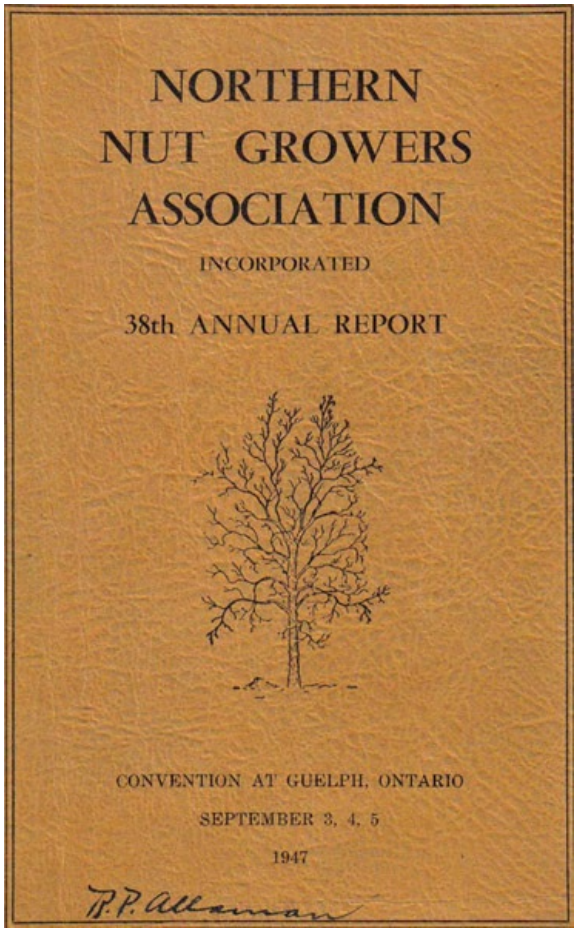

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NUT GROWERS ASSOCIATION

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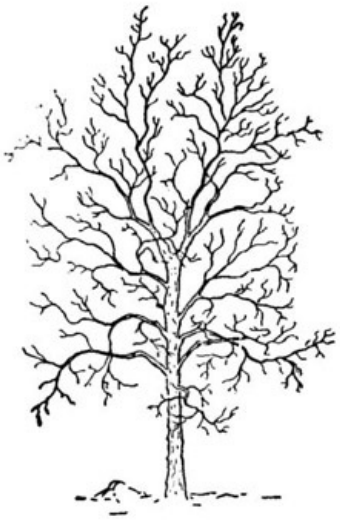
AFFILIATED WITH THE AMERICAN HORTICULTURAL SOCIETY

38th Annual Report



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Knorr, Mrs. Arthur, 15 Central Park, West, Apt. 1406, New York

Kraai, Dr. John, Fairport
Larkin, Harry H., 189 Van Rensselaer St., Buffalo 10
*Lewis, Clarence, 1000 Park Ave., New York
Little, George, Ripley
Lowerre, James D., 1121 Bedford Ave., Brooklyn 16
*MacDaniels, Dr. L. H., Cornell University, Ithaca [Pg 14]
Maloney Brothers Nursery Co., Inc., Dansville
Miller, J. E., Canandaigua
Mitchell, Rudolph, 125 Riverside Drive, New York 24
*Montgomery, Robert H., 1 E. 44th St., New York
Mossman, Dr. James K., Black Oaks, Ramapo
Muenscher, Prof. W. C., 1001 Highland Road, Ithaca
Newell, P. F., Lake Road, Rt. 1, Westfield
Oeder, Dr. Lambert R., 551 Fifth Ave., New York
Overton, Willis W., 3 Lathrop St., Carthage
Page, Charles E., Rt. 2, Oneida
Rauch, Basil, Barnard College Columbia U., New York 27
Rebillard, Frederick, 164 Lark St., Albany 5
Rightmyer, Harold, Rt. 4, Ithaca
Salzer, George, 169 Garford Rd., Rochester
Sameth, Sigmund, 38 E 65th St., New York 21
Schlegel, Charles B., 990 South Ave., Rochester
Schlick, Frank, Munnsville
Schmidt, Carl W., 180 Linwood Ave., Buffalo
Shank, W., 141 Parkway Road, Room 9, Bronxville
Shannon, J. W., Box 90, Ithaca
Sheffield, Lewis J., c/o Mrs. Edna C. Jones, Townline Rd., Orangeburg
Slate, Prof. George L., Experiment Station, Geneva
Smith, Gilbert L., State School, Wassaic
Smith, Jay L., Chester
Steiger, Harwood, Red Hook
Stern-Montagny, Hubert, Erbonia Farm, Gardiner
Szego, Alfred, 77-15 A 37th Ave., Jackson Heights, New York
Timmerman, Karl G., 123 Chapel St., Fayetteville
Todd, E. Murray, 55 Liberty St., New York
Waite, Dr. R. H., Willowwaite Moor, Perrysburg
Wichlac, Thaddeus, 3236 Genesee St., Cheektowaga (Buffalo) 21
Windisch, Richard P., c/o W. E. Burnet & Co., 11 Wall St., New York
*Wissman, Mrs. F. De R., G. W. 54th St., New York

NORTH CAROLINA

Brooks, J. R., Box 116, Enka
Dunstan, Dr. R. T., Greensboro College, Greensboro
Finch, Jack R., Bailey
Parks, C. H., Rt. 2, Asheville
Rice, Clyde H., Rt. 2, Box 158, Mars Hill, N. C.

OHIO

Barden, C. A., 215 Morgan St., Oberlin
Bitler, W. A., 322 McPheron Ave., Lima
Bungart, A. A., Avon
Bush, David G., Rt. 3, Warren
Chapman, Floyd B., 1944 Denune Ave., Columbus 3
Cinadr, Mrs. Katherine, 13514 Coath Ave., Cleveland 20
Clark, R. L., 1184 Melbourne Rd., East Cleveland 12 [Pg 15]
Cook, H. C., Rt. 1, Box 125, Leetonia
Cranz, Eugene F., Mount Tom Farm, Ira
Davidson, John, 234 E. 2nd St., Xenia
Davidson, Mrs. John, 234 E. 2nd St., Xenia
De Leon, Donald, Box 244, Sta. G., Columbus 7
Diller, Dr. Oliver D., Dept. of Forestry, Experiment Sta., Wooster
Dubois, Miss Frances M., 4623 Glenshade Ave., Cincinnati 27
Elliott, Donald W., Rogers
Emch, F. E., Genoa
Evans, Maurice G., 335 S. Main St., Akron 8
Fickes, Mrs. W. R., Rt. 1, Wooster
Foraker, Maj. C. Merle, 152 Elmwood Ave., Barberton
Foss, H. D., 875 Hamlin St., Akron 2
Franks, M. L., Rt. 1, Montpelier
Frederick, Geo. F., 3925 W. 17th, Cleveland 9
Garden Center of Greater Cleveland, 11190 East Blvd., Cleveland

Gauly, Dr. Edward, 1110 Euclid Ave., Cleveland
Gerber, E. P., Kidron
Gerstenmaier, John A., 13 Pond S. W., Massilon
Goss, C. E., 922 Dover Ave., Akron 2
Gray, G. A., 3317 Jefferson Ave., Cincinnati 20
Grad, Dr. Edw. A., 1506 Chase St., Cincinnati 23
Haydeck, Carl, 3213 West 73rd St., Cleveland 2
Hill, Dr. Albert A., 4187 Pearl Rd., Cleveland
Hoch, Gordon F., 6292 Glade Ave., Cincinnati 30
Hunt, Kenneth W., Yellow Springs
Irish, Charles F., 418 E. 105th St., Cleveland
Jacobs, Homer L., Davey Tree Expert Co., Kent
Jacobs, Mason, 3003 Jacobs Rd., Youngstown
Kappel, Owen, Bolivar
Kintzel, Frank M., 2506 Briarcliffe Ave., Cincinnati 13
Kirby, R. L., Rt. 2, Blanchester
Kratzer, George, Rt. 1, Dalton
Krok, Walter P., 925 W. 29th St., Lorain
Laditka, Nicholas G., 5322 Stickney Ave., Cleveland 9
Lashley, Charles V., 216 S. Main, Wellington
Lehmann, Carl, Union Trust Bldg., Cincinnati
Lorenz, R. C., 121 N. Arch St., Fremont
Madson, Arthur E., 13608 5th Ave., E. Cleveland 12
McBride, William B., 2398 Brandon Rd., Columbus 8
Metzger, A. J., 724 Euclid Ave., Toledo 5
Neff, William, Martel
Nicolay, Chas., 2259 Hess Ave., Cincinnati 11
Oches, Norman M., Rt. 2, Brunswick
Osborn, Frank C, 4040 W. 160th St., Cleveland
Pomerene, W. H., Coshocton
Poston, E. M., Jr., 2640 E. Main, Columbus
Ranke, William, Rt. 1, Amelia
Rowe, Stanley M., Rt. 1, Box 73, Cincinnati 27
Rummel, E. T., 16613 Laverne Ave., Cleveland 11
Scarff's Sons, W. N., New Carlisle
Schaufelberger, Hugo, Rt. 2, Sandusky [Pg 16]
Seas, D. Edw., 721 South Main St., Orrville
Shelton, Dr. E. M., 1468 W. Clifton Blvd., Lakewood 7
Sherman, L. Walter, Mahoning Co., Exp. Farm, Canfield
Shessler, Sylvester M., Genoa
Silvis, Raymond E., 1725 Lindbergh Ave., N. E., Massillon
Smith, L. A., Rt. 1, Uniontown
Smith, Sterling A., 630 W. South St., Vermilion
Spring Hill Nurseries Co., Tipp City
Strauss, Jos., 3640 Epworth Ave., Cincinnati 11
Stocker, C. P., Lorain Products Corp., 1122 F. St., Lorain
Sylvarium Gardens, L. E. Crawford, 5499 Columbia Rd., North Olmsted
Thomas, W. F., 406 S. Main St., Findlay
Toops, Herbert A., 1430 Cambridge Blvd., Columbus
Urban, George, 4518 Ardendale Rd., South Euclid 21
Van Voorhis, J. F., 215 Hudson Ave., Apt. B-1, Newark
Walker, Carl F., 2851 E. Overlook Rd., Cleveland
Weaver, Arthur W., 318 Oliver St., Toledo 4
*Weber, Harry R., Esq., 123 E. 6th St., Cincinnati
Weber, Mrs. Martha R., Rt. 1, Morgan Rd., Cleves
Whitney, Charles E., West Mansfield
Willett, Dr. G. P., Elmore
William, Harry M., 221 Grandon Rd., Dayton 9, Ohio
Wischhusen, J. F., 15031 Shore Acres Dr., N. E., Cleveland 10
Yoder, Emmet, Smithville

OKLAHOMA

Butler, Roy, Rt. 2, Hydro
Cross, Prof. Frank B., Dept, of Hort., Stillwater
Hirschi's Nursery, 414 N. Robinson, Oklahoma City
Hubbard, Orie B., Kingston
Hughes, C. V., Rt. 3, Box 564, Oklahoma City 8
Jarrett, C. F., 2208 W. 40th, Tulsa
Meek, E. B., Rt. 2, Wynnewood
Pulliam, Gordon, 407 Osage Ave., Bartlesville
Ruhlen, Dr. Chas. A., 114 W. Steele, Cushing
Swan, Oscar E., Jr., 1226 E. 30th St., Tulsa 5

OREGON

Borland, Robert E., 219 Mill St., Silverton
Butler, Joe C., Sherwood
Carlton Nursery Co., Forest Grove
Dohanian, S. M., P. O. Box 246, Eugene
Miller, John E., Rt. 1, Box 312-A, Oswego
Pearcy, Harry L., H. L. Pearcy Nursery Co., Rt. 2, Box 190, Salem
Schuster, C. E., Horticulturist, Corvallis
Sheppard, Chas. M., Tucker Road, Hood River

PENNSYLVANIA

Allaman, R. P., Rt. 1, Harrisburg [Pg 17]
Anundson, Lester, 2630 Chestnut St., Erie
Banks, H. C., Rt. 1, Hellertown
Beard, H. K., Rt. 1, Sheridan
Berst, Chas. B., 655 Brown Ave., Erie
Bowen, John C., Rt. 1, Macungie
Breneiser, Amos P., 427 N. 5th St., Reading
Buckman, C. M., Schwenkville
Catterall, Karl P., 734 Frank St., Pittsburgh 10
Clarke, Wm. S., Jr., Box 167, State College
Colwell, F. A., R.F.D., Collegeville
Creasy, Luther P., Catawissa
Damask, Henry, 1632 Doyle St., Wilkinsburg
Dewey, Richard, Box 41, Peckville
Dible, Samuel E., Rt. 3, Shelocta
Eckhart, Pierce, 573 Haddington St., Philadelphia 31
Etter, Fayette, P. O. Box 57, Lemasters
Gardner, Ralph D., Box 425, Colonial Park
Gibson, Ralph, 331 Center St., Williamsport
Good, Orren S., 316 N. Fairview St., Lock Haven
Gorton, F. B., Rt. 1, East Lake Road, Harbor Creek, Erie Co.
Heasley, George S., Rt. 3, Beaver Falls
Heckler, George Snyder, Hatfield
Hershey, John W., Nut Tree Nurseries, Downingtown
Hostetter, C. F., Bird-In-Hand
Hostetter, L. K., Rt. 5, Lancaster
Hughes, Douglas, 1230 East 21st St., Erie
Johnson, Robert F., Rt. 5, Box 56, Crafton
Jones, Mildred M., 301 N. West End Ave., Lancaster
Jones, Dr. Truman W., Coatesville
Kaufman, M. M., Clarion
Kirk, DeNard B., Forest Grove
Knouse, Chas. W., Colonial Park
Laboski, George T., Rt. 1, Harbor Creek
Leach, Hon. Will, Court House, Scranton
Long, Carleton C., 138 College Ave., Beaver
Mattoon, H. Gleason, Narbeth
McCartney, J. Lupton, Rm. 1, Horticultural Bldg., State College
Mercer, Robert A., Rt. 1, Perkesmenville, New Hanover
Miller, Elwood B., c/o The Hazleton Bleaching & Dyeing Works, Hazleton
Miller, Elwood B., c/o The Hazleton Bleaching & Dyeing Works,
Moyer, Philip S., U. S. F. & G. Bldg., Harrisburg
Niederriter, Leonard, 1726 State St., Erie
Parloff, Robert, 2018 N. Broad St., Philadelphia, Pa.
Ranson, Flavel, 728 Monroe Ave., Scranton 10
Reece, W. S., Clearfield
Reidler, Paul G., Ashland
Rial, John, 528 Harrison Ave., Greensburg
*Rick, John, 438 Pennsylvania Sq., Reading
Rupp, Edward E., Jr., 57 W. Pomfret St., Carlisle [Pg 18]
Schaible, Percy, Upper Black Eddy
Smith, Dr. J. Russell, 550 Elm Ave., Swarthmore
Stewart, E. L., Pine Hill Farms Nursery, Rt. 2, Homer City
Stewart, John H., Yule Tree Farm, Akeley
Stinson, George, Box 77, Bedminster
Theiss, Dr. Lewis E., Bucknell University, Lewisburg
Twist, Frank S., Northumberland
Washick, Dr. Frank A., S. W. Welsh & Veree Rds., Philadelphia 11
Weinrich, Whitney, 134 S. Lansdowne Ave., Lansdowne
*Wister, John C., Scott Foundation, Swarthmore College, Swarthmore

Wood, Wayne, Rt. 1, Newville
Wright, Ross Pier, 235 West 6th St., Erie
Zimmerman, Mrs. G. A., Piketown, R. D., Linglestown

RHODE ISLAND

*Allen, Philip, 178 Dorance St., Providence
R. I. State College, Library Dept., Green Hall, Kingston

SOUTH CAROLINA

Bregger, John T., Clemson
Gordon, G. Henry, Union, Union Co.
Poole, M. C., Cross Anchor

SOUTH DAKOTA

Bradley, Homer L., Sand Lake Refuge, Columbia

TENNESSEE

Chase, S. B., Norris
Garrett, Dr. Sam Young, Dixon Springs
Holdeman, J. E., 208 Shrine Bldg., Memphis 3
Howell Nurseries, Sweetwater
Lowe, Dr. Jere., Thayer Vet. Hospital, Nashville 5
McDaniel, J. C., Tenn. Dept. of Agriculture, 403 State Office Bldg., Nashville 3
Rhodes, G. B., Rt. 2, Covington
Richards, Dr. A., Whiteville
Shadow, Willis A., County Agt., Decatur
Roark, W. F., Malesus
Zarger, Thomas G., Norris

TEXAS

Arford, Charles A., Box 1230, Dalhart
Bailey, L. B., Box 1436, Phillips
Buser, C. J., Rt. 1, Arp
Florida, Kaufman, Box 154, Rotan
Gray, O. S., P. O. Box 513, Arlington
Kidd, Clark, Arp Nursery Co., Tyler
Price, W. S., Jr., Gustine
Winkler, Andrew, Moody

UTAH

Jeppeson, Chris, Wildwood Hollow Farm Nursery, Provo City
Oleson, Granville, 1210 Laird Ave., Salt Lake City 5
Peterson, Harlan D., 2164 Jefferson Ave., Ogden

VERMONT

Aldrich, A. W., Rt. 3, Springfield
Collins, Jos. N., Rt. 3, Pultney
Ellis, Zenas H., Fair Haven, Perpetual Membership "In Memoriam"
Farrington, Robert A., Vermont Forest Service, Montpelier
Foster, Forest K., West Topsham
Ladd, Paul, Hilltop Farm, Jamaica

VIRGINIA

Acker, E. D., Co., Broadway
Burton, George L., 728 College St., Bedford
Case, Lynn B., Rt. 1, Fredericksburg
Dickerson, T. C., 316-56th St., Newport News
Gibbs, H. R., McLean
Gunther, Eric F., Rt. 1, Box 31, Onancock
Nelson, C. L., 964 Avenel Ave., Lee Hy. Ct., Roanoke

Nix, Robert W., Jr., Lucketts
Pertzoff, Dr. V. A., Carter's Bridge
Pinner, H. McR., P. O. Box 155, Suffolk
Stoke, H. F., 1420 Watts Ave., N. W., Roanoke
Stoke, Mrs. H. F., 1420 Watts Ave., N. W., Roanoke
Stoke, Dr. John H., 408-10 Boxley Bldg., Roanoke
Thompson, B. H., Harrisonburg
Variety Products Co., 5 Middlebrook Ave., Staunton
Webb, John, Hillsville
Zimmerman, Ruth, Bridgewater

WEST VIRGINIA

Cannaday, Dr. John E., Charleston General Hospital, Charleston 25
Cross, Andrew, Ripley
Frye, Wilbert M., Pleasant Dale
Glenmount Nurseries, Arthur M. Reed, Moundsville
Gold Chestnut Nursery, Arthur A. Gold, Cowen
Hoover, Wendell W., Webster Springs
White, Roscoe R., 635 Mulberry Ave., Clarksburg
White, Wayne G., 833 Glendale Ave., So. Charleston 3

WASHINGTON

Altman, Mrs. H. E., 2338 King St., Bellingham 9
Barth, J. H., Box 1827, Rt. 3, Spokane 16
Bartleson, C. J., Box 25, Chattaroy
Biddle, Miss Gertrude W., W. 923 Gordon Ave., Spokane 12
Brown, H. B., Greenacres
Bush, Carroll D., Grapeview [Pg 20]
Clark, R. W., 4221 Phinney Ave., Seattle
Denman, George L., 1319 East Nina Ave., Spokane 10
Garvin, Mrs. Mildred S., W. 3408 2nd Ave., Spokane 9
Harrison, Geo. C., Greenacres
Hyatt, L. W., 2826 West La Crosse, Spokane 12
Jessup, J. M., Cook
Kling, William L., Rt. 2, Box 230, Clarkston
Latterell, Ethel, Greenacres
Linkletter, F. D., 8034-35th Ave., N. E., Seattle 5
Lynn Tuttle Nursery, The Heights, Clarkston
Naderman, G. W., Rt. 1, Box 381, Olympia
Rodgers, W. R., N. 1411 Mamer, Opportunity
Shane Bros., Vashon
Watt, Mrs. L. J., W. 203 16th Ave., Spokane 9

WISCONSIN

Bassett, W. S., 1522 Main St., La Crosse
Brust, John J., 135 W. Wells St., Milwaukee 3
Dopkins, Marvin, Rt. 1, River Falls
Heberlein, Edw. W., Box 747, Milwaukee
Johnson, Albert G., Rt. 2, Box 457, Waukesha
Koelsch, Norman, Jackson
Ladwig, C. F., 2221 St. Lawrence, Beloit
Mortensen, M. C., 2117 Stanson Ave., Racine
Reische, Frank C., Rt. 1, Plymouth
Zinn, Walter G., P. O. Box 747, Milwaukee

WYOMING

Greene, W. D., Box 348, Greybull

* Life Member ** Honorary member [Pg 21]

CONSTITUTION

ARTICLE I—NAME

This Society shall be known as the **Northern Nut Growers Association, Incorporated**.

Article II—OBJECT

Its object shall be the promotion of interest in nut-bearing plants, their products and their culture.

Article III—MEMBERSHIP

Membership in this society shall be open to all persons who desire to further nut culture, without reference to place of residence or nationality, subject to the rules and regulations of the committee on membership.

Article IV—OFFICERS

There shall be a president, a vice-president, a secretary and a treasurer, who shall be elected by ballot at the annual meeting; and a board of directors consisting of six persons, of which the president, the two last retiring presidents, the vice-president, the secretary and the treasurer shall be members. There shall be a state vice-president from each state, dependency, or country represented in the membership of the association, who shall be appointed by the president.

Article V—ELECTION OF OFFICERS

A committee of five members shall be elected at the annual meeting for the purpose of nominating officers for the following year.

Article VI—MEETINGS

The place and time of the annual meeting shall be selected by the membership in session or, in the event of no selection being made at this time, the board of directors shall choose the place and time for the holding of the annual convention. Such other meetings as may seem desirable may be called by the president and board of directors.

Article VII—QUORUM

Ten members of the Association shall constitute a quorum but must include two of the four officers.

Article VIII—AMENDMENTS

This constitution may be amended by a two-thirds vote of the members present at any annual meeting, notice of such amendment having been read at the previous annual meeting, or copy of the proposed amendment having been mailed by any member to each member thirty days before the date of the annual meeting. [Pg 22]

BY-LAWS

Article I—COMMITTEES

The Association shall appoint standing committees as follows: On membership, on finance, on programme, on press and publication, on exhibits, on varieties and contests, on survey, and an auditing committee. The committee on membership may make recommendations to the Association as to the discipline or expulsion of any member.

Article II—FEES

Annual members shall pay two dollars annually. Contributing members shall pay ten dollars annually. Life members shall make one payment of fifty dollars and shall be exempt from further dues and shall be entitled to the same benefits as annual members. Honorary members shall be exempt from dues. "Perpetual" membership is eligible to any one who leaves at least five hundred dollars to the Association and such membership on payment of said sum to the Association shall entitle the name of the deceased to be forever enrolled in the list of members as "Perpetual" with the words "In Memoriam" added thereto. Funds received therefor shall be invested by the Treasurer in interest bearing securities legal for trust funds in the District of Columbia. Only the interest shall be expended by the Association. When such funds are in the Treasury the Treasurer shall be bonded. Provided: that in the event the Association becomes defunct

or dissolves then, in that event, the Treasurer shall turn over any funds held in his hands for this purpose for such uses, individuals or companies that the donor may designate at the time he makes the bequest or the donation.

Article III—MEMBERSHIP

All annual memberships shall begin September 1st. Annual dues received from new members shall entitle the new member to full membership until the next August 31st, including a copy of the Annual Report published for the fiscal year in which he joins the Association.

Article IV—AMENDMENTS

By-Laws may be amended by a two-thirds vote of members present at any meeting.

Article V

Members shall be sent a notification of annual dues at the time they are due and, if not paid within two months, they shall be sent a second notice, telling them that they are not in good standing on account of non-payment of dues and are not entitled to receive the annual report.

At the end of thirty days from the sending of the second notice, a third notice shall be sent notifying such members that, unless dues are paid within ten days from the receipt of this notice, their names will be dropped from the rolls for non-payment of dues.

NORTHERN NUT GROWERS ASSOCIATION, INC. CONVENTION ONTARIO AGRICULTURAL COLLEGE SEPTEMBER 3-5, 1947

PROCEEDINGS

of the

Thirty-eighth Annual Convention

of the

Northern Nut Growers Association, Inc.

Meeting At

ONTARIO AGRICULTURAL COLLEGE GUELPH, ONTARIO, CANADA

SEPTEMBER 3-5, 1947

The meeting was called to order by Dr. L. H. MacDaniels in the absence of Clarence A. Reed, our President, who was ill and could not attend the meeting.

Telegram from the Rev. Paul C. Crath: "Let the Lord bless you and keep you. I am sorry I am unable to attend the present meetings."

Address of Welcome

DR. J. S. SHOEMAKER, Head of Horticulture Department, Ontario Agricultural College.

Our President, Mr. W. R. Reek, had hoped to be here in person to extend this welcome to you but he has found it necessary to go to Toronto today. He regrets that he cannot meet with you at this time, and has asked me to welcome you. Mr. Reek has shown a great deal of interest in this convention and I am sure you will find definite evidence of this in our hospitality while you are here.

In looking through your 37th Annual Report I noticed that the address of welcome at your meeting in Wooster, Ohio, last year was given by Dr. L. H. Gourley. I held the position of Associate Horticulturist at Wooster and Columbus for some 10 years, and so knew Dr. Gourley intimately. His sudden death was a great shock to myself and his many other friends, and a great loss to horticulture. My 10 years with Dr. Gourley was a very pleasant, helpful, and exceedingly important part of my career.

I am very happy that you have come to the Ontario Agricultural College for your convention this year. As a simple matter of fact, the O. A. C. is one of the oldest and largest colleges of agriculture in the British Empire. It is the second oldest agriculture college in North America, Michigan State being the only older one.

We are an affiliated college of the University of Toronto and function as the Faculty of Agriculture of the University of Toronto. I believe the enrollment at the University of Toronto is in the neighborhood of 18,000 students. [Pg 24]

There will be about 1,500 students on this campus in a few weeks. Most of these will be in the four-year course which leads to the B.S.A. degree. Some will be in the two-year course. The Ontario Veterinary College is also located on this campus, as is the MacDonald Institute which provides courses for girls.

The O. A. C, like the Horticultural Experiment Station at Vineland, comes under the Minister of Agriculture, the Honourable T. L. Kennedy. The Vineland Station and we ourselves co-operate closely in horticultural work. No doubt many of you have visited Vineland and met Director E. F. Palmer. You will hear from two members of the Vineland staff, Mr. Strong and Mr. Van Haarlem on tomorrow's programme.

I spent some 13 years in the United States—at Ames, Iowa; East Lansing, Michigan; St. Paul, Minnesota; and Wooster and Columbus, Ohio. There are in this audience some good friends of long standing whom I first met in the United States. They are probably surprised to hear that I graduated from this institution, but as an Irishman would say "That I did," some 26 years ago.

I expect that all of you are familiar with the contributions made by James A. Neilson in the field of nut growing. Mr. Neilson was a member of the staff here some years ago. He left his mark throughout Ontario, and in the field of nut growing in general. We are happy that Mrs. Neilson, who is a life member of the Association, is attending this Convention.

I am sure you will agree that the campus here is a very beautiful one. The dining hall and the residence may surpass what you expected to find. It is a real privilege to have you in our Horticulture building. We made certain plans for your entertainment at the mixer and banquet. In brief, we are delighted that you have come, we know from the programme that the meetings will be good ones, and we hope that our hospitality will meet with your full approval. We indeed welcome you here.

RESPONSE

Dr. L. H. MacDaniels: "In reply to Dr. Shoemaker's address of welcome we are certainly happy to be here and appreciate the excellent arrangements which have been made for our entertainment. Dr. Shoemaker spoke about the work done on nut trees several years ago by Mr. Neilson in Canada. I am familiar with the work of Mr. Neilson and hope that at some time someone on the staff in Canada will give more time to the culture of nut trees. That goes for the United States as well. Nut trees, if you have the facilities and good varieties, are something that will make living more enjoyable and worthwhile. I do appreciate very heartily the trouble you have gone to in making facilities so acceptable and useful."

Presidential Address—Mr. Reed was unable to be present and preside at the meeting because of illness. This telegram was sent to him: [Pg 25]

Telegram to Clarence A. Reed, Garfield Hospital, Washington, D. C.

"The Northern Nut Growers Association last night received the news of your illness with deepest regret. We appreciate your long and earnest work in our field. You have been one of the 'spark plugs' of our organization and we all miss your presence.

SECRETARY."

COMMITTEES APPOINTED

Resolutions Committee—W. Rohrbacher, Sterling Smith, J. Russell Smith, Wm. Hodgson.

Auditing Committee—Royal Oakes, R. P. Allaman, Gilbert Smith.

SECRETARY'S REPORT, SEPT. 3, 1947

Miss Mildred M. Jones

The duties of the Secretary during the year were of the usual routine nature. Three separate mailings of information to all members were made. The 1944 report is now exhausted, partly because of the long season in which it was current, and partly because there were several articles in it which were of vital interest to a number of people who were not members of the Association. In March of this year an article appeared in Organic Gardening magazine which referred to our report and the Hemming chestnut trees which were described in the 1944 report. As a result of this one article I was obliged to return more than $30.00 which had been sent to me, a dollar from each person, for this report. I returned the money with a letter to each person telling them Mr. Hemming would bring his report up to date at our meeting this year, telling them about the work of our Association, and inviting them to join our group so they could keep up with progress being made in nut tree culture as the information became available. The sale of reports other than membership this past year amounted to $135.00. This amount includes 5 sets of reports which sell for $8.00 per set. About $95.00 of this amount was for single copies at $1.00 per copy to non-members. Since our printing costs have increased considerably, and since we are handling the mailing and printing of these reports at $1.00 per copy at almost a loss, it would seem advisable to raise the price to non-members.

Every member can help us increase our membership. We have a number of members who are equipped with writing ability and by writing articles about interesting nut trees and mentioning our Association and the Secretary many, many inquiries are received. To these inquiries we can send our four page information folder or answer questions and thus we can increase our membership by letting people who are interested in nut trees know about our Association. On February 28, 1947, Mr. George L. Denman wrote me that at different times he had two articles about nuts and nut trees in the Spokesman-Review of Spokane. He said the result was rather surprising and he requested fifty copies of our folder to assist him and make it easier to answer inquiries. If our Association can be mentioned in the article, many inquiries will come direct to the Secretary and thus save the author the work of answering questions if he does not have time [Pg 26] to do so. The article written by Mr. Davidson in December, 1946, American Fruit Grower brought in over 100 inquiries to the Secretary's office.

The Secretary's office has a number of calls for information regarding sources of nuts and nut kernels for private consumption or planting. Chestnuts seem to head the list the past year—mostly for planting. Requests are also received regarding information for market outlets, nut cracking equipment, nut shelling plants, trees, budwood and graftwood. Anything you may do to supply this and other kinds of information about nut trees will be appreciated.

The Secretary of the American Horticultural Society, Inc., with whom we are affiliated, has expressed the desire of that Society for ideas as to how we may both profit more from this affiliation. Their need, like ours, is for more members, more and better articles for the National Horticultural Magazine. Mr. Reed has contributed several worthwhile articles to this magazine. The Editor would like to have more articles about nut trees from our members. The National Horticultural Magazine is nicely printed and bound, issued four times a year, and is well illustrated with pictures of the horticultural subjects described in each issue. Dues in this society are $2.00 per year if you are a member of our Society, $3.00 if you are not. You can ask our Treasurer to bill you for membership at the same time membership in our Association is billed, or membership may be sent direct to The American Horticultural Society, 821 Washington Loan and Trust Building, Washington 4, D. C.

Our membership at present is 621 according to my present mailing list which has been corrected to paid-up members. During the war all members who were thought to be in the armed forces were carried along without the payment of dues according to our Treasurer's report of last year. For this reason we can use only our income as an indication of our growth during those years.

The question of a seal for the Association came up at the time of the Ellis legacy. Our member, Sargent H. Wellman, Boston, Mass., represented the Association, and payment was made finally without our seal being shown. It may be well to consider whether we may need a seal in the future and if so to take the necessary steps to have one made.

The American Fruit Grower magazine has printed quite regularly the column "Nut Growers News". They also refer nut tree inquiries to us and have indicated their interest and further cooperation. They devoted an entire issue to nuts last December.

A number of our members during the year do much work for the Association and it is here that I wish to acknowledge all of the help and assistance the Secretary has had from the various committees and members. The printing of the report for 1946 and the responsibility of getting it mailed was due mostly to the work and effort of Mr. Stoke, and Mr. Reed.

It was a real pleasure to work with the members of the Staff at Ontario Agricultural College with whom I had considerable correspondence during the year in arranging for our meeting this year.

It has been a real pleasure to serve in the capacity of Secretary to this organization and I regret that lack of time to do this work as it should be done makes me feel it is necessary to relinquish this post. I shall always continue my interest in the Association. [Pg 27]

Dr. MacDaniels: "More articles should be written for magazines as one way in which to increase membership."

Telegram from Dr. W. C. Deming was read:

"Infirmities of age detain me. Congratulations on membership and on accomplishments. Everything depends on good officers. Present officers are ideal but young members should now take over. Don't wear out the old ones.

W. C. DEMING, Dean."

This telegram was sent to Dr. W. C. Deming:

Sept. 3, 1947.

"We had hoped you would be with us. Your telegram evoked many warm appreciations of your great and long service to our organization and the cause of nut growers in the North. Warmest greetings from N.N.G.A.

SECRETARY."

J. Russell Smith: "Dr. Deming was one of the five founders of the Association. He did an excellent job on the reports and in compiling the cumulative index. He is Dean of the Association."

Report of Committee on Time and Place: Prof. Slate reported three invitations, the most attractive at the present time being the invitation to meet at Norris, Tenn.

Prof. Slate: "In order to bring the matter to a head, I move we hold our 1948 meeting at Norris, Tenn., or wherever arrangements can be made convenient to that point."

Stoke: "Second."

Passed with unanimous approval.

Report on the Ohio Contest—Sterling Smith: "The Ohio contest had 692 entries. Mr. Chase helped with the judging. A number of good walnuts were brought out. The data for the first ten is given in the 1946 annual report. We are trying to find out what the parent trees are doing—what they were bearing in the past and also this year. This is to be done for 5 years. Ohio has 90 members which puts them in the lead—ahead of New York."

J. Russell Smith: "I greatly appreciate the report given. I approve of the 5 year plan. It would bring in members."

Sterling Smith: "Couldn't we offer $100.00 or more for a really outstanding black walnut that would meet certain specifications? Our good walnuts now run about 25 grams and 32% kernel."

Dr. MacDaniels: "Is there anyone present who helped with the judging of this contest?"

Mr. Chase: "It required over 2 weeks with 4 to 6 persons to crack and cull out the ones we knew were not worth further consideration. One-tenth passed the screening test. The nut selected is one in ten-thousand expectancy. This contest brought out some outstanding nuts. The judges didn't have much trouble selecting No. 1. The next four were harder to place. The third prize went to Pennsylvania and the eighth prize to West Virginia." [Pg 28]

Report of Treasurer

For Period from September 1, 1946 to August 30, 1947.

INCOME:	
Annual Memberships	$1,212.00
Philip Allen Life Membership	50.00
Sale of Reports	44.00

Ellis Legacy	12.50	
Miscellaneous	5.60	
Total Income	$1,324.10	
DISBURSEMENTS:		
Fruit Grower Subscriptions	$80.80	
President's Expense	10.00	
Secretary's Expense	59.50	
Treasurer's Expense	45.80	
Supplies	77.66	
Banquet 1946 Meeting	22.32	
Reporter 1946 Meeting	25.00	
Ellis Legacy Bond & Addition	1,000.00	
Treasurer's Bond	12.50	
Report for 1945	569.84	
Report for 1946	821.83	
Postage & Envelopes	49.03	
Miscellaneous	19.20	
Total Disbursements	$2,793.54	
Balance on Hand September 3, 1946		$3,259.88
Receipts for the Year		1,324.10
Total		$4,583.98
Disbursements for Year		2,793.54
Balance August 30, 1947		$1,790.44
In Walker Savings Bank		$633.92
In Peoples Savings Bank		1,056.44
Cash and Checks on hand		100.08
Subtotal		$1,790.44
Secretary has on hand		26.71
Balance		$1,817.15

D. C. SNYDER, *Treasurer* [Pg 29]

Member: "The charge of $1.00 to non-members for the current report—shouldn't the price of the reports be increased to cover the increased costs of printing?"

Mr. Snyder: "I think the amount should be increased as the cost of the report is almost $1.00 now, and with handling and mailing we are doing this at a loss if we continue to sell the report for $1.00."

McCollum: "Shouldn't the price of a full set of reports be raised? They are sold at the same price now as they were a number of years ago. Several volumes have been added. I believe the price should be increased."

Prof. Slate: "Some years go out of print about as soon as new ones come along."

Dr. Rohrbacher: "I move we sell our current and last year's report at $2.00 per copy."

Second by Mr. Silvis.

Mr. Corsan: "Nut enthusiasts and nut groups haven't the slightest hesitancy in parting with $2.00."

Member: "A non-member paying $2.00 for the annual report would automatically become a member."

J. Russell Smith: "I would like to recommend that if at all possible an index be included in each volume of our report as it is published. A volume like this has 50 or 75 different articles but no mention in the title reveals the content of the article which makes it a job to try to refer back to or use these reports for reference. An index would make them much more valuable. This is not a job for the Secretary, it is a technical job. I would like to make a motion, if the Executive Committee finds it feasible, that this be done."

Second by Mr. Silvis.

Dr. Colby: "Don't you think that index should begin with the volume Dr. Deming finished? I suggest that the executive Committee arrange for compiling of the index subsequent to and including 1940."

Mr. Corsan: "I would like to suggest that the nut exhibit be left at O.A.C. permanently because of the large number of visitors who come here and who would see it. This would help to increase our membership."

Report from the Constitution and By-Laws Committee—Dr. MacDaniels.

Dr. Crane: "I move we accept the report of the Committee and suggested changes be voted on item by item."

Mr. Silvis: "Second."

The question of whether the entire Constitution and By-Laws should be read at this meeting or mimeographed and mailed to each member was considered.

Prof. Slate: "I move the Constitution be taken up now."

Dr. Colby: "Second." [Pg 30]

The motion was carried. Dr. MacDaniels read the Constitution and By-Laws and they will be voted on at the 1948 meeting.

J. Russell Smith: "I move that '10 days' notice for change in the Constitution be changed to '30 days'."

Seconded by Mr. Silvis.

Motion carried.

On fiscal year—Dr. Rohrbacher: "I suggest the fiscal year be changed to January 1 through to the end of December."

Mr. Snyder: "I can see no improvement in changing the fiscal year. If we are to hold our meetings the first part of September each year it would be better to have our fiscal year ended August 31."

Dr. MacDaniels: "I move that our fiscal year be from September 1st to August 31st and I move that the annual dues include a report for only the year you join."

Motion carried.

Factors Influencing the Hardiness of Woody Plants

H. L. CRANE, Principal Horticulturist[1]

There is hardly any soil or climatic condition found in the world where it is not possible for at least one or more kinds of plants to be grown. This is possible because the plants that can be grown under the most adverse conditions have special structures and adaptations with regard to periods of growth and rest or dormancy. One of the most important adaptations of nearly all trees and shrubs that shed their leaves in autumn and survive freezing weather without injury for a part of the year, is that of rest. This rest in plants is somewhat similar to sleep in animals in that it is a period in which the life process activities take place slowly. In other words, the plant physiologist defines rest in living plants as that period in which their buds will not open and grow even though the temperature, moisture, and other external environmental conditions are highly suitable for growth.

Different kinds of deciduous plants have or require rest periods of different lengths, just as some people require more sleep than do others. Two or three weeks may be enough for soft-shelled almonds but three or four months may be required for butternuts, to cite extremes. The Eastern black walnut requires more rest than most Persian walnut clones, and they more than the Southern California black walnut. Even within a species there is considerable difference in the rest period of individual seedling trees and certain clones. For example, it has been found that the varieties of Persian walnut grown in northern California and in Oregon, such as Franquette and Mayette, have the longest rest period; and those grown in Southern California, such as [Pg 31] Placentia, Ehrhardt, Chase, and others, have the shortest rest period. It is quite possible that the clones and seedlings of the Persian walnut brought to this country a few years ago by the Rev. Paul Crath from the Carpathian Mountains of Poland may require the longest rest period of all.

The question may be asked what causes or brings on this rest period in plants and what breaks it? The scientific answers to these questions are not known at this time, but we do know some of the factors which cause the initiation of rest and how it is broken.

Tree growth is initiated in the spring with coming of warm weather and other suitable conditions. At first the rate of growth is slow; but the rate increases and goes through a maximum and then slows up again and finally ceases. On the cessation of growth in length, a terminal bud is formed

and the tree begins to go into rest. This period of growth is determined by the age of the tree, the suitability of moisture and nutrient supply. Young trees grow longer during the spring and summer than do old ones. Deficiencies of soil moisture or nutrients or both cause the cessation of growth and the beginning of rest. In some trees, such as tung, cessation of growth and the initiation of rest is caused by the change from long to short day-lengths.

After rest has begun, the longer it continues the more profound or deeper it becomes until a maximum is reached, i.e., it becomes increasingly difficult, up to a certain time, to make the trees start growth again even though optimum conditions are provided. Some trees such as Persian walnuts and pecans, for example, are slow to go into deep or profound rest in late summer or fall. For this reason, there may be several cycles or periods of growth during the summer and early fall, depending on weather conditions and whether the leaves on the trees have remained in a healthy condition. Under conditions of dry weather growth stops on the Persian walnut and pecan and when this is followed by a rainy period and warm weather growth begins again. In fact in early summer a walnut or pecan tree may form terminal buds on all the shoots and remain without growth long enough for an apple or pear tree to go into complete or profound rest; then later, new shoot growth may be made from all or nearly all of the walnut or pecan shoots. Not only is this an important factor in promoting susceptibility to cold injury but in the case of bearing trees more often than not this late growth prevents the proper development of the kernels in the nuts and they are poorly filled or shriveled at harvest. Should the leaves of these trees in midsummer or later be so seriously damaged by disease or insects as to result in partial or complete defoliation, new growth is generally sure to follow even in late fall if growing conditions are suitable. This habit permits such trees to grow so late that there is much greater danger of severe injury from late fall or early winter than is the case with most other deciduous fruit trees. Furthermore, it explains why we see so much cold injury in the shoots and limbs of trees; they had grown late and had no chance to develop hardiness before killing temperatures occurred.

After the rest in trees has become deep or profound a certain amount of chilling temperature must prevail before the rest period is broken so as to permit the buds to open and grow normally on the approach of warm weather. This is often spoken of as the chilling requirement. If the rest period is not broken by a suitable amount of chilling, tree growth is very slow to start in the spring, and then only certain of the longer and stronger twigs may force into growth; water sprouts may develop on the trunks and main limbs; flower buds may not open but fall off; and [Pg 32] even though the trees may flower the flowering period is long and few or no fruits or nuts may be set. The most effective chilling temperature is not known but we can be reasonably certain that temperatures of 45°F. to 32°F. are just as effective in breaking the winter rest period as are those well below freezing, if not more so.

This chilling requirement is essentially the same as the rest period. Almonds have a short rest period and require 2 to 3 weeks of chilling, while butternuts, with a long rest period, may require 3 or 4 months. When the tree has been subjected to adequate chilling the rest period is broken and with the oncoming of warm weather growth, blossoming and fruit setting is normal.

A distinction of great importance from a physiological and a practical point of view is made between rest and dormancy in plants. This difference can be simply stated: plants, trees, or seeds that will not grow when external environmental conditions are favorable for growth are in rest, but after the rest period has been broken and they do not grow because of unfavorable conditions they are said to be dormant.

The difference between rest period and dormancy is of great importance in the United States in determining the amount of cold injury that may be sustained by woody plants. Furthermore, it explains why certain plants may be successfully grown in much colder parts of the world and yet fail here. Our winter weather conditions are not uniform, in that it is quite common for us to have quite long periods of alternating warm and cold weather. Too often during mid-or late winter the weather may be quite warm for several days, with above-freezing temperatures even at night, only to be quickly followed by a sudden and extreme drop in temperature. Such conditions are almost certain to result in cold injury to at least certain kinds of woody plants in which the rest period had been broken prior to the occurrence of warm weather, especially so if conditions are favorable for initiation of growth. The plants that were still in the rest period at the time of the warm weather or those with high heat requirement to start growth (as for example, the pecan) would be the only ones that would escape injury. To illustrate with an example: The Chinese chestnut tree has a shorter rest period or less chilling requirement than does the average Persian walnut tree. Now suppose that during the months of November and December a sufficient number of hours of chilling temperatures were experienced to break the rest period or to satisfy the chilling requirement of the Chinese chestnut but not that of the Persian walnut. Then suppose there was a period of two weeks or more of warm weather in January and it was ended by a very sudden drop to below freezing temperatures. Later we would expect to find that some parts or tissues of the Chinese chestnut trees had been injured while the Persian walnut trees had survived without injury. Similar differences would be expected with other crops, such as peaches and apples, that have a difference in rest period or chilling requirement. Under the conditions just described the parts or tissues of the tree that are most likely to be injured are those that first become active with the coming of warm weather, such as the pith in the wood, the lower buds, and later the cambium or the leaf buds. This explains why peach fruit buds and the catkins of the European filbert are often killed in the East during the winter.

Some kinds of woody plants are very much hardier than are other kinds. For example, the

butternut is hardier than the eastern black walnut and the almond is hardier than the tung tree. [Pg 33] Hardiness is only a relative term and can be determined only when the different kinds of plants are in the same physiological condition as regards growth or activity. Just what it is that makes a difference in the hardiness or ability to withstand low temperatures without injury is not known. However, over the years, experience and research have taught us that there are a number of factors that affect the hardiness of woody plants.

There is a very great difference between the temperature that will cause injury to a tree tissue when it is in active growth and most tender in the spring and that required when it is most resistant in midwinter. With some trees this difference in temperature is as much as 50° to 60°F. or even more. With woody plants, the tissues are least hardy in spring when they are growing rapidly, and as the season progresses hardiness normally increases provided that second or late growth does not occur. There are many changes that take place in the tissues of a tree as hardiness is developed: the moisture content is reduced; cell walls are thickened; the concentration of sugars, starches, and other carbohydrates becomes greater; there is the formation of pentosans, gums, and waxes; and the respiration and other life processes become slower. However, none of these offer a full and satisfactory explanation of why the plant becomes as resistant to cold as it does. All of these changes and probably many others play a part in developing hardiness in woody plants.

Maximum hardiness is developed only by trees that support a large area of normal leaves continuously from the time of foliation in the spring until late fall when they are killed by frost. Attacks by insects or diseases that injure the leave or cause partial or complete defoliation at any time during the spring, summer, or before the occurrence of frost in the fall, not only prevent the development of maximum hardiness of the trees, but such defoliation results in reduced growth of the trees and in poor filling of the nuts. The importance of maintaining a large area of healthy leaves on the trees during the entire growing season can hardly be too strongly stressed. This is because trees that hold their leaves are strong, vigorous trees and are the ones best able to withstand cold, as well as other adversities, without injury. This, however, does not mean that fertilizer applications should be made in late summer or that cultivation should be practiced at that time, which would tend under suitable conditions to stimulate late growth of the trees. This is because some trees like the Persian walnut are slow to go into rest at best and practices that stimulate late growth of the trees cause them to be susceptible to cold injury especially in late fall or early winter. I have seen very severe injury and killing of pecan trees in south Georgia as a result of spring fertilizer applications which, because of drouth, did not become available to the trees until late August and early September and then caused second growth of the trees.

In the case of walnuts and pecans, especially, but also others than are not sprayed for the control of diseases and insects, it is not uncommon for the trees to become defoliated in late summer and while bearing a crop of nuts. Very often this premature defoliation results in the production of a new crop of leaves and some shoot growth. This is one of the worst conditions one can have in an orchard, for the nuts are certain to be very poorly filled and the trees especially susceptible to cold injury.

In such a case as this, the nuts withdraw carbohydrates, proteins and minerals from the leaves and wood of the tree for their development and the production of new leaves and shoots has a [Pg 34] like effect. This all results in such a severe removal or using up of the materials involved in the development? of hardiness that such trees are very susceptible to cold injury.

Woody plants to be resistant to cold injury must be well nourished. Unbalanced mineral nutrition of trees is a very important factor in determining the amount of injury they may sustain from cold weather. In the various parts of the United States the soils on which fruit and nut trees are grown generally do not supply in adequate amounts some one or more of the essential elements required in their nutrition. This condition results in unbalanced nutrition, in that too much of certain elements is absorbed by the trees and too little of certain other elements. Under severe conditions this causes the leaves to be abnormal in size or in form, for them to be chlorotic or to scorch or burn, or for them to drop prematurely. Such leaves do not function properly, they are not able to carry on photosynthesis at a normal rate and hence do not make sufficient plant foods of the proper kinds to properly nourish the trees. This results in disorders of various kinds said to be due to mineral deficiencies. Among these deficiencies that have been found to reduce tree growth and yield and to increase susceptibility to cold injury are (1) boron, (2) copper, (3) iron, (4) magnesium, (5) manganese, (6) nitrogen, (7) phosphorus, (8) potassium, (9) zinc, and others. In all cases the corrective treatment to be given consists in supplying the trees with the element or elements in which they are deficient. These must be supplied in an available form and by such methods that they can be absorbed by the trees.

The size of the crop of fruit or nuts borne by a tree and the length of time between harvest and a killing freeze are important factors in determining the cold resistance of fruit or nut trees. In test winters many cases have been observed in which trees that matured heavy crops during the previous summer were severely injured. Cases have been observed in which the degree of cold injury sustained has been largely in proportion to the size of crop matured the previous growing season. Trees that mature the crop of fruits or nuts late in the season may be less hardy than those that mature the crop early. It seems not only that some material or materials are made in the leaves during late summer or early fall which move out of them into the wood and cause it become resistant to low temperatures, but that when a tree is maturing a crop so much of this material goes into the fruits or nuts that if the season is not a favorable one the wood may not attain its maximum hardiness. We have learned that a high percentage of certain of the minerals,

carbohydrates, and oil that go to make up the kernels of the oily nuts are transported into them during a period comprising a month to six weeks before they are mature. In the production of a heavy crop the amount of minerals and elaborated food materials such as proteins, carbohydrates, and fats removed from a tree is very large. If the trees do not carry a large healthy leaf area at the time of harvest or if there is a killing frost at that time, the leaves have no opportunity to elaborate more carbohydrates and other materials to replace those removed in the crop, and as a result the trees do not develop maximum hardiness.

To cite an outstanding example of this effect of the crop on hardiness, I want to describe some observations I made several years ago. The late J. B. Wight of Cairo, Ga., had a few hundred Satsuma orange trees that bore a very heavy crop of fruit. The fruit had all been harvested from certain of these trees for two weeks or more before the occurrence of a freeze the last of November. From other trees the fruit crop had only been partially harvested and none had been [Pg 35] harvested from most of them. The day and night temperatures had been warm but there was a rather sudden drop into the low 20's during one night with the result that all of the trees from which no fruit had been harvested were killed to the ground. The trees from which a part of the fruit had been removed were defoliated and all but the large limbs were killed. The trees from which all the fruit had been removed two weeks or more before the freeze were defoliated, but little or no injury to the woods occurred. The severe injury was probably because the materials making for hardiness in the wood had been transported to the maturing fruits and the temperature dropped quickly before the trees had time to develop cold resistance.

It is a well-known fact that many kinds of non-woody as well as many woody plants develop hardiness or cold resistance on exposure to very gradually falling temperatures. This change, in the case of non-woody plants such as cabbage or wheat, is spoken of as "hardening off." It is not known how important this is in developing cold resistance in flower and leaf buds of woody plants. It is quite possible that buds that have become extremely tender as a result of rapid growth might, if held for some time at temperatures too low for further growth, become quite resistant to low temperatures just as do wheat or cabbage.

Generally speaking, the greatest amount of cold injury to the buds or above-ground portions of a tree occurs on a single night. The length of the cold period is of only indirect importance as influencing the rate of temperature fall or the acquiring of cold resistance by the trees. Trees that are subjected to low temperatures over a considerable period of time are not nearly so likely to be injured as are those that are subjected to a low temperature suddenly. That is really why there is so much severe cold injury to woody plants in the South. In the deep South freezing weather may be uncommon but when freezes do occur usually they follow a period of comparatively warm weather and the temperature falls quickly. It is this sudden change in temperature that causes the severe injury. Two different places may have had the same mean monthly temperature yet at one place severe injury may have occurred and no injury at the other place with plants normally having equal hardiness. A careful analysis of the situation, however, would probably show that at the place where the injury occurred a period of warm weather had existed which was followed by a rapid drop in temperature to a killing low on a single night, whereas the trees at the place where no injury occurred were not subjected to such changes in temperature. On the other hand, injury to the roots usually occurs only after prolonged periods of cold weather. This is largely because the soil cools slowly and it requires a long period of cold weather to reduce the soil temperature sufficiently and to such depths as to cause injury to the roots.

Under northern conditions where low temperatures for a rather long period are sometimes experienced, injury to the portion of the trees above ground may occur as a result of drying out of the wood. It is well known that a cake of ice will gradually evaporate and disappear when in the open and exposed continuously to below-freezing temperatures. We all know that the family wetwash when hung on a line and frozen will soon dry, especially if the wind blows. The principles operating in these cases may cause severe injury to trees. In the wintertime the root systems of trees take up water from the soil that is not frozen and this water moves in the tree to replace that lost by evaporation. Under conditions where the soil is frozen to such an extent that [Pg 36] the water absorbed by the roots is continually less than that lost by the top of the trees by evaporation, drying out of the top occurs. If this is continued over a period of time a dryness of the wood and other tissues occurs that causes death of the dried-out portions. This type of injury does not show the typical symptoms of cold injury but rather those of drying out. The conditions that are most likely to cause such injury are a soil frozen to the effective rooting depths, a dry atmosphere, and a moderately high wind velocity. Injury of a similar nature to that just described very often affects trees transplanted in late fall or early winter, especially those that did not have their tops cut back to balance the loss of roots sustained in transplanting. During even very mild winters the tops of such trees dry out to such an extent that the small branches and even the leader may die. In extreme cases the entire top may die back to the root. In planting bare-root trees regardless of the time of the year they should be rather severely cut back immediately after transplanting to prevent such drying out and dying back of the wood. Cut-back trees generally will make more growth the first season following transplanting than will similar trees not cut back.

One of the most common types of injury to young nut trees as well as others is that known as "sun scald" or "winter injury". This occurs generally on the south or southwest sides of the trunk and for some distance between the ground and the head of the tree. Usually the injury is not evident until a year or so after it occurred and then it may be observed as a narrow strip of

discolored and sunken bark which may crack where it meets the live tissue. This dead or injured area is usually invaded by borers of one or more kinds. This so-called sun scald injury is thought to be caused by the alternate freezing and thawing of the tissues on the south and southwest sides of the tree. On a bright, sunshiny day, even though cold, the sun's rays striking the bark of the tree quickly raise the temperature of the bark and wood. When the sun is obscured by clouds or at nightfall the temperature of the tissues drops rapidly and they may freeze again. It is thought that the rapid and rather great change in temperature of the bark and wood is the primary cause of sun scald. Whatever the cause, we know that it can be prevented by shading the tree trunk. This can be done by heading the trees low so that the branches shade the trunk, or by shading the south side of the trunk with a board 6 or 8 inches wide, or by wrapping the trunk with burlap or similar material. Much of the injury to Chinese chestnut, pecan, and hickory trees, especially, is caused by inexperienced growers who cut off the low branches in an effort to raise the head of young trees. The Chinese chestnut generally forms a very low-headed or bush-type tree. Most of the cold or winter injury I have seen on Chinese chestnut trees has been on the trunks and has resulted from removing the lower limbs so that they were not shaded.

Hardiness in woody plants is only a relative term and is determined by the condition of the plant at the time the low temperature occurs. Woody plants are most tender when they are most actively growing and most resistant to cold injury when they are in deep or profound rest. Strong, vigorous, well-nourished trees are much more resistant to cold injury than weak, poorly-nourished trees. Hence, the successful grower makes an effort through disease and insect control and proper fertilization and cultivation to keep his trees strong. These practices should be so carried out that the trees will make a strong, vigorous growth in the spring and early summer and then go into rest without a second or third flush of growth. The trees should carry their [Pg 37] leaves until frost as there are some things made in them that cause the trees to develop resistance to cold injury. Winter or cold injury can destroy in a single night the hopes and expectations of several years' work but, in the main, if one grows well only those trees that are suited to the environment such losses are only rarely experienced.

Nut Culture In Ontario

I. C. MARRITT, District Forester, Ontario Department of Lands and Forests

It was suggested to me that a paper be prepared on nut culture in Ontario. The Department of Land and Forests of Ontario has not done specialized work on nut culture. The reason for this neglect is not that various members did not realize the importance of nut culture, but that there was always more work on general reforestation and woodlot extension than could be done. The work with nut trees has been along with their general work. We have not, as yet, had a member of the staff who has gone "nutty" over nuts. It is hoped that your meeting here will stir up interest in this worthy subject.

We are very proud in Ontario of the work that has been done on general reforestation and woodlot management. This is a subject that all nut enthusiasts are interested in, and we would like you to know what is being done in Ontario.

The Province of Ontario has been distributing trees free to landowners since 1907. There are three well-equipped tree nurseries, and a fourth is being developed in the eastern part of the province. A fifth nursery has been started in the northwest at Fort William on Lake Superior. The number of trees distributed varies considerably from year to year. The high distribution years were 1939 and 1940, when approximately seventeen million trees were planted each year. During the war years, on account of the labour situation and war activities, the distribution declined to between ten and eleven million trees. This past season, the demand was much larger than the supply. All the nurseries are expanding, as it is anticipated there will be a heavy demand by private planters, and also most of the counties are enlarging the area of their county forests.

The application form for forest trees includes seven evergreens and nineteen deciduous trees. Walnut and butternut are the only nut trees on the application form. Shagbark hickory has also been grown, but not in large enough quantity to include it in the list of available trees. The St. Williams tree nursery near Lake Erie has grown named varieties of walnuts and hickories. These have been given out to interested parties, and, in future years, will further the growing of the more desirable nut trees. About ten years ago, the citizens of St. Thomas planted nut trees two or three feet in height for seventy miles along No. 3 Highway which crosses Elgin County. A large number of these trees have survived.

A large acreage of forest trees has also been planted under the Counties Reforestation Act. Under this act the county purchases the land and the province plants and looks after the plantations for thirty years. The county then has three options *re* paying back the cost of planting and supervision. All the options are without interest charges. The county forests are largely on [Pg 38] light sandy soils that, in most cases, are a liability to the municipalities if they are not growing trees.

The Ontario Government passed an act in 1946 that gave the counties the right to pass a by-law to regulate cutting on privately-owned woodlots. You will be interested to know that eleven

counties have passed by-laws to regulate cutting. They are all based on a diameter limit. We realize that a diameter limit is a poor substitute for good forestry practice, but it is better than unrestricted cutting. The diameter limits range from ten to sixteen inches for most trees, and five to six inches for cedars.

Considerable extension work was done on nut growing in the period from 1920 to 1930. Mr. James A. Neilson, an Extension Horticulturist stationed at Vineland, became very interested and located many individual trees and gave numerous lectures on nut culture. A bulletin by Mr. Neilson on nut culture was published in 1925, and reprinted in 1930, by the Ontario Department of Agriculture. Mr. Neilson went to Michigan and did extension work on this subject until his untimely death. Mr. G. H. Corsan has also done considerable work to keep nut culture before the public by writing letters to the different newspapers.

There has always been a large demand for black walnut. The reason for this is the high value placed on this wood and the planting of these trees for shade and nut production, although the consumption of native nuts is comparatively low. The black walnut grew, originally, south of a line from Toronto to Sarnia. It has been planted as far north as Ottawa, and is distributed quite widely in Old Ontario now—being planted largely as shade trees. These shade trees are producing nuts, and with the aid of squirrels, the walnuts are seeding up along fence rows, around farm homes, and in woodlots. Walnut has been observed coming up in a woodlot, and the only possible source is a shade tree half a mile away. The walnut caterpillar defoliates the trees but seldom kills them, although it does lower their value as shade trees.

Walnut has been a favorite species for forest tree planting. It is planted in pure stands and in mixtures. The largest and best known walnut plantation was put out by Sir William Mullock in 1926 on the highway north of Toronto. There are numerous small plantations throughout the province. Foresters in Ontario generally recommend mixing walnut with other hardwoods and evergreens rather than planting in pure stands.

It has been advocated to plant walnuts with white spruce. The idea is that spruce will shade the ground, kill the side branches of the walnut, and help to force the walnuts to grow long slender poles. It is understood, and expected, that the spruce will be ruined, as their leaders would grow into the branches of the walnut. As far as we know, this experiment has not been undertaken.

The butternut tree is found growing naturally farther north than the walnut tree. Its northern boundary is roughly a line drawn from Midland on Georgian Bay to Ottawa. It is widely distributed, but is not in large enough quantity to have commercial value for lumber. An expert wood carver, who is employed by the Department of Lands and Forests, uses butternut largely in his work.

The shagbark and bitternut hickories make up the large percentage of the hickories growing in Ontario. The northern limit of the bitternut is approximately the same as the butternut—that is, Midland on Georgian Bay and Ottawa on the east; while the northern limit of the shagbark is [Pg 39] thirty to forty miles south of the bitternut. The pignut and the mockernut hickories are found in the southern hardwood belt along Lake Erie.

The American chestnut was quite plentiful in different sections of the southern hardwood belt. It was valued quite highly for the nuts. It has been killed out by the chestnut blight and it is very rarely that live suckers are seen.

The beech was widely distributed in the woodland of southern Ontario. It has rarely been planted as a shade tree and it is not seeding up extensively in woodlots. There are many stories of hogs being fattened on beechnuts in pioneer days.

The Japanese heartnut has been planted in various parts of the province. A heartnut tree in Bruce County lived through a hard winter that killed many sugar maples and beech in the same area. Nut trees are seeding up in many pastured woodlots in southwestern Ontario. The reason for this is that stock do not relish their foliage as they do the maple, beech and basswood, etc., and because of this, it is likely that nut trees will make up a larger percentage of trees in Ontario woodlots than originally, as it is a sad fact that at least seventy-five percent on the farm woodlots in Ontario are still being pastured.

It is hoped that more interest will be shown in planting nut trees by farmers and home owners. The Department of Lands and Forests is enlarging its staff of Extension Foresters, and no doubt they will include the propagation of nut trees in their extension work.

Nut Growing at the Horticultural Experiment Station, Vineland Station, Ontario

W. J. STRONG

There was very little interest in nut growing in the early days of the Horticultural Experiment Station although back in 1914 a few filberts and Persian (English) walnuts were planted.

The first nut orchard at the Station was set out in 1922 and since then several lots of nut trees

have been added from time to time, principally filberts and Persian walnuts. Also a few black walnuts, Japanese heartnuts, Chinese chestnuts, hickories, pecan and several hybrids were planted.

In 1922 twenty varieties of filberts were obtained from a nursery near Rochester, N. Y. These were reputed to be some of the better sorts imported from Germany but when they came into bearing only one was true to name, this being Italian Red. Another un-named variety in this lot (field number 3 R 1 A T 10, 11, 12), proved to be hardy and very vigorous. The nuts were only of medium size but very well filled and of good quality. The rest of these were a nondescript lot of worthless varieties or seedlings and so after a few years nearly all were uprooted and discarded.

At this time (1922) four varieties of Persian walnuts were planted, Franquette, Mayette, Hall and Rush. The Franquette and Mayette have not grown very well here and have given very poor yields. Both Hall and Rush made good growth the first 15 or 20 years from planting but latterly, growth has been poor and yields have fallen off considerably, although this year (1947) there is a very fair crop showing, but with rather much dropping. The nut of the Hall variety is quite large but the husk is thick and the shell is thick and coarse, also in some seasons the kernel has not filled out very well. The Rush has given good crops of medium-size nuts. It seems to be rather susceptible to bacterial blight. [Pg 40]

Five named varieties of black walnuts also were planted at this time (1922), Thomas, Ohio, Stabler, Ten Eyck and McCoy. The Thomas has proven to be the best of these and the value of the others was pretty much in the order named. The last two were quite inferior as to nut, while the Stabler lacked vigour and did not yield very well, although it is a nice nut and the kernel comparatively easy to extract.

Eight Persian walnut seedlings in the same plantation, set out in 1926, have made poor to fair growth. They have given very few nuts until this year (1947) when two of them are showing a very fair crop.

About 1928 twenty Japanese walnuts and hybrids with the butternut, and about the same number of Persian walnut seedlings, which have been brought in by the late Professor Jas. A. Neilson, were transplanted to the permanent fruiting positions. The Japanese walnuts and hybrids were worthless and so were discarded. The Persian walnuts, however, seemed to be of more value, several are quite nice nuts and one, at least, looks to be worthy of increase for further trial or limited distribution. This seedling (field number 13R3T14) has made very fair growth and has shown only slight winter injury. For the last five or six years it has given moderately good yields of very nice looking nuts. The nuts are large, rather long and oval, resembling somewhat the Franquette. The shell is smooth and moderately thick, well sealed but easy to crack. Usually they are quite well filled and the kernel is mild in flavour and of nice quality.

Another Persian walnut, set out about the same time, is the McDermid. The original tree was found on the property of a Mr. McDermid at St. Catharines, Out. One grafted tree and four seedlings were planted on the Station grounds. They grew well and showed very little killing back and for several years gave quite nice crops of nuts, but of recent years the yield has been rather small. The nut is blunt-oval in shape and of good size with a fairly hard shell which is well sealed but not any too easy to open. The quality is fairly good but the pellicle is rather strong flavoured.

The year 1936 may be considered the high water mark in nut planting at the Station. A variety block of filberts was set out that year and fifty one-year-old Persian walnut seedlings (Carpathian strain) were planted in a nursery row, and in permanent location in 1937. The filbert planting consisted of from three to nine bushes each of twelve varieties, including Aveline (white), Barcelona, Bixby, Bolwyller, Buchanan, Cosford, Daviana, Du Chilly, Medium Long, Red Lambert (?) and Jones hybrid. These were planted in a compact block, 18 feet apart each way on the square. A lesser distance no doubt would be sufficient for upright growing sorts like Du Chilly but some of the more spreading kinds can use the greater distance.

Most of these filberts started to yield a few nuts at five to seven years from planting and at nine or ten years were giving good crops. Yields have fluctuated considerably from year to year, and also between varieties and different bushes of the same variety. Yields obtained from individual ten-year-old bushes and size of nut are given in the following table. [Pg 41]

Name	Quarts[2] (with husks)	Pints, nuts (without husks)	Size of nut No. per pint
Barcelona	11	8	101
Bixby (1)	11	9	130
Bixby (2)	22	12	148
Daviana (1)	10	6	94
Daviana (2)	11	7	90
Du Chilly (1)	20	11	93
Du Chilly (2)	17	12	92
Medium Long	11	8	115

Higher yields have undoubtedly been obtained from other plantations and from other individual bushes and certainly lower yields, also, may be expected. Those given above are for 1946 from the best ten-year-old bushes in a plantation of forty plants.

Yield and size of nut while of major importance are not the only criteria for appraising the value of a nut variety. In filberts, such points as ease of husking, amount of fibre and, of course, quality must be considered. Also, as in other nuts, thickness of shell and proportions of kernel to shell are quite important. Vigour and hardiness of bush and hardiness of flower, male and female, are assumed, as without these high yields are not to be expected.

Most of the filbert varieties in bearing at the Horticultural Experiment Station with a few of their outstanding qualities are noted below.

Barcelona has a rather thick shell and too much fibre. It matures early, first week of September, and the nuts drop out of the husk fairly readily. The plant is strong and vigorous and somewhat spreading in habit of growth. It appears to be hardy.

Du Chilly is not always hardy and it is difficult to husk. Some bushes of this variety have given quite low yields.

Medium Long is a useful nut. It is not as large as the former two, but it fills well and there is very little fibre; also the shell is thin. It ripens somewhat later than Barcelona and is easy to husk.

Bixby is of medium size, somewhat pointed with a medium thick shell but almost no fibre. It is late in maturing, first week of October, and does not husk readily.

Daviana is a large, attractive nut with a moderately thin shell and has very little fibre. The quality is good. The nuts are mostly borne singly but with some pairs and they are apt to cling to the husk.

Cosford is a very nice nut. It is similar to Medium Long, somewhat smaller and of good appearance. It has a thin shell and is of good quality. It ripens early and separates readily from the husk. Perhaps not always hardy.

Bolwyller is hardy, yields moderately well and has nice quality.

Buchanan, much like Bixby, but a more vigorous grower. Rather difficult to pick. The nut has good quality and very little fibre.

Italian Red, one of the best but not hardy.

The filbert plantings have been added to from time to time. In 1942, 200 open-pollinated seedlings of the hardy seedling (3R1AT 10, 11, 12—1922 planting) were set out and are now (1947) beginning to bear a few nuts. The main purpose of growing these seedlings is to find a larger nut of good quality with the vigour and hardiness of the female parent. [Pg 42]

In 1944 a bush each of Beethe, Buchanan, Luisen and Volkugel varieties were set out, also bushes of the following hybrids:

Rush x White Aveline No. 21

Rush x Kentish Cob No. 110 and 111

Rush x Barcelona No. 157 and 159

Rush x Bolwyller No. 200

Rush x Red Lambert No. 394 and 398

Rush x Du Chilly No. 485 and 555

Rush x Daviana No. 529 and 521

This material was supplied by the New York State Agricultural Experiment Station for test purposes. So far none of these has come into bearing.

The seedling Carpathian walnuts (1937 planting) are nearly all bearing a few nuts. Some began in 1943 while other bore nothing until several years later. One tree in 1946 gave six pints of nuts, without the husks, another four pints and several two pints, but most of them much less. As in other seedling trees there is much variation in this lot of walnuts. They vary considerably in habit of growth and vigour, also in nut characteristics. They have shown little or no winter injury. It is too early yet to pass judgment on these seedlings. Undoubtedly many of them are worthless, others are on the border line, and a few may be better than seedlings already growing in the Niagara fruit belt. It is possible that some may have sufficient hardiness for planting in the less favoured sections of Ontario.

Other types of nuts growing at the Horticultural Experiment Station are of general interest. The chestnuts and most of the pecans are very young and so are not bearing. Several hickories, **Carya ovata** and **C. laciniosa**, and Japanese walnuts bear some nuts occasionally. The Persian walnut x black walnut hybrids bear a few nuts sometimes but are worthless; the trees however, are nice as ornamentals. The Japanese walnut x butternut hybrids usually have a nice crop but

the nuts are of questionable value. The trees are nice ornamentals although subject to wind injury.

Several seedling Chinese chestnuts were topworked to selected Chinese chestnuts, grafts of which were obtained from the Division of Forest Pathology of the U. S. Department of Agriculture. Unfortunately these were all destroyed at the result of construction work.

In addition to plantings made at this Station, nuts and nut seedlings have been distributed to people who wished to grow a few nut trees on their own places.

Cultural practices have been very simple at the Station. After planting, the trees were cultivated for a year or two, then the space between sown to grass and clover and the space just around the trees was mulched with manure, hay, etc. The grass is cut several times a year and placed around the trees as additional mulch. Small quantities of a good commercial fertilizer such as 4-8-10 have been applied occasionally and some nitrogen also has been used.

Pruning has been reduced to a minimum, a light thinning out of branches being given as required. Very little attempt has been made to keep filberts to a single stem, but the walnuts have been kept to a single low-headed trunk.

There has been a marked increase in interest in the planting of nut trees in Ontario since the first plantings were made at the Station. These Station plantings serve to demonstrate in a small way that nut trees can be grown in the Niagara fruit belt of Ontario. The feasibilty, however, of [Pg 43] growing nut crops in a commercial way, even in this district, is still open to question, although it is felt that farmers and others should be encouraged to plant a few nut trees on their property both for the sake of the nuts and because of the ornamental nature of the trees.

Soil Management for Nut Plantations in Ontario

J. R. van HAARLEM, Horticultural Experiment Station, Vineland Station, Ontario

Fruitgrowers with high priced land, such as we have in the Niagara Peninsula, are not much interested in using such land for a crop not yet proven commercially sound. Plantings, whether large or small, are likely to be made on low-priced marginal land needing good care. It is doubtful if these locations are best suited to proper nut culture since most nut trees are deep rooted with extensive root systems requiring the best soils.

At the Vineland Station we have three plantations made up of 110 walnuts, 240 filberts, 14 chestnuts and 6 pecans. These comprise named varieties and seedlings of black, Carpathian, and other Persian walnuts, filberts, chestnuts and pecans.

During the first years of the life of these plantations we maintained a clean cultivation program during the spring and early summer followed by the planting of a green-manure crop about July 1st each year. Such crops as buckwheat, millet, rye, and weeds, have been used on occasion. We soon found that the treatment was not good enough for the trees and we then changed to a grass sod with mulch around each tree within the spread of the branches. Since this sod-mulch treatment was applied the trees have done very much better, making fine growth and maintaining a large leaf area of good color. This treatment is fairly representative of the many trees planted in dooryards under sod conditions, where the grass is cut and left on top.

Most of our Ontario soils are deficient in organic matter and, depending on location, deficient in phosphate or potash, or both together. The mineral deficiency should first be corrected by liberal applications of the required fertilizer before placing the plantations in sod, in fact it would pay to do this several years before setting out the trees, growing alfalfa on this land and returning all the hay back into the soil. For plantations already set out these minerals could be placed in a furrow cut just under the outer spread of the branches. Our soils have a high fixation factor for phosphate and potash and we have found that the best practice is to place the fertilizer under the surface either with a deep-placement machine or as outlined above.

After the plantation is in sod an application of 500 to 1,000 lbs. of a 4-8-10 fertilizer every fifth year should take care of the mineral requirements. However, our experience with fruit in general where planted in sod is that not sufficient care is taken to keep the trees well supplied with nitrogen, many growers laboring under the mistaken idea that just the sod is sufficient. Liberal applications of either manure or nitrate in the spring is necessary to make sure that the tree gets its required nitrogen and not just the sod alone. Mineral fertilizers should be applied in the late fall, for under our conditions fixation of phosphate and potash is considerably less at that time. The plantation may be seeded down in the early spring but mulch should not be added until late [Pg 44] fall. Applying the mulch in late fall will allow the material to fill up with water from the fall rains and winter snows, and so prevent the serious withholding of water from the trees during dry spells in the summer, because the light summer rains are seldom sufficient to soak through the dry mulch material. We have had several instances where a summer-applied mulch has seriously robbed the tree of needed moisture during dry weather. Do not look for immediate improvement from sod-mulch, it will take at least two years to become well established. Improvement should begin to show up the second year after applying.

We sometimes see a chlorotic condition of the foliage, different from the pale yellow foliage due to nitrogen deficiency, which occurs on marginal or shallow soil and often where the soil remains too moist, as along a water course or low spot. We frequently see this same trouble on grape foliage in such locations. This is probably due to a lack of sufficient iron intake caused by a deficiency of manganese. It can be cured by either spraying with a 1% solution of magananese sulphate or applying the dry salt under the spread of the branches. The spraying method seems to give better and faster results.

It has been reported from British Columbia that some die-back is due to deficiency of boron. Perhaps some of the die-back we see on nut trees during the summer is due to this cause and not all to winter injury. The very erratic results from ground application of borax would indicate that borax should be incorporated with one of the regular sprays as a 1% mixture.

Our conclusions therefore are that nut plantations should be placed in sod as soon as possible and a mulch established the fall of the year the grass is sown. Each year cut the grass and draw in around the tree to supplement the mulch. If not enough material is gathered in this way it can be supplemented by straw or old hay. Manure or nitrate should be applied each spring and trace elements where needed can be incorporated in the regular spray program.

Discussion after J. R. van Haarlem's paper.

Dr. MacDaniels: "I realize that there are more trees which are starving to death than are being overfed."

Silvis: "Do you recommend that freshly cut hay be used as mulch?"

Van Haarlem: "Any crop refuse can be used as mulch. Anything that will rot down. The pH of the soil should be 6.2 to 6.5."

O'Rourke: "Would you use clean cultivation for the first year?"

Van Haarlem: "There is nothing against it. We use sod mulch at Vineland. The reason that our growers are not growing nut plantations is that good land, that is good soil, sells for $1,000 per acre. Nut trees grown on poor land, cheap land, do not produce."

McCollum: "I am surprised that rain would not go through loose straw and will go through old straw. Where does the rain go when it falls on the loose straw?"

Van Haarlem: "It is absorbed before it gets through the straw. Dry mulch should be 18 inches deep."

Member: "How would you prevent erosion on rolling land?"

Van Haarlem: "Plant on the contour."

Dr. Crane: "How often do you renew mulch under trees?"

Van Haarlem: "After first application additional may be needed but after that enough is grown under trees which when cut and raked will suffice." [Pg 45]

Report from Southern Ontario

ALEX TROUP, Jordan Station, Ontario

Here in southern Ontario we find that most of the northern nuts do well in most seasons. Among black walnuts the Thomas, Ohio, and many others do well. The Thomas does not always fill. The Ohio seems to be the favorite among Persian (English) walnuts. Franquette, Broadview and a few others are satisfactory but sometimes do not fill well. Of Japanese heartnut walnuts nearly all do well. The Mitchell, Stranger, Bates and others are satisfactory.

All the shagbarks and shellbarks are doing well, although only the young shagbarks are bearing, and then only lightly.

Chestnuts have done well at times but some trees have been killed by the blight. We have Japanese, Chinese and some other seedlings. They are sometimes winter injured.

Filberts are satisfactory and usually bear well. We have Barcelona, Du Chilly, Troup, White Aveline, Italian Red, Kentish Cob, Daviana, Mosier, Guy Smith, Nonpariel and Brixnut. The Barcelona drops nearly free of the husk and is a fine nut. Most are of this variety. We do not have hazels.

Pecans will grow and bear but do not fill.

Nut Trees Hardy at Aldershot, Ontario, Canada

O. FILMAN, Aldershot

During the past nine or ten years I have planted a few trees of some of the better known varieties of northern nut species, some of them chosen from the lists of promising selections in the annual reports of the Northern Nut Growers Association, some on the recommendation of reliable nut nurserymen. These trees have been planted here and there in various locations where space permitted on a small fruit and vegetable farm, not in orchard form nor in a solid nut tree planting.

Editor's Note: Anyone reading this paper should remember that it applies to an area of intensive growth of peaches, pears, and other fruits in a bit of Canadian land west of Niagara Falls and protected spring and fall from extremes of temperatures by Lake Ontario on the north and Lake Erie on the south. The paper by H. L. Crane in this report should be read in connection with it.

Aldershot is a fruit and vegetable growing district, about six miles from Hamilton, below the escarpment, on the Toronto-Hamilton lake shore highway. This district is almost at the western tip of Lake Ontario and is more or less a continuation of the Niagara fruit belt which borders the lake. Consequently the climate is not so severe as that of localities situated a few miles farther from the lake and above the Niagara escarpment at higher altitudes. Winter temperatures seldom go much below zero, although, in occasional seasons, temperatures of-20 degrees F., and sometimes even somewhat lower, are experienced.

The soil is a deep, well-drained, light sandy loam, known as Fox sandy loam, considered a good fruit and vegetable soil, if organic matter and fertility are maintained with manure, fertilizers and green manure crops. [Pg 46]

Nut trees, which I have planted, include Chinese chestnut, heart nut, filbert, hickories, butternut, Persian walnut, a few black walnut seedlings and two seedling pecans.

Chestnuts. The native chestnut grew in the woods of this locality before the blight reached it. I have tried eight varieties of Oriental chestnuts, and I have trees surviving of five: Abundance, Hobson, Carr, Zimmerman, and one of Mr. Carroll D. Bush's called Chinese Sweet No. 3. They all came through a temperature of about-20 degrees, early in 1943 (with the exception of Zimmerman which was planted later) without showing any sign of killing back or other visible injury. Unfortunately, I have kept no records of crops but expect to do so.

Abundance. One bearing tree, purchased from Mr. Bush of Oregon, and planted in the spring of 1938. Bore a few burs in 1941. Bore a crop in 1944, missed 1945, a good crop in 1946. It is bearing what appears to me to be quite a heavy crop this year, 1947. Blossoms in July. Bears a good-size, attractive nut, which falls free from the bur, ripening in early October. Abundance has made the best growth of any of the varieties and appears the most promising.

Hobson. Two trees, one, planted in 1940, bore its first crop in 1946; the other, planted in 1943, not yet bearing. Has been a little disappointing, in view of the very favourable reports of its performance in more southern locations in the United States. Probably it is a little too far north of its natural environment. In some seasons it has made rather good growth, but not as vigorous as that of Abundance. It bore a fair crop in 1946, however, of attractive nuts of about the same size as Abundance. It ripened in late October about two weeks later than Abundance. These nuts germinated well this spring when planted in pots in the greenhouse.

Carr. One tree surviving, planted in 1940. Two others, planted in 1943, have died, but I do not believe that winter injury was the cause of their death. Has grown slowly, bearing in 1944 and 1946. The nut is much smaller than that produced by the same variety at more southern latitudes, judging from descriptions of it which I have read. The nut is much smaller than that of Hobson, as grown here. This small tree bore a tremendous crop in 1946, more than I thought any tree of its size could support. The tree was literally covered with burs. The nuts were very small, not larger than a small native chestnut. They ripened early, beginning to drop from the burs by September 25th. I stratified most of the nuts in pots of soil and planted 206 nuts from this little tree, which is only about seven feet high and not at all spreading. Germination was good.

Zimmerman. One small tree planted spring of 1945. Not bearing yet. Is not growing fast but appears healthy with good foliage.

Chinese Sweet No. 3. Purchased from Mr. Bush in 1938. Planted at the same time as Abundance, which Mr. Bush at that time called Chinese Sweet No. 1. He later named No. 1 Abundance, but did not consider No. 3 worthy of naming. Has grown well, but has borne very few nuts. Mr. Bush discarded it for the same fault. [See comment following.—Ed.]

I have also tried and lost the following varieties: Connecticut Yankee, Austin Japanese and Stoke hybrid.

I have quite a number of young seedlings of Abundance, Carr and a few of Hobson, from seed produced on my own trees, some of which I hope to allow to bear in order to see if anything promising shows up among them. The Abundance seedlings seem to inherit the superior vigour of their female parent. [Pg 47]

Heartnuts. The Japanese walnut grows vigorously. I have planted a few of Mr. J. U. Gellatly's varieties, as well as the Wright heartnut. All of the ones planted seem perfectly hardy and at home. I have only one tree of each variety.

O.K. From J. U. Gellatly, planted in 1942. Transplanted 1944. Bore its first nuts, one cluster, in 1946. Cracking and extraction of kernel were excellent. The flavour was fine. Size of nut about medium.

Okanda. From J. U. Gellatly, 1942. Said by Mr. Gellatly to be a hybrid between heartnut and native butternut. Tree vigorous. Nut has a smooth shell like a heartnut. Cracking and extraction good. Flavour excellent. Nut about size and shape of a medium-sized heartnut. Bore its first crop in 1946 and is repeating this year with a fair crop.

Crofter. From J. U. Gellatly, 1942. Also said by Mr. Gellatly to be a hybrid between heartnut and butternut. Tree vigorous. Bore its first crop in 1946 and has a few nuts this year. The nut has a comparatively smooth shell like a heartnut, is somewhat larger than that of Okanda but does not crack as well, or rather the kernel does not come out of the cavity nearly so well as that of Okanda. Flavour fine.

Canoka. From J. U. Gellatly, 1944. A pure heartnut. Tree very vigorous. Bearing its first crop this year, several clusters.

Slioka. A new heartnut from Mr. Gellatly, planted in 1945. Tree growth is vigorous. Is bearing one nut, its first, this year.

Wright. From Benton and Smith nurseries 1946. Seems to be hardy. Tree growth has not been very strong but appears healthy.

New, un-named heartnut. From J. U. Gellatly, planted in the spring of 1944. A new selection which Mr. Gellatly has not named. The tree has grown vigorously and it is bearing its first crop of several clusters of nuts.

Butternuts. I have only one grafted butternut tree, a Crax-ezy, from the Michigan Nut Nurseries in 1940, transplanted in 1942. The tree has been hardy and healthy but has not grown very vigorously. It is bearing its first crop this year.

I had one tree of the Sherwood butternut, planted in 1938, which died last winter as a result, I believe, of a heavy infestation of oyster shell scale which I did not control soon enough. Sherwood bore early and heavily. The nut was extremely large but did not crack at all well.

Persian walnut. Only one grafted tree, a Broadview, from Mr. Gellatly, planted in 1942, transplanted in 1944. Has been hardy, but has just begun to make really good growth, this year. Has not borne.

Filberts. I have planted four of Mr. Gellatly's varieties, namely Craig, Brag, Comet and Holder, as well as Barcelona, Cosford, Medium Long and Buchanan. Craig and Brag are the only ones which have borne. Trees of those varieties planted in 1942 bore their first crop in 1946. They have very few nuts on them this year. All varieties seem to be winter-hardy in the wood. Craig, [Pg 48]
Brag and Comet, the only ones which have borne staminate flowers do not seem too hardy in the catkins however. Nearly all were killed, last winter, although the temperature scarcely went as low as zero. Mr. Gellatly states that their catkins survive much lower temperatures than that in the west. Some other factor than low temperature probably is accountable. (See paper by H. L. Crane in this report.—Ed.)

Cosford, Medium Long and Buchanan were planted in the fall of 1946, and hence it is too early to have any information on their hardiness. They survived their first winter in good condition and have grown vigorously this summer.

Hickories. Only three grafted trees surviving.

Pleas hybrid. One tree, planted in 1938, has been perfectly hardy, having come through several severe winters without any sign of injury. It has made good growth and has developed into a fine shade tree for the lawn but has not borne. It has had many staminate catkins for several years.

Barnes. One small tree, planted in the spring of 1946, has made slow but healthy growth and appears to be hardy thus far.

Miller. One tree, planted in 1946, is still living but very weak.

In addition to these named varieties I have a number of seedling black walnuts, butternuts and heartnuts, which I hope to topwork to named varieties; also two seedling pecans which are making surprisingly good, thrifty growth. The pecan seedlings have been quite hardy.

Discussion after Mr. Filman's paper.

Stoke: "Hobson is not as large as Abundance. Abundance is always larger than Hobson. Carr always produced better nuts than Hobson. Mr. Filman finds that Carr has very small nuts. I am surprised to see a reversal of performance between Ontario and Virginia."

McDaniel: "Mr. Bush now reports that his No. 3 chestnut has borne better crops recently. Abundance has not survived in TVA tests at Norris."

Report from Echo Valley, 1947

GEORGE HEBDEN CORSAN, Islington, Ontario

The Northern Nut Growers Association visited Echo Valley, Islington, Ontario, September 5th on the field trip following their annual convention at Guelph. Some 15 species of nuts and nearly 400 varieties are growing there. The filberts drew a lot of attention, as the most of them were seedlings and quite large, some larger than the largest Oregon varieties. The seeds planted were: Italian Red. Du Chilly, Giant de Halle, Brixnut, Bollwyller, Cosford, Daviana, and Jones No. 1 Hybrid. The policy followed has been not to discard a plant because it bears small nuts or no nuts at all, because such trees may bear hardy catkins that live through the winter. The female blossoms of filberts are very hardy but many male blossoms may be killed during cold winters.

Years ago the Dominion Department of Agriculture declared that filberts, chestnuts and Persian (English) walnuts could not be grown north of Lake Ontario. I would grant that they grow better south of the lake. However, the filbert crop this fall south of the lake was very poor and scanty, [Pg 49] whereas mine was large and in fact the largest I ever had. My Winkler and Rush hazelnuts are crowded on the branches. And the same with the English walnuts. My crop on the larger trees could not be better. The Thomas black walnut, as well as other black walnuts, Jap heartnuts, hybrid butternut x Japanese heartnut cross, chestnuts and hickories are very large.

Hicans and northern pecans do not develop north of Lake Ontario. Down in the very southwest corner of Ontario, north of Lake Erie, some small pecans have cropped well on trees. As a curiosity pecan trees are quite hardy here, but we lack length of season to mature the nuts properly. No Weiker hickory hybrid crops and ripens well here. This nut is one of the very few crosses between shellbark and shagbark hickories, (**Carya laciniosa**) western and (**Carya ovata**) eastern, hickories.

I have some crosses between the Chinese and Japanese chestnuts that I am watching. I have one European x American cross chestnut, the Gibbons, and one native (**Castanea dentata**) that have escaped the blight. So far this year I have found only one blighted chestnut limb and I promptly cut it off and tarred the cut well.

At least I have persimmons hardy enough to stand the winters north of Lake Ontario, but I am not sure about the pawpaw. This fruit seems to require shade from the winter's sun.

Many but not all of the Crath importations of Persian walnuts from the Carpathians are hardy and much more so than the Pomeroy varieties. Even the Broadview is not hardy as many of the Crath varieties. Rev. Crath did an immense service to us by his importations which far exceeded our highest expectations. I have here nearly half a hundred varieties of **Juglans regia** that are doing well, especially the three Rumanian giants that ripen so well here.

List of Some of the Larger and More Important Trees at Echo Valley, Islington, Ontario

Black Walnut

Stambaugh 1926—1st prize.
Thomas from J. F. Jones, late ripener.
Troup, cracks out whole in spring.
Hepler, from Miss Riehl, a long nut.
Elmer Myers, excellent flavor, the thinest shell.
Snyder, medium size, large kernel.
Tasterite, a small nut, origin New York State.
Clark, origin Iowa, very large nut.
Gifford, bears very heavy crop every second year, ripens before Thomas.

Persian (English) Walnut

David Fairchild, seedling Rumanian giant.
Senator Pepper, seedling Rumanian giant.
Paul de Kruif, seedling Rumanian giant.
Chinese, very hardy, medium size.
Broadview, from British Columbia but originally from Russia.

Hickory

Neilson, a true shagbark, nut large flat and very thin shell, flavor is wonderful. A big tree on highway 24 not far south of where Alexander Graham Bell perfected the telephone.
Hagen, a true shagbark, a fast grower. [Pg 50]
Hand, a shagbark.
Weiker, a shellbark and shagbark cross, a large, heavy bearing nut that ripens here north of Lake Ontario. Excellent flavor, grafted on pecan.
Papple, a small good shagbark, cracks out whole.

Anthony No. 1 shagbark.
Glover, from Miss Riehl.

Heartnut

Wright, a good bearer and excellent cracker.
Stranger, very heavy bearer, excellent cracker.
Gellatly.

Filbert

Italian Red, medium long with wide base.
Bollwyller, large round.
Du Chilly, long smooth.
Many seedlings of named varieties.

Chestnut

Gibbons, Miss Riehl, hybrid European American.
Chinese, test not completed.

Jap Butternut

Helmick, from Miss Riehl, 14 cluster, regular bearer, very thin shell, grafted on black walnut.

Report from Beamsville, Ontario

LEVI HOUSSER

About twenty years ago I started to plant nut trees, as I decided nuts were the solution to good health, which I later found was correct. Most of my first trees died. I started gathering nuts all over the country until at last, near my own home, I found a neighbor who had ten trees and two out of the ten were bearing large size nuts of an excellent flavor. I also added filberts to my collection.

About this time I learned of Prof. Neilson, so I went to see him in Guelph. He told me about the Northern Nut Growers Association. I also learned about Mr. Corsan and his work at Islington so I went to see him. He also told me about the Association so I went to the next meeting and joined up. I began to add more varieties to my plantings. My first four acre planting was seeded with oats the second year. All my tress had a nice start. I spent some three hundred dollars that year for grafted nut trees. That second fall I hired a man to watch and stand by each tree as the binder passed. It was impossible for me to be there. The man who cut the oats in his own stubborn way went alone and cut everything as he went, trees and all. My heart was nearly broken! I started again. I bought nuts of good varieties from all over. I decided to make a little nursery this time then plant out after the trees got bigger. Just as I got this started nicely the war came. I also had a fruit farm where I now live besides also planting some grafted stock here. My nursery, seventy-eight miles away on my fifty acres, I had to leave as gas was rationed and I was forced to sell, so remaining there are about one hundred trees which I shall watch. My best trees died but I kept [Pg 51] going on planting every year. Today, after all the calamities I had, I have around two hundred trees living.

This year I expect two bushels of heartnuts; about two bushels of filberts; some extra nice ones that ripened early, large and well filled; about two bushels of black walnuts, some very promising. Besides these I have about fifty trees of the Carpathian walnuts from which I have gathered about two quarts of nuts. My oldest tree is ten years old. One I grafted on black walnut stock and it is a very large nut. I gathered five nuts from this. The graft is now five years old. Hundreds of nuts started; nearly all dropped off. Possibly as the tree gets older it will do better as I have planted several other nut trees not far away to help with cross pollination.

I have some good sized butternuts and I gathered about 17 quarts of these so I expect to have enough nuts to supply my daily needs from now on from my own plantings. After twenty years of hard work and with an outlay of at least $1,000, my trees, as they grow up around me, are like children to me. They supply me with food. My nervousness was cured by them and my health has returned.

My worst enemy here with filberts is they start to grow too early, then a frost comes and they are done after a week or two of nice weather. Even though we have this trouble we gathered nearly two bushels from 25 trees which are eight years old.

Our lowest temperature here was 20 below zero a few years ago. My Carpathians did not seem to mind that nor did the heartnuts. From now on I am planning my own little nursery and do my own grafting as well. I top work my young trees that show poor nuts.

Nut Growing in New Hampshire

L. P. LATIMER, Assistant Horticulturist, University of New Hampshire, Durham, New Hampshire

At the present time there are no nuts grown commercially in New Hampshire. Those gathered by the residents of this state for home use or local consumption are comprised almost entirely of butternuts from wild seedling trees and nuts of the native hickory. The butternut is the most highly prized among our native nuts. It grows wild over a large portion of the state. The hickory nuts take second place, probably because of their smaller size and the greater difficulty involved in removing the meat from the shells. Black walnuts are occasionally found but do not seem generally as popular.

Dr. A. F. Yeager of the Horticultural Department of the University of New Hampshire, Durham, New Hampshire, has several times called for specimens of superior butternuts grown in the state. These have been tested for their cracking ability, and size of kernel and ease of removal from the shell in halves or as whole meats. Several very fine specimens have been collected, but progress in the development of these better types has been impeded by the difficulty involved in trying to propagate them vegetatively. The New Hampshire Horticultural Department would gladly welcome any information concerning the propagation of the butternut that would make grafting or budding successful.

The best possibility in developing commercial nut crops in New Hampshire apparently lies first in [Pg 52] the use of the hazel or filbert. Although the European filbert has not been very successful, such varieties of the American hazel as Winkler and Rush look promising. The Winkler has borne heavy crops but in a short summer season the nuts do not always mature fully in the fall. Although we have had much less experience with the Rush variety, this does mature earlier in the fall and seems promising. Some of the Jones hybrids have been tested at the Experiment Station in Durham, a few of which have done quite well. Of these Jones hybrids No. 1181, 1154, and 1094 have made quite vigorous growth. Seedling No. 1094 has been outstanding, producing good sized nuts which mature well and shell out easily from the husks. In type and flavor of nut it resembles the European hazel quite strongly under our conditions.

So far, none of the chestnuts, including the Chinese species, have shown great enough resistance to chestnut blight to warrant their recommendation. We still hope that we may discover a good chestnut for this section. The hardy Persian or English walnuts have not been tested long enough to warrant any conclusion as to their promise for New Hampshire; one difficulty will probably lie in the fact that the nuts of some do not ripen properly under our cool, short summer conditions.

Mr. Matthew Lahti of Wolfeboro, New Hampshire, has been experimenting with various species and varieties of nuts for that section. His location on the shore of Lake Winnipesaukee undoubtedly presents a more favorable site for growing certain types of nut plants than exists here in Durham, or most other parts of New Hampshire. At the present moment I have on my desk a parcel received from Mr. Lahti containing some fine specimens of one of the hardy Persian walnuts which he is growing in Wolfeboro. The unusually warm and dry late summer and fall of this year have favored the maturity of this walnut. (For a detailed description of Mr. Lahti's experience with nut varieties, please refer to his paper printed below.)

Nut Notes from New Hampshire

MATTHEW LAHTI

Not being able to attend the annual convention I thought possibly some of the members might be interested in the following random notes of an amateur nut grower.

My place is in Wolfeboro, N. H., which is situated in the eastern end of Lake Winnepesaukee, 43 degrees, 35 minutes north latitude; elevation above sea level, 687'. The elevation of the lake is 504'. Wolfeboro is just about at the northern fringe of the climate where peaches will ripen, that is during favorable years in favored locations. Improved varieties of field corn will ripen during favorable seasons. It also happens to be the northern fringe of the American chestnut, in favored location. I have discovered a number of saplings that are still alive. As a matter of fact, three or four years ago I was fortunate in finding some ripened nuts, but the trees that bore those nuts have since died of the blight. While a certain variety of old fashioned sweet cherry will live and bear fruit, some of the recent improved varieties will not live. Every one that I have planted was winter-killed. The Montmorency cherry, however, does well. It is also the northern limit of the pignut. Butternuts do very well. [Pg 53]

DDT Dust versus Butternut Curculio

I was prompted to write this note by reading Mr. S. H. Graham's article entitled "An Experiment with DDT" appearing on page 101 of the 1945 annual report, in which he states that the butternut curculio did not survive DDT powder.

In the past four or five years the butternut curculio (identified as such by Prof. Conklin of the University of N. H.) has all but ruined my Crath Persian walnuts and heartnuts, so, acting on the basis of Mr. Graham's experiment, I had my trees dusted early in the morning when the dew was on the leaves, using a 10% DDT powder, the first time about May 30 and again two weeks later, and I am happy to say that this dusting has been very effective. I have been unable to find any sign of curculio injury this year, although I have seen it nearby on some native butternut trees.

My Gellatly heartnut was riddled by the curculio last year. This year, when the dusting was done, this tree was overlooked, so I undertook to dust it myself, and not realizing that the Niagara duster which I used was set in the closed position, I dusted the tree with considerable effort. In spite of the small amount of dust that came out, it proved sufficient to keep the curculios away or else to kill them so that there is no sign of any damage at this writing.

Persian Walnuts

In the spring of 1938 I planted a number of Crath Persian walnut seedlings. Out of possibly eight or ten, only two survive. (I gave each one about three years, and if it showed serious winter injury, I pulled it up.) I was pleasantly surprised the other day to discover that one of them has borne a single nut this year. This particular tree is at least 300' from any other Persian walnut, so it looks as if it were self-fertile. It now remains to be seen whether or not the nut will ripen.

In the spring of 1940, I planted a Broadview Persian walnut graft on black walnut stock, and this tree is bearing for the first time with eighteen nuts showing. Three or four years ago this Broadview suffered some winter damage by a split trunk and split lower branch. I painted over the cracks with gasket cement, and they are now healed. The Broadview has also shown some winter-kill of terminal twigs, but not enough to affect its bearing this year. There has been no splitting of the trunks or branches of the two surviving Crath Persian walnut trees and no winter injury to terminal twigs. The Crath walnut trees are now 18" in circumference a foot from the ground and about 12 to 15' tall. The Broadview on the black walnut stock has a circumference of 16" above the graft and 15¼" below the graft, tending to show that the Broadview grows faster than the black walnut.

It is interesting to note that the Broadview blooms a week or ten days later than the Crath Persian walnut, and at the same time as the native butternut.

Black Walnuts

I have planted a few Thomas black walnut seedlings, two grafts, and a Tasterite black walnut graft. A Thomas black walnut graft has borne nuts in three different years, including this year. The graft was sent out in the spring of 1939, and the seedlings were set out in the spring of 1940. The seedlings have not yet borne. The Thomas black walnut graft last bore three years ago, when the nuts on the whole ripened and were well filled. We had a very cold spring in 1945, so much so that apples were almost a total failure. [Pg 54]

I also planted a Tasterite black walnut in the spring of 1939, and this is the first year that it has borne any nuts. It remains to be seen whether they will be filled out or not. There is, however, an important difference between the Thomas and the Tasterite, which are growing only 50' apart, namely that the Thomas suffers from winter injury to the terminal twigs each year, whereas there has not been any sign of such injury to the Tasterite.

Hickories

I have planted possibly two dozen of a number of varieties of hickories, of which only nine survive to date, the cause being not winter injury but what appears to me to have been improper circulation through the graft union. They would struggle along for three or four years (producing suckers from the root stock which I broke off), and then die. None of these has borne any nuts yet except the Weschcke, which was planted in the fall of 1941, and which is now bearing one nut. This nut is a mystery to me because the tree bore no catkins. There are no hickory trees within thirty miles of the vicinity to my knowledge, and the nearest pignut tree is perhaps three-quarters of a mile distant, in a direction against the prevailing winds, the intervening space being forest. Could it be possible that the Weschcke hickory was pollinated by a butternut or the Broadview Persian walnut? A big butternut tree stands within 60' and the Broadview is situated about 150' distant.

Heartnuts

I have tried a number of heartnuts, including the Gellatly and the Wright. Only a single Gellatly survives. Here again the cause was not winter injury so much as either the butternut curculio or other causes. The Gellatly, while suffering some terminal twig winter injury and deer damage by rubbing of horns, has borne and ripened nuts.

Filberts and Hazelnuts

I planted a number of Winkler hazels in the fall of 1940, and this is the second year of bearing. The nuts hardly have time to ripen in our climate and a good many of the catkins get winter-

killed.

In the spring of 1939 I planted a number of filbert seeds received from Mr. Slate such as No. 128 Rush Barcelona; Medium Long; and Red Lambert. These are bearing for the first time this year, and judging from the size of the nuts now, it looks as if they will mature. Many of the catkins were winter-killed.

Bixby and Buchanan planted in the spring of 1939: While the plants did very well, most of the catkins invariably were winter-killed, so I was obliged to pull them up.

I have a feeling that filberts would do better here if it were not for the very cold winds that blow off the lake in winter, killing most of the catkins.

I discovered a wild hazel in Lexington, Mass., (which town is located in a so-called cold air pocket) the nuts of which are almost equal to the Winkler. I have transplanted some of these to Wolfeboro and shall know more about them later. I also discovered some wild hazels in northeastern Maine, between Lincoln and Vanceboro on the border of New Brunswick, Canada, [Pg 55] which two weeks ago had good sized, well filled nuts on them. I have also transplanted some of these to Wolfeboro.

In closing I should like to thank all officers, committee members, and others who are responsible for the annual report. To those of us who do not get to the conventions very often, the report is the Northern Nut Growers Association, and a source of very valuable and interesting information, especially to an amateur like myself.

A Simplified Schedule for Judging Black Walnut Varieties

L. H. MacDANIELS and S. S. ATWOOD, Cornell University

All its members would agree that the Northern Nut Growers Association should have an officially accepted schedule for judging black walnuts and the other kinds of nuts with which it is concerned. Some yardstick is needed to serve as a basis for the comparison of varieties which the members of the Association will use. Persons familiar with nut varieties are freqeuntly asked to answer questions about the best varieties to plant. Of course there is no simple answer to such a question as many factors besides the nuts themselves determine the value of a variety. The quality and value of the nuts are, however, the most important initial consideration in selecting a variety on its merit and there should be some objective test adopted to aid in evaluating nut samples.

During the many years that the Northern Nut Growers Association has been operating more than a hundred and fifty varieties of black walnuts have been named. Yet at the present time we are not certain which are the better varieties except in a very general way. There is no widely accepted judging schedule being used as is evident in the tables published by Seward Berhow in his paper in the 1945 Proceedings (2). In these tables scores are given but these come from several sources and are not comparable and hence are of little value in making comparisons.

There have been many schedules for judging black walnuts presented in the past. One of the first was proposed by the late Willard G. Bixby (3, 4). This was complicated and never came into general use although the testing done by Mr. Bixby was a valuable contribution to our knowledge of varieties. The late N. F. Drake tested many varieties through the years according to a schedule of his own devising (5, 6). Professor Drake's schedule was related to his concept of a perfect walnut and the various values were related to this on a percentage basis. This schedule never had wider acceptance, chiefly because it was too complicated and required too much figuring.

Mr. C. A. Reed has probably tested more varieties of nuts and is more familiar with varieties than any other person but he does not have a definite scoring schedule. Kline and Chase (7) summarized results of the testing work that had been done and Kline (8) compared varieties according to a system which he devised in which they were rated in terms of return per hour of labor spent in cracking and extracting the kernels. Mr. C. C. Lounsberry has proposed a method of scoring which was related to kernel cavity measurement (9).

In 1935, a Committee on Varieties and Standards endeavored to formulate a working schedule [Pg 56] that would be adopted as official. This committee set up a score that represented the best thinking of the group at that time (1). Twenty-five nut samples were used. The score was the sum of the weight of an individual nut in grams plus twice the per cent kernel of the weight of the nuts recovered in the first crack plus the total percentage of kernel plus 1/10 of a point for each quarter kernel recovered. Penalties were proposed for shrunken kernels and empty nuts. Through the years a large number of samples have been tested according to this scoring schedule (11). In 1943, MacDaniels and Wilde (12) summarized the previous work done, added many tests and evaluated the scoring system. This was not considered to be altogether satisfactory. In the first place, it was somewhat cumbersome and had never been adopted by the Association nor had it been used much by others. The figuring of percentages and penalties made a score too involved for wide aceptance. A very serious difficulty was the problem of shrunken kernels and empty nuts. Obviously, with a score related to the weight of the sample before cracking, the inclusion of a number of empty nuts made it impossible to make any accurate

correction in the percentages that were used in the score. Penalties did not solve the problem. Also the initial weight of the sample varied with the amount of husk clinging to the shells. From this work it was evident that an acceptable score would have to be formulated on some other basis.

The next approach was to analyze data of this type statistically in an attempt to devise a better scoring system (1). The results from such a study proved valuable in answering such questions as 1) the size of sample necessary to obtain significant differences between samples; 2) the significance of small differences in measurements or in scores and 3) the amount of variation that is normal and without significance in comparing varieties.

The following qualifications were considered essential to a workable schedule:

1) The schedule must be easy to use.

2) The schedule must concern itself with objective qualities or characters which can be weighed or measured. It cannot be concerned with flavor and other characters upon which there may be disagreement and which depend upon personal preference.

3) Characters must be avoided which vary with the treatment of the samples themselves such as color of kernels.

4) It must give a score that will separate samples on small differences.

Considering the problem from these angles and scrutinizing the older schedules, a number of ideas came out. First of all, why include the shells? If shells are discarded a number of problems would be solved, such as the cleaning of the nuts and adjustments for shrivelled and empty nuts. Also, why reduce any of the weights or measures to percentages which only add to the complexity of the score? The actual amount of kernels recovered reflects both the size of nuts and the yield of kernels. Plumpness of the kernels is reflected in the total weight of kernels and does not need to be considered separately.

The important elements in a score were considered to be:

1) The crackability of the nuts of the variety. This is measured by the weight of kernels obtained in the first crack. [Pg 57]

2) The yield of the variety. This is measured in the total weight of kernels.

3) The marketability of the product. This can be measured by the number of pieces in the sample. In general, the smaller the number and the larger the size of the pieces the better the marketability.

With this general background in mind, many samples were tested and the results published in the 1945 report[1]. In order to secure the data needed the kernels of the individual nuts in the samples were weighed separately.

NOTE: All samples were cracked with the (John W.) Hershey nut cracker.

Some of the conclusions drawn from these tests were as follows:

1) Using kernel weights only gives a rapid and accurate test of differences between varieties.

2) Ten nuts are adequate for a single sample.

3) The location of the tree with reference to climate and soil is probably the most important single factor influencing kernel yield. No evidence was obtained, however, to indicate that the varieties ranked significantly different at different locations.

4) If reasonable care is used in cracking the differences due to different operators tend to be non-significant.

The statistical proof that a ten-nut sample is adequate and that differences between operators are not significant are two findings that are important in setting up a schedule.

During the past year further testing has been done, in which scores were computed from ten-nut samples.[A] The samples had preliminary cool, dry storage to assure comparable moisture content. Enough nuts were cracked in each sample to secure ten that were well filled. Empty nuts were recorded. The following data were kept for each sample:

1) The weight of the kernels recovered in first crack in grams.

2) The total weight of the kernels in grams.

3) The number of quarters and number of halves recovered.

Scores were computed as 1) the weight of the first crack in grams plus 2) half of the total weight of the kernels recovered in grams plus 3) the number of quarters divided by four and, 4) the number of halves divided by two. In this score, it was considered that the crackability of the sample was measured by the weight of the first crack; the yield, by the total weight of kernels secured from the sample; the marketability by the number of quarters and halves. From the use of this schedule scores were secured ranging from 83.9 for the variety Thomas grown in Maryland to 37.4 for the variety Huen, which is a small nut giving relatively small kernel yield.

Analyses of the data to determine the percentage of the score that was derived from each component showed that crackability as measured by the weight of the kernels recovered in first crack gave an average of 54% of the score with a range of 49 to 58 for the different samples; yield, as measured by total weight of kernels divided by two, 31% with range of 27 to 34%; marketability measured by number of quarters divided by four 14% with range of 10 to 22% and number of halves divided by two 1%. The percentage of the score derived from the number of halves was so small as to be negligible. It seemed better, therefore, to base the score on only three elements, namely, the weight of the first crack, the total yield of kernels and the number of quarters recovered from the sample. [Pg 58]

On this basis the problem becomes that of deciding the weights that should be given to these three components. The score as set up emphasizes the crackability of the variety much more than its marketability. This seems logical because the value of a variety is in large part dependent upon the ease of recovery of the kernels on first cracking. Several different combinations of the weighting of these three components were considered and it was decided that the most logical was to weight the elements as follows: 1) The weight of first crack in grams. 2) The total weight of the kernels divided by two and 3) the number of quarters recovered divided by 2. If there are halves, each half would count as two quarters.

Table I. Average scores from 18 black walnut samples cracked by three operators and computed by two scoring systems.

Variety	Source	Year	Scoring Systems[3]	
			I	II
			points	points
Thomas	Maryland	'46	83.9	93.1
Snyder	Ithaca, N. Y. (A)	'46	81.8	89.2
Ohio	Maryland	'46	79.5	88.9
Thomas	Ithaca, N. Y. (A)	'46	76.4	85.5
Norris	Tennessee	'45	76.1	83.9
Stambaugh	Ithaca, N. Y. (A)	'46	75.9	81.0
Stambaugh	Ithaca, N. Y. (A)	'46	74.0	83.2
Thomas	Tennessee	'45	71.5	79.6
Thomas	Ithaca, N. Y. (B)	'46	65.7	74.6
Cornell	Ithaca, N. Y. (C)	'46	59.3	67.6
Stabler	Maryland	'45	56.9	64.5
Cresco	Ithaca, N. Y. (A)	'46	55.8	65.2
Seedling No. 1	Geneva, N. Y.	'46	52.7	62.2
Seedling No. 3	Geneva, N. Y.	'46	50.6	59.0
Brown	Ohio	'45	49.7	59.4
Stabler	Tennessee	'45	47.5	51.4
Seedling No. 2	Geneva, N. Y.	'46	44.4	52.2
Huen	Iowa	'46	37.4	44.9
Least significant difference (5%)			6.3	6.6

Calculating the percentage of each component in the total score on this basis gives crackability 48%, yield 27%, marketability 25%. This schedule gives relatively more weight to marketability as against the other two components. The average scores of 18 samples cracked by three operators and calculated on both the above described schedules are given in table I. [Pg 59]

The table shows that the rank of the different samples was not changed materially by using only the three components, except in a few cases in which there were an appreciable number of halves. The Stabler has many one-lobed nuts which increase the number of halves recovered. It is to be noted that with both schedules the least significant difference at the 5% level is about 6 score points.

Table II gives the score calculated by schedule II for five samples, each cracked by six operators. The difference between operators is not significant but the difference between varieties is highly significant.

Table II. Scores from five samples of black walnuts each cracked by six operators according to scoring schedule II.

			Operators						
Variety	**Location**	**Year**	**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Snyder	Ithaca, N. Y.	'46	89.2	87.3	78.9	94.4	87.5	91.5	86.5
Thomas	Ithaca, N. Y. (A)	'46	83.5	79.2	83.1	78.0	84.2	83.8	83.6
Thomas	Ithaca, N. Y. (B)	'46	73.1	67.4	73.4	74.1	69.6	83.8	73.6
Cresco	Ithaca, N. Y.	'46	66.0	69.2	63.1	67.2	68.5	60.2	65.7
Brown	Ohio	'45	62.5	51.0	65.4	60.4	48.1	64.8	58.7
Average			74.9	70.8	72.8	72.8	71.6	78.8	73.6
Least significant difference (5%) for variety averages									6.2

A third scoring system, involving 1) weight of kernels in grams for the first crack, plus 2) total weight of kernels, 3) all divided by the number of marketable pieces (as counted following sifting on a ¼" round hole screen) was tried, and the resulting ranking of the varieties was very similar to that obtained with systems I and II. The results from this system appeared to be the most precise, but it was not considered as generally acceptable as system II, since the latter would be easier to record and calculate.

It is the opinion of the authors that Schedule II gives a score that estimates very well the relative merit of the samples tested as to crackability, yield and marketability. It is simple to use and the only equipment required is a scale accurate to 1/10 gram. Calculations are reduced to a minimum and the characters used are not dependent on judgment of the individual making the test. It should be pointed out, however, that differences in score of less than six points are not significant on the basis of testing done to date. As more tests are made this value may be reduced. The schedule should serve as a measure to establish differences between varieties, particularly when a considerable number of tests are made. It can also be relied upon to measure differences due to the location of trees of the same variety, variation of the same variety from year to year in the same and in different locations and differences of a similar nature. In ranking varieties which have scores within the limits of variability, it will be necessary to use judgment as to small differences of appearance. No scoring schedule can be expected to entirely eliminate the judgment of experts. Also it must be realized that characters other than the nuts, such as bearing habit, hardiness, yield of trees, disease resistance and the like must be considered in finally establishing the value of a variety. [Pg 60]

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Test Plantings of Thomas Black Walnut in the Tennessee Valley

SPENCER B. CHASE, Tennessee Valley Authority

Native black walnut occurs abundantly throughout most of the Tennessee Valley. Practically every farmer has at least one "favorite tree" and each fall he collects nuts from that tree and stores them for cracking during the winter. In some sections of the Valley walnut cracking in the home is of considerable importance. Each year, some million and a quarter pounds of kernels are cracked out at the five modern cracking plants located in or adjacent to the Valley. Utilization of the crop is becoming more and more complete.

In early studies of native nut trees, TVA recognized the possibilities of black walnut, especially the improved varieties. Here was a tree that produced not only valuable nut crops but also cabinet wood without equal; in addition, it was a desirable pasture shade tree. Black walnut has long been a favorite among farmers, but few of them had ever heard of **improved** black walnuts. Along with TVA, the state agricultural extension services saw the advantages of the improved varieties and were eager to test them under Valley conditions. And so it was that a cooperative testing project was developed. TVA produced the trees and the seven Valley state extension services distributed them to farmers for test planting.

The Test

The Thomas walnut was used in these test plantings for several reasons. In the first place, it produces large, rather thin-shelled nuts with good cracking qualities. Few varieties are more easily cracked with a hammer or a hand-operated cracking machine. In addition, fast growth is characteristic of the variety and it should produce merchantable sawlogs earlier than the common walnut. Despite its northern origin, 5-year-old plantings at Norris, Tennessee, seemed well adapted to Valley conditions. No other variety at the time offered as many advantages. [Pg 61]

Test planting was begun in Tennessee in 1939 and then it was extended to the other Valley states as more trees were propagated. For the most part, planting sites were selected by extension foresters and county agents. If the tests were successful they would automatically become demonstrations, so special attention was given those areas where walnut cracking in the home was an important enterprise. Many of the test plantings were located in communities that had been organized for the study and application of improved farming methods. In general, farmers planted the trees in low, fertile spots not suitable for other uses, along fences, or in pastures if they could be protected from livestock.

Through 1946, 9,614 trees were planted in 3,286 test plantings. They were scattered all over the Valley, in 92 of its 125 counties. The number of trees per planting varied with the availability of good walnut sites. Generally, there were 2 to 4 trees in each planting.

The Results

Getting survival and performance data on these widely scattered experimental plantings presented quite a problem. Examination of a few plantings showed that trees given reasonable care had survived and were beginning to bear nuts. So in 1946, the farmers who had planted the trees were polled by mail for an overall evaluation of the plantings. Questionnaires asking for information on survival, growth, and bearing were sent by the state extension foresters to 3,274 farmers. The return of questionnaires was excellent. Forty-two percent came back and three-fourths of them were filled out completely.

Survival and Mortality Causes. Eighty-one percent of the 1,373 plantings reported on were still active in 1946; that is, they still had at least one living tree. Survival reports received on 3,831 trees planted showed that 2,439 or 64 percent of the trees were living in 1946. Survival was best in the portion of the Valley north and east of Chattanooga; 84 percent in Virginia, 71 percent in North Carolina, and 66 percent in eastern Tennessee. South and west of Chattanooga survival percent was lower: 62 in Georgia, 61 in western Tennessee, 54 in Kentucky, 45 in Alabama, and 26 in Mississippi (Table 1).

Causes of mortality, as reported, were classified in five categories; losses prior to establishment, livestock and destruction, drought, insects and disease, and unknown (Table 1). Cause of mortality was listed as unknown for 42 percent of all trees reported dead. Field experience leads us to believe that most of the trees in this category probably succumbed to improper planting or complete neglect following planting. Many persons do not follow planting instructions; they often substitute their own methods with disastrous results.

Among the reported known causes, drought killed most of the trees—29 percent. We know black walnut is very susceptible to dry weather after transplanting. Weather records for the area show that the early growing season of 1941 was exceptionally dry; 1942 was also drier that average; in 1943 and 1944 near drought and drought conditions prevailed throughout most of the Tennessee Valley. Weather is usually blamed when a tree dies without apparent cause, but in this case the reported mortality due to drought appears reasonable. [Pg 62]

Livestock, mowing, fire, and intentional removal were reported to have caused 13 percent of total mortality. Cows are curious animals and newly set trees seem to arouse all the curiosity in their make-up. Horses and cows apparently do not relish the foliage of walnut trees but they do bite at it, and in so doing usually break down the branches to such an extent that the tree dies. Some trees were accidentally destroyed simply because they had been forgotten. The next highest mortality cause reported was pre-establishment loss; this was blamed for 9 percent of the deaths. Losses resulting from delayed planting were placed in this category, also those where the report was "trees failed to leaf out." Insects and diseases were reported as causing 7 percent of the mortality.

Growth and Bearing. Those who plant improved black walnut trees naturally want to know how soon they will begin bearing. This survey shows that bearing begins much earlier than most people thought. Trees in 32 percent of the plantings established between 1939 and 1944 were bearing by 1946. Of these 342, 113 began bearing 2 to 4 years after planting; 120 bore their first crop after 5 years; 109 began bearing after 6 to 8 years (Table 2). According to the reports, the earlier plantings were slower to come into bearing than the later plantings. This probably is not a true picture. We suspect that after six or eight years the actual date of first bearing had been forgotten in many cases.

Growth was reported in terms of total height for each tree. These heights were then converted to annual growth rates for trees 3 to 8 years old and placed in arbitrary classes are follows: low (less than 1 foot) medium (1 to 2 feet), and high (over 2 feet). Test plantings in North Carolina had the highest growth rate; those in Mississippi, the lowest. In other states, growth rates fell between these two and were quite similar for the most part (Table 3). Average for all trees was 1.6 feet per year. Trees averaging less than one foot of height growth per year were slow to come into bearing. Only 14 percent of the trees in the low growth rate class were bearing. On the other hand, 71 percent of the trees with a high growth rate had come into bearing. Growth of black walnut, following recovery from transplanting shock, depends on site conditions and tree care. Trees set in fertile soil with an adequate moisture supply and kept free of livestock and other damage make rapid growth. Trees set in poor, thin or droughty soil do not make much growth if they survive at all. Black walnut is very sensitive to any wounds and, if subject to mechanical or livestock damage, growth is retarded.

Cases of exceptional growth and bearing were reported. One in eastern Tennessee is worthy of brief description. There were two trees in this planting set approximately 40 feet apart. One was on the edge of a garden; the other, in a chicken run. In seven years the first tree grew to a height of 32 feet—an average growth of 4.5 feet a year. It began bearing in 1943 and produced a crop of nuts each year up to the time of the survey. The 1946 crop, reported as a light one, yielded 3.5 pounds of kernels. The other tree, shown in Figure 1, was 18 feet tall, having averaged 2.5 feet a year. It also began bearing annual crops in 1943, and in 1946 it had a very heavy crop for its size, yielding 2.5 pounds of kernels. Here are two Thomas trees of the same age planted practically side by side; one is almost twice the size of the other, but they both began bearing annual crops three years after planting. [Pg 63]

Field Survey in Sample Area. To check on the adequacy of the questionnaire survey, 108 test plantings in eastern Tennessee were visited and inspected. Forty of these had been reported on by mail; 68 had not. In general, the trees had been planted on the best sites available. Some were set out in farm orchards (Figure 2); a large number were planted in yards as combination nut and shade trees (Figure 3).

Field examination of the 40 plantings which had returned questionnaires revealed conditions very similar to those reported (Table 4). Survival was found to be 75 percent compared with a reported 77 percent. Average tree height was reported as 9 feet; actual height averaged 11 feet. There was some hesitancy in reporting tree deaths caused by livestock; 4 percent was reported while 23 percent was found. Such mortality was usually listed as unknown on questionnaires.

Information collected by field examination of 68 plantings which had not returned questionnaires and the 40 plantings which had returned questionnaires is shown in Table 4. Trees were found to be 2 feet taller in the 68 plantings but these trees averaged one year older than trees in the 40 plantings. Trees in the 68 plantings averaged 13 feet in height compared with 11 feet. Average age at first bearing was very similar. And here is a revealing discovery; livestock, mowing, and fire were responsible for 47 percent of the tree mortality in the 68-planting group, compared with 23 percent in the 40 plantings. This is perhaps one reason why the persons involved in these 68 plantings did not return questionnaires; it also explains most of the poorer survival. A large number of trees were planted in pastures and elsewhere without adequate protection from livestock. Even when cattle guards were used they were generally too small or weak for tree protection. Severe livestock damage resulting in poor growth and eventual death of trees was encountered frequently. We are inclined to believe that livestock accounted for a much higher percent of tree mortality than that reported in this survey.

The high percent return of questionnaires in this survey, followed by a field check in a sample area, provides a good picture of Valley-wide plantings. Since survival was found to be lower in plantings which did not return questionnaires, an actual overall survival of 64 percent may be slightly high. Other spot checks in the field will give more information on this point.

Discussion

Interest in improved black walnut is mounting in the Valley. As the test plantings came into bearing farmers were quick to see the superiority of these nuts over the wild ones to which they had been accustomed. Word spread from farm to farm, and as a result there has been an increasingly large number of inquiries about sources of improved varieties and cultural treatments. The interest was reflected in the questionnaire survey. Nineteen percent of the questionnaires returned contained unsolicited comments of one kind or another. A large percentage of them showed evidence of interest such as: "the nuts are large and easy to crack," "where can I get more grafted trees?" Only 7 percent implied disinterest: "the trees are slow growing," "the nuts are faulty."

This test-planting project will be completed in 1948. The plantings have already yielded much valuable information on the Thomas variety; they will yield much more as the trees become older. [Pg 64] Further studies are planned on nut yield, nut quality, and tree growth in relation to the varying conditions existing in the Tennessee Valley.

Summary

Farmers in the seven Tennessee Valley states established 3,286 test plantings of Thomas black walnut in cooperation with state extension services and TVA during the period 1939-1946. A questionnaire survey in 1946 showed 81 per cent of the plantings still active and 64 percent of the trees living. Tree growth averaged 1.6 feet per year. Age at first bearing varied from 2 to 8 years, with 5 years most frequently reported.

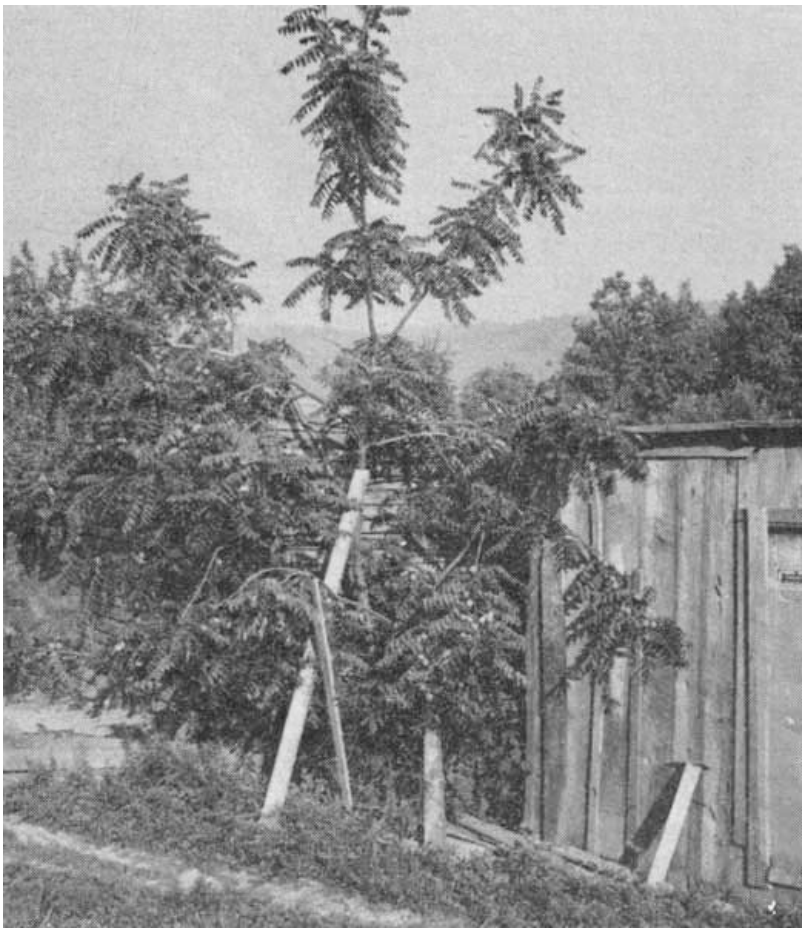

Figure 1. The Thomas variety appears well adapted to Tennessee conditions. This 7-year-old tree began bearing annual crops 3 years after planting. In 1946 it was 18 feet tall and heavily laden with nuts yielding 2½ pounds of cracked-out kernels. (Hancock County, Tenn.)

[Pg 65]

Figure 2. Black walnut makes an ideal combination nut and ornamental tree. This 8-year-old Thomas has been producing nut crops for 3 years. In addition, it has enhanced the beauty of the lawn and provided welcome shade. (Anderson County, Tenn.)

Table 1.—Number of Questionnaires Sent and Returned, Reported Tree Survival and Cause of Tree Mortality by State. [Pg 66]

State	Questionnaires		Trees Reported	
	Sent	Returned	Planted	Living
	no.	pct.	no.	pct.
Alabama	161	44	274	45
Georgia	50	28	26	62
Kentucky	174	49	241	54
Mississippi	19	58	72	26
North Carolina	586	40	733	71
Tennessee, East	1,386	40	1,516	66
Tennessee, West	720	44	809	61
Virginia	180	48	160	84
All	3,276	42	3,831	64

FIGURE 3. Thomas tree planted in the farm orchard. This young tree has received excellent care and began bearing at 5 years of age. (Hancock County, Tenn.) [Pg 67]

Transcriber's note:

It is regretted that Fig 3 was unable to be placed.

Reported cause of tree mortality

Pre-establishment	Livestock, destruction	Drought	Unknown	Insects, diseases	Total Planted Trees

						Lost
	pct.	pct.	pct.	pct.	pct.	no.
Ala.	11	7	51	2	29	150
Ga.	30	10	0	20	40	10
Ky.	2	2	46	4	46	112
Miss.	19	4	49	0	28	53
N. C.	15	16	12	13	44	223
Tenn. (E.)	7	18	20	7	48	515
Tenn. (W.)	8	9	38	7	38	318
Va.	32	12	12	4	40	25
All	9	13	29	7	42	1,406

Table 2. Number of Bearing Thomas Plantings Established 1939-44, by Age of First Bearing and Growth Class.

Plantings		Age in years at first bearing							Growth rate		
Year	Number	2	3	4	5	6	7	8	Low	Medium	High
1939	27			1	6	10	6	4	1	19	7
1940	112		2	14	39	41	16		9	58	45
1941	89	1	4	17	35	32			1	58	30
1942	71	1	12	18	40				1	34	36
1943	38	1	13	24					1	21	16
1944	5		5							2	3
All	342	3	36	74	120	83	22	4	13	192	137

Table 3. Tree Survival, Growth, and Percent Bearing by State and Year of Planting

State	Plantings reported number	Trees, number	Growth, feet	Bearing percent
Alabama	71	124	1.6	65
Georgia	14	16	1.5	18
Kentucky	85	129	1.5	71
Mississippi	11	19	1.0	29
North Carolina	235	518	1.9	25
Tennessee, East	553	1,007	1.5	32
Tennessee, West	318	491	1.6	32
Virginia	86	135	1.6	0
Year of planting				
1939, 1940	255	627	1.6	64
1941, 1942	499	693	1.6	44
1943, 1944	326	558	1.6	18
1945, 1946	293	561	1.5	0
All	1,373	2,439	1.6	32

Table 4. Data Obtained from Returned Questionnaires and Actual Field Examination of 40 Plantings and Field Data Only on 68 Plantings. [Pg 68]

	Data on 40 Plantings	Data on 68 Plantings	
	Questionnaire	Field	Field
Tree Survival, percent	77	75	51
Average Height, feet	9	11	13
Cause of Tree Mortality, percent			
Pre-establishment	33	42	11
Livestock and Other	4	23	47

Destruction			
Drought	13	0	0
Insects and Diseases	8	4	2
Unknown	42	31	40

West Tennessee Variety, Breeding and Propagation Tests, 1947

AUBREY RICHARDS, M.D., Whiteville, Tennessee

I surely wish I could have made the trip to the Northern Nut Growers Association meeting, but I simply had "too many hens setting" at that time. I've been waiting for you [the Secretary] to show up down here for the big news—at least it is to me—if it holds up. If you have ever tried to propagate heartnuts on Japanese walnut you know what it means.

Here it is: Rhodes, Wright and Fodermaier heartnuts patch-budded on 10 Japanese understocks (all I had) took 100%. The same 3 varieties as a control on black walnut gave a take of only 80%.

These trees give me a chance to check on the performance of black versus Japanese stocks for these varieties. From last year's propagation, Rhodes on black is beating Rhodes on Japanese and Bates (which was not used this year) seems fully as good on black walnut stocks.

An isolated tree of Bates did not set a nut. Its pollen all shed before the pistils were receptive. An isolated tree of Rhodes bore a full crop.

Incidentally, a weak chlorine bleach (Clorox) after these heartnuts are hulled does for them what peroxide does for the ladies and makes them look very inviting.

Stambaugh again led in topworked black walnuts, bearing its second consecutive full crop on a 3-year graft. It seems to be immune to whatever it is that causes the other nuts to turn black, shrivel and drop off from the time they set until near maturity. Thomas was second. Snyder, Sparrow and Myers had no crop. I budded 25 more trees of Stambaugh this year.

The Carpathian Persian walnut that we pollinated this spring with Wright heartnuts [no other walnuts were shedding at the time] matured a nice, large, rather pointed, heavy nut. It also matured another nut higher on the tree than we could reach with the catkins, but I'm sure it's a blank. It is still more pointed than the well-filled nut. The good nut is stored for planting.

Rush hazel that set fruit last year with the help of a bouquet of native [West Tennessee] catkins set only 5 nuts this year "on its own." These I have also stored to plant. [Pg 69]

I didn't have enough stocks to utilize all the pollen-sterile Japanese chestnut buds you sent me [in early September]. I put in most of them, even in some cases several to the stock to see what percentage of takes we would get with the twin T. [See 1946 Report of N. N. G. A., pp. 87-88, for a description of the Twin T budding method.—Ed.]

Here are the percentage takes for chestnut propagation this year. Of course I don't know how many of these buds will later drop off.

1. Pollen-sterile Japanese on Japanese stock. Late summer buds	100%
2. Austin Japanese on Japanese Stock. Late summer buds	86%
3. Hobson Chinese on Chinese. Late summer buds	75%
4. Zimmerman Chinese on Chinese. Late summer buds	50%
5. Colossal hybrid on Japanese stock. Spring grafts	60%

I had a nice crop of Chinese chestnuts on my young Hobson and Zimmerman trees. The 1947 nuts were exceptionally large. One 3-year seedling bore 1 bur with 3 nuts fully as large. Connecticut Yankee bore for the first time, 3 nuts to a bur, but very small, scarcely ½" in diameter. (You will notice I budded none of this variety!) (Perhaps mislabeled seedling.—Ed.)

I have about 100 nuts from isolated trees that were hand pollinated, as follows: Austin x Hobson, Austin x Zimmerman, Hobson x Austin and Hobson x Zimmerman.

I have altogether 3 quarts of select nuts stored in the refrigerator. So far they are keeping nicely. (I dusted them with Fermate, hope it doesn't affect germination.)

Notes on Some Kansas and Kentucky Pecans in Central Texas

A letter to the Secretary from O. S. Gray, nurseryman at Arlington, Texas, October 28, 1947, has some interesting notes on two standard northern pecans, three new varieties from Kansas, and the Moore variety, one of the earliest maturing among southern pecans:

We are propagating Major and Greenriver from Kentucky; Coy, Tissue Paper and Johnson from southeastern Kansas; and Brake from eastern North Carolina.

Several years ago we used quite a few pecan trees of the Moore variety in planting around Tulsa. We though it would be a dandy because of its early maturity in the fall. I find that early fall maturity is only one important factor. The other is the date of starting growth in the spring. Moore seems to start out a little early in the spring and that disadvantage seems to limit it in the Tulsa, Oklahoma area. I also believe this might be a factor in using this variety in northern locations. [Moore originated in north Florida from Texas seed—Ed.]

I have been considerably impressed with the Johnson variety. It matures two or three weeks ahead of Moore in the fall. The only data that I have was made in 1944 when Moore buds began to put out on March 25, Stuart and Success—April 5, Johnson—April 5, Coy and Major—April 8, Greenriver and Tissue Paper—April 10.

The Johnson matures on our place several weeks ahead of Major and Greenriver although I don't have the exact date on maturity. [Pg 70]

Experiences of a Nut Tree Nurseryman

J. F. WILKINSON, Rockport, Indiana

In pioneering a nursery as we did in the early days of propagation of Northern nut trees, especially the pecan, it was necessary to first locate parent trees in this section that were worthy of propagation, in order that the nursery stock produced from them would be hardy in this and more northern territory.

Along the Ohio and Wabash rivers and their tributaries many thousands of large seedling pecan trees grew naturally, and to locate some of the most worthy ones for propagation took the combined efforts of all of us in this section who were interested, as well as the aid of the tree owners and nut gatherers.

In the year 1910 three nut nurseries were established here in Southern Indiana, two of which have long since been discontinued. Before that time a very few propagated pecan trees had been produced in an experimental way by some fruit tree nurserymen.

Little did I realize at that time the trials and headaches that lay in the path I was to travel in this venture, such as locating the parent trees, securing the graft and budwood from them, learning to keep this wood from time of cutting until used, methods of propagation, trying to educate the prospective tree buyer as to the value of these trees, and to believe that pecan trees could be transplanted, and that they would bear if the taproot had been cut, and many other things.

Production of nut trees in nurseries in this northern territory is so different, and more difficult than in the Gulf Coast country, where I spent a part of two seasons hoping to get information that would be of value here. What I learned there was of little or no value here, so it was up to us to solve our own problems in this section by experience, as there was very little in print at that time on Northern nut tree propagation.

One of our first problems was to learn to keep cions from time of cutting until time of use, not knowing when that time was. We tried all times from March until May, having little success at any time. At first we kept the scions in a cold storage plant in Evansville, and at a temperature of around 32 degrees, and in wet moss. Later we found it much better to keep scions at home in a cellar at a higher temperature, and in only slightly dampened sphagnum moss.

In the beginning our efforts were mostly in grafting, then after a year or two of failure, probably largely due to the way we kept our scions, we had some results at the McCoy Nursery, with scions kept at home. The McCoy Nursery was about four miles from my place, and located in a sandy soil with a near quicksand sub-soil. At that location they were later reasonably successful in grafting, using the modified cleft graft.

My nursery is in clay soil with a hard stratum of soil three or four feet below the surface, and because of this I have been unable to graft pecans in the nursery, though I have tried every known method, and under all conditions. I could successfully graft at the McCoy Nursery, then use the same scion wood and the same method at home, but have a complete failure; therefore, I turned to budding entirely on pecans in the nursery.

It is somewhat different with walnut—I can get fair results with walnut grafting at times, though I do very little of this, as more than 95% of my walnut trees are produced by budding. [Pg 71]

I do a lot of topworking on native seedling nut trees for others. Mr. Sly, who is with me, and I make one or more of these trips each spring. For this work I use only the slip-bark method, shaping the scion a little differently from any other I have ever seen used. This has given splendid results everywhere I have used it, which has been over the territory from Ohio to Oklahoma.

A certain amount of allowance is made in this work as to safe drainage of the stock, depending on weather and soil conditions, which vary as, to season and location.

I do practically all of my nursery propagating by budding, and one of the most essential things is to have favorable sap conditions in budwood as well as in stocks.

On walnut I use only the current season's growth of wood for budwood, and it must be reasonably well matured. Very often sap in the stock may show signs of leaving before budwood is matured enough for use, and only the riper buds near the base of the bud stick can be used, in which case the rest of the buds on the bud stick are lost. Sometimes sap in the stocks can be held a few days longer by cutting a ring around the stock above the place where the bud is to be placed, which checks the flow of sap to the upper part of the stock. Sap in the stock must be in a favorable condition to hope for good results.

In budding pecan it is different. Either the current or the past season's growth may be used with about equal results, though the current season's buds must be well matured. Very often in a dry season when there is evidence of sap leaving the pecan stocks earlier than usual and the current season's buds are not well matured, I use the past season's growth until the new growth is mature.

A nut tree nurseryman has experiences that are both pleasant and unpleasant in selling trees as well as producing them. This is probably well known to all of you who have produced and sold nut trees. It is astonishing how many questions (some of which are amusing) the public can ask, and very often those that ask the most questions, leading one to believe they are a good prospect for a large order, may order only one or two trees, or none at all. Then there are those who have never bought a nut tree before, and when they see their first one are dissatisfied because it does not have a root system like a fruit tree; and there are a few who will try to get replacements whether they are entitled to them or not, and usually they are not; for, regardless of the instructions given for the planting and after-care, they will neglect them, then complain if they have a loss, and certain experiences have led me to believe they claim loss before having it.

Many seem to think that a nurseryman should guarantee his trees to live when planted by the purchaser. To do this would be assuming the responsibility of the handling, planting and after-care of the planter, which would make it necessary for the nurseryman to put a price on his trees that would take care of a lot of replacements to the more careless ones who would have losses, and be very unfair to those who take good care of their trees, and have little or no loss, as they would be standing part of the loss of the careless ones.

The most a nurseryman can do is to produce the best trees possible, dig them carefully, pack them in first class condition and ship them immediately. [Pg 72]

Discussion after Mr. Wilkinson's paper.

Dr. Crane: "Minor elements are important in plant nutrition The problem of deficiencies is going to become very important. We do not keep the livestock we did and we are not returning to the land the manure and other fertilizers that contain the elements the trees need. Nitrogen, phosphorus, and potash, also magnesium are needed. We are taking more from the soil than we are putting back."

Corsan: "In Cuba there are hundreds of sharks. These make fine manure, wonderful for nut trees."

Prof. Slate: "How many sharks would you need for an acre of land?"

Morphology and Structure of the Walnut

C. C. LOUNSBERRY, Iowa State College

This subject, the structure of the walnut, is discussed in its relation to propagation. Catkin bearing nut trees, such as the walnut, have a refined structure that makes grafting difficult. Structure, rather than form of walnuts, suggests treatment under the headings, bark, cambium, wood, roots, pith and buds, as well as the sap that permeates them.

Bark: When the bark of the walnut is cut, as in budding, it is difficult to tie down so it will not curl and yet not strangle the bud. The wax-like covering of the bark is thin. However, the bark itself will stay green two months or more if weather is cool.

Cambium: The cambium dries quickly when exposed to air, and must be kept covered. Grafted walnuts show callus growth from the cambium, and also from the pith of stems and the endodermis of the root.

Wood: The wood of the walnut is diffuse porous, brittle, straight grained, and easily split. The wood must be cut diagonally to get sufficient tension to hold the scion in grafting. The branch grows rapidly in a short season, May 15th to July 1st in central Iowa. The upper two-thirds of the one year growth is usually light weight with pith of large diameter. The base of the one-year growth is the best for scions. Some varieties of walnut as for example the Thomas, have relatively large one-year growth and more scions can be cut from its branches than from the wood of Ohio which is small and willow-like.

Measurements taken in 1940 on 118 common black walnut seedlings planted in 1939 showed 9/16" average diameter of seedling at crown, 5/16" average diameter of pith at crown; 3/8" average diameter of seedling at top; and ¼" average diameter of pith at top; 3.26 inches average length of solid pith above crown; 2.91 inches average length of solid pith in root below crown.

Pith: Pith in the black walnut is chambered (lamellate) in the older wood, but solid in the younger, growing wood. The plates are a light brown color, getting larger in diameter toward the top of the year's growth. The leaf traces from the leaf rachis to the pith show heavier from the bottom buds of the branch than at the tip, and the pith is usually solid at the bottom of the branch. [Pg 73]

Roots: When the nut of the black walnut germinates in the soil the lobes or cotyledons do not rise above the ground like the cotyledons of the bean but remain in the nut shell under ground, and are broken off in the growth of the seedling, the root going down and the stem rising above the ground. Where the cotyledons are broken off, the so-called crown of the walnut, two rough places appear, nearly opposite on the stem. In these rough places, two groups of buds are formed, rarely three groups.

Cytological studies at Iowa State College have not shown why there are not stem initials in the tap roots of the walnut. When the root is cut off a foot underground, root initials develop but no stem initials. The sensitivity of walnut leaf buds to water may have something to do with it.

Buds: Buds of the walnut are in vertical groups of two or three in the axils of the leaves. They have few scales. They appear on seedlings and current year branches. Some have short stalks. If broken off they do not usually grow back again. The second year, these buds usually drop off in mid-season. In cutting off buds, unless the group of buds is taken out as a chip, some may grow out again.

Leaf arrangement: There is a three rank arrangement of leaves in the walnut, the ninth leaf coming in the same position as the first. According to the work of Caesalpino, the buds should then rise in three places at the crown. Only in rare cases does this occur in the black walnut, although it is usual with the Persian walnut. If the nut is planted deep this causes much suckering and a tendency to etiolate the buds so they will stand water.

Buds are sensitive: Buds are sensitive to water, and storage material must be fairly dry and cool. In two large boxes of scions received last year from Germany, some 20 varieties of Persian walnut, all had dead buds when received. They were packed in German peat. When buds are covered with wax the wax must not be too hot or it will kill the buds. In placing grafted walnuts in sphagnum or sand they should not stay wet or the buds will die. Either unions must be above damp sand or sphagnum, or the buds be protected by wax or adhesive.

Sap: In spring grafting there is an enormous flow of sap which will sometimes tear the plates out of the pith. Grafts may be protected by girdling the stock a few inches below the place where the graft is set, or both above and below it. In 1937 259 walnuts three years old were cut off six inches above the ground and girdled two inches above the ground. 171 crown buds came up, 88 started above the girdling. 207 trees were cut off three feet above the ground, and the trunk girdled six inches above the ground. 153 started above the crown, and 90 started above the girdle. The same year (1937) 195 trees three years old were cut off four feet above the ground, and all buds above ground were cut flush with the surface of the bark. This was repeated twice, finally taking buds out as a chip, except the top bud; 126 died; 69 grew from the top but. 203 trees three years old were cut off five feet above ground and all buds cut off except upper one; 64 died; 139 grew from top bud. 200 trees three years old were cut off six feet above ground, and all buds kept rubbed off except top one; 33 died, and 167 grew from top bud. [Pg 74]

Vitality and sap: Black walnut sap changes color from oxidation almost instantly. Bench grafts must be made quickly and put in place at once or the unions will dry out. If the root does not stain hands in grafting the graft usually fails. In outdoor grafting if the sap stands in pockets the sugar will ferment, killing the graft. There is a new Jersey (3) bulletin which shows black walnut sap as unstable, quickly forming sugar when exposed to warm weather.

Vegetative propagation of greenwood cuttings: Witt and Spence (4) in England working with greenwood cuttings attained 75 per cent success with Persian walnut and Royal walnut in July and August. They had no success with black walnut at that time (1926). The Germans in 1936 (1) working on greenwood cuttings had most success with the Persian walnut, but used greenwood taken in September.

Vegetative propagation or hardwood cuttings: In 1938 the author (2) using growth substance on saddle grafts of various walnuts found Asiatic and western walnuts went on their own roots. At this time the Tasterite black walnut went on its own root. In 1946 and 1947 using about 25 varieties of black walnut, Persian, western and Asiatic walnuts, eight inch hardwood cuttings

were used beginning in December and repeated in the spring of 1947. Nearly all the cuttings of the larger size (about ½") started in about a month and grew about two months. Then all died. There were balls of callus on many of them. One on Thomas was an inch in diameter. The bottom heat was held at 70 degrees F. This may have been too high, as on raising the cuttings it was found the callus had rotted. This procedure has possibilities.

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A Method of Budding Walnuts

H. LYNN TUTTLE, Clarkston, Wash.

It took man some thirty thousand years to learn to build a fire—conveniently. I thought it was going to take me that long to learn how to bud walnuts, but fortunately the period has been somewhat shortened.

When I first began to propagate, or try to propagate, walnuts, I naturally looked to the approved and accepted methods. For me, they did not work. Before I was through I think I tried them all. I patch-budded with variations and improvisations. I shield-budded and bark-grafted. I coated the wounds with grafting-wax, latex, cellophane, asphalt and paraffine. I trimmed off the bud shoulders to make a smoother tie and trimmed around the edges to make more contact. I wrapped with raffia, strings, rags and rubber strips and tacked with small nails. Whatever I did [Pg 75] or however I did it results were all about the same—the sap soured. In fact over a period of years I tried every way I could think up or read about to bring the bud and the cambium layer together and make them stick. Results were surprisingly uniform—the sap soured.

But we must not dwell too long on the shots that missed. As with a refractory engine that will suddenly sputter, there came some elements of success. The point to learn was, why? Concentrating on the shield bud entirely we determined to find these whys. So we tried taking big slabs of bark along with the bud, peeling out the wood, breaking off the leaf stem entirely and waxing the scar and making an unnecessarily long cut for the bud. The bark stuck fairly well but the buds died. This was some encouragement and I knew that with enough time, reason and a little luck we would eventually hit the mark.

Now Dame Fortune had decreed that I be raised on a grain and stock ranch where the only trees we could see were in the distant mountains, or, if we rode in the canyons, cottonwoods and choke-cherries. My experience and training was with animals, and animals, especially horses, seem quite susceptible to accident. The first principle of treating almost any wound is to give it drainage, otherwise, both literally and figuratively, the "sap" soured. Thus it dawned on me that a tree-wound, even if only skin deep should have the same treatment as a flesh wound. And drainage, being desirable, should be ample.

It was quite late in the season but I went out and set a dozen Schafer walnut buds on eastern black stocks. These buds HAD DRAINAGE. The vertical cut of the T extended at least two inches below the bud. Success ensued, they grew. The following spring we budded as soon as the bark would slip and continued at intervals all summer. Results were good. Some of the steps we now use are probably not essential and perhaps not even the best, but there are two points that cannot be over-emphasized, namely, drainage and contact. The complete method is as follows: 1. Trim bud sticks to leave an inch of petiole on the bud. 2. Make the T cut with a long vertical slash that will extend at least an inch below the bottom of the bud. 3. Cut the bud long and deep and peel it from the wood by pinching the sides. Be carefull not to injure the bark just below the bud. 4. Insert the bud either flush with or below the cross-cut. 5. Wrap with large sized rubber budding strips just firmly enough to make good contact. Too tight wrappings curtail circulation. Do not cover the cut below the bud. The wound must have **drainage**. 6. Be sure that the center of the bud-cut is firm against the cambium layer. If it humps of bows and won't stay down insert a tooth-pick or bit of leaf stem or something along the center line to hold it down. We usually do this during the wrapping process.

We use no wax. We throw a wrap over the bud, shoulders even though it may press the petiole forward against the bud. If the center of the bud pulls out it will not grow although an adventitious bud may eventually start. Budding seems about equally successful any time that the bark slips freely. On walnuts this is all summer if not too dry.

Early-placed buds may make several feet growth before fall if sufficient moisture is available. On walnuts there are always dormant buds. We have used storage wood but now just cut it fresh. We have not tried draining patch-bud or grafts. Although we have not tried it we think cherries and other trees inclined to drown the buds might be better handled in this manner. Climate is a factor in the type of propagation advisable. One very fine grower using buds in California could propagate only by grafts when he moved to Western Oregon. [Pg 76]

The kernel of my walnut budding experience may well be summarized in one word—drainage.

Questions asked Mr. Stoke after his demonstration of grafting and budding.
[See his paper in 1946 Report, pp. 99-103.—Ed.]

Member: "How do you keep your scions?"

Stoke: "I prefer 'orange' cold storage for scionwood. This is just above freezing. Walnuts should be in full leaf before spring budding."

McDaniel: "What percentage of chestnuts did well with the 'plate' method of budding?"

Stoke: "I don't use it with chestnuts for spring budding, but sometimes for summer budding. It will work well on any variety of Persian walnut, heartnut and black walnut. Place buds on the north and northeast side of tree to prevent sun injury."

Question: "Do you find any difference in using buds from an eight or ten year old tree as against a younger tree?"

Stoke: "No, not so long as it is healthy. For spring budding I don't care to have any trees too vigorous. Cut tops off young trees three to five days after budding, and force the buds into growth. If you delay too long the bud will die. I wouldn't try to bud trees unless bark is slipping."

Member: "I have used parapin wax and covered it with old bread paper."

Stoke: "That may work because the wax was shaded. Southern sun may melt parapin and paraffin waxes."

Mr. Corsan: "Dentists, surgeons and wood carvers make the best grafters."

Question: "Can the scions be cut with a small plane?"

Stoke: "Anything you have to cut with a plane is too big. I never use a plane."

Question: "What do you use a splice graft for?"

Stoke: "Anything except walnut. In walnut I use a modified cleft graft, and I take care of the sap flow by placing the graft down about 1" or 1¼" below the cut (where the tree is cut off). Wax the scion but do not wax the cut. Let it bleed."

Question: "What is the value of cut leaf black walnut?"

Stoke: "Purely ornamental. Weschcke reports that it is very hardy with him."

Rick: "What about the Lamb walnut?"

Stoke: "We don't know whether the wood of grafted trees is curly or not. I sent Mr. Reed a limb from Lamb and he gave it to the forest laboratory and they found no evidence of curly grain." [Pg 77]

Rick: "Shouldn't it be propagated until we are sure?"

Stoke: "We had Mr. Lamb himself talk before us at Roanoke and he told us about the parent tree. He doesn't know what makes one tree curly and another not."

Korn: "Is that uncommon?"

Stoke: "Not so very. Trees are most curly at the base and in the outer wood."

Question: "Do you always leave that stub on black walnut?"

Stoke: "Yes, but it should be removed later in the first summer."

Question: "Where do you use your splice graft."

Stoke: "On anything other than walnut, if scion and stock are the same size. Where stock is larger than scion I use the modified cleft graft up to sizes approaching one inch in the stock. For topworking larger stocks I use one of the forms of bark graft. For the large hickory stock Dr. Morris' bark slot graft is preferred. For large, thin-barked stocks the simple bark graft may be used. My original grafts of the Carr and Hobson Chinese chestnuts, made with scions received from Messrs. Carr and Hobson in the winter of 1932, are still perfect unions.

"I believe that grafted chestnuts growing in frost pockets are most likely to develop faulty unions; possibly frost injury to immature cells at the junction point may occur. Dr. Crane mentions a similar failure of unions between Persian and black walnuts on the Pacific Coast."

Dr. Crane: "What cut did you use in grafting those chestnuts?"

Stoke: "Modified cleft. In using Dr. Morris' bark slot graft I find it best to leave just a little of the

cut face of the scion wedge above the top of the stock. This, with top of the stock cut sloping away from the scion, as illustrated, promotes quick healing with no 'die-back.'"

Dr. Smith: "Is that top slanting?"

Stoke: "Yes, I cut it slanting."

Dr. MacDaniels: "That is a good graft for walnuts, too."

Note: Mr. Stoke showed the group a picture of a mockernut tree in one of his fields which he had girdled to kill it. The tree lived four years and during those years the moisture had to go up through the inner wood.

The substance of Mr. Stoke's talk, together with illustrations, may be found on page 99 of the 1946 report. [Pg 78]

Importance of Bud Selection in the Grafting of Nut Trees

G. J. KORN, Kalamazoo, Michigan

For many years the fruit growers have been improving the qualities of their fruits in several ways. The early pioneers of our country selected the best fruits from seedling trees. Chance seedlings that were found in pastures, by roadsides, or possibly in some out-of-the-way place, selected because of some special quality or group of qualities, still dominate our commercial plantings of fruits and nuts. Several of the apple varieties to be found in the market today are from these chance seedlings.

In more recent years some of our agricultural colleges have been breeding fruits. Such breeding has given us several of our more promising named varieties. In this way a great improvement has been brought about in our fruits.

Environment too appears to have played an important part in making changes in fruits and nuts. Nuts that are extremely hardy in the more northern latitudes, appear to have developed this hardiness gradually throughout many generations. Because of this quality we are now able to select varieties that are most likely to succeed in any particular locality.

More rapid and satisfactory methods of improving our fruits and nuts have been brought about through breeding. This development of the science of plant breeding has made it possible to blend the good qualities of two seedlings into a new variety. Man does not have to follow nature's slow hit-and-miss method of developing more desirable qualities in her products. Controlled breeding, as brought about by man, produces faster and more satisfactory results. Man's improvement over nature has come about through his choice of the qualities to be blended, and his ability to bring together two parents from widely separated parts of the earth, if necessary.

Besides breeding, we are able also to use some of the mutations or bud sports to improve our nuts as well as fruits. Although our progress in improving nuts may not yet be as spectacular as cross-breeding with apples, bud selection has already modified the list of our commercial varieties.

One of the first requisites in bud selection is so thorough a knowledge of the variety that any departure from the type will be detected. Then it will be necessary to start propagation to determine whether the variation was caused by some environmental factor, or is really a sport which can be perpetuated by vegetative propagation. You may wonder if many of our nut growers know nut varieties well enough to detect any but the most obvious sports. Nut improvement through bud selection within the variety lies ahead of us.

Among fruit growers the search seems to have been for fruits of different or more pleasing color. As nut growers we are more likely to be interested in nut sports having better size, kernel, cracking qualities, etc. Trees that are able to ripen their nuts in short or cool seasons are especially desirable in some of our more northern states.

My attention was especially called to the importance of bud selection several years ago while buying my winter's supply of apples. I was examining the splendid crop of Jonathan apples in a neighbor's large commercial orchard. On most of the Jonathan trees the apples were large and well colored and the crop was heavy. However, a few trees bore apples of inferior size and color. [Pg 79] Upon questioning the fruit grower as to the difference in the performance of the two types of Jonathan apple trees, he explained that the better apples came from trees supplied by a nurseryman who was very particular in selecting a good bud strain. The other trees were just the ordinary strain of Jonathan.

It was while working in a commercial orchard of the grafted varieties of black walnuts that I noticed one especially promising Thomas tree. During the few years that I have observed this tree, its nuts have been of splendid size and very uniform. The kernels from the nuts from this tree were somewhat better than those from most of the other trees. I now have some grafts growing from this promising tree.

There appears to be much promise for nut improvement by cross-breeding to regroup desired qualities. Although many of us enjoy the nut contests that are conducted from time to time, it appears that our nut improvement program might move along faster if more attention were given to nut breeding and searching out desirable bud sports.

Discussion after G. J. Korn's paper.

Corsan: "Farmers should be encouraged to plant nut trees along boundary lines. Enormous amounts of fertilizer there."

J. R. Smith: "One tree in ten thousand seedlings is worth while."

Dr. Lounsberry: "We have two trees planted close together—one bears small nuts and the other large nuts. They are from the same grafting. It would seem that the trouble is in the stock. The stock makes a vast difference."

The Hemming Chinese Chestnuts

E. SAM HEMMING, Easton, Maryland

The bearing record of our row of 18 Chinese chestnuts has attracted so much attention that I thought the Association would be interested in seeing some slides of these trees, also of our experimental orchard, as well as the large quantity of small trees we grow in our nursery and the manner in which we raise them.

You will see a number of slides of chestnut trees and hear a lot about the bearing qualities, but you won't see a single nut, for unfortunately all these slides were taken between December 1946 and July 1947. You will just have to let the numerous little trees attest to the fact that these trees bear. We have 50,000 trees in our nursery.

These trees are now nineteen years old and have borne rather remarkably since 1937. They are spaced too close—an accident—but I believe that helps thorough pollination. They are now 12 and more inches in diameter, some are 30' high and the spread is at least 35' where they have the room. All but No. 14 are spreading in character; spreading character and good bearing seemed to be connected.

The bearing record of these trees has been given before but I will summarize them by years again: 1937—118 pounds; 1938 (no records); 1939-463 pounds; 1940—250 pounds; 1941—564 pounds; 1942—658 pounds; 1943—749 pounds; 1944—678 pounds; 1945—250 pounds; 1946—1,100 pounds; this year's crop will probably run 700 to 800 pounds. [Pg 80]

The trees seem to bear much the same, with No. 14 the poorest and No. 19 the best and, like many other tree crops, they tend to alternate good and poor crops on each tree. The nuts are of good size, averaging 40 to 50 per pound (green) with No. 6 and No. 19 bearing the smallest nuts. They ripen in September with the exception of No. 19 which is a month later. Mr. Reed likes No. 16 which has a wrinkled shell. All the nuts are medium sweet to sweet and all of them fall free of the bur. I think the most significant thing is that at least 12 of the trees have nut characteristics so near alike that they are about indistinguishable, which certainly makes them a good source of seed.

The similarity of the nuts brings up the controversial subject of the seedling raised tree, and I will make some remarks in defense of this method.

1. All our parent trees are good bearers.

2. There is no extraneous pollen in the vicinity.

3. I will present as a question: Has the Chinese chestnut, like the rose and the apple been hybridized out of all semblance of the wild form?

4. The seedling tree should bring chestnuts to the average householder's table 30 years sooner than grafting will.

5. We now produce a 3'-4' tree for a very reasonable figure.

6. All varietal forms at present are as yet unstabilized (most varieties of 10 years ago have been discarded). There will probably be some duds in seedling trees, but we've had no local complaints and I wonder if they will exceed the "troubles" found in the grafted tree. We have had customers brag about what their 2 or 3 or 6 trees bore.

To prove our faith in this method we planted a test orchard. When the trees were 3 years old from 2 year transplants they bore 25 pounds. Next year, 1944, they bore 800 pounds or an average of 1 pound per tree. Right then and there we thought that we would have a real story to tell, but we had misfortune in another direction. Three years in a row we have had frosts when 6 inches of new growth were on these trees (the orchard is not as well situated as the parent trees in this respect). So we had no crops worth mentioning but neither did we have strawberries or

similar fruits. This year the orchard was frosted 2/3 the way to the top so we will get quite a few nuts, maybe 500 pounds. Incidentally, we have been here 25 years and we've not had frosts like these before.

We use all of our good nuts for seed purposes, grading out all small or damaged nuts. In raising these trees, even from seed, we've had our troubles. We let them cure several weeks then plant them in well fed soil in a narrow trench about 2 inches deep. We place the nuts 5 or 6 inches apart; we fill the trench with sawdust level with the surface. We mound the soil over this about 4 inches until spring. Then it is removed. This method lets the shoots through, otherwise they tend to send 3 or 4 stems. The nut sends down the root very early in the spring. We have some trouble with the mole-mice combination; for this reason heavy soil and sawdust is better than sandy soil. As you know neither the nut nor the tree likes wet soil.

In raising the young tree the principal difficulty is in getting a trunked upright tree. A seedling, especially when transplanted the first year, flops all over like a flowering shrub. To get them up we plant them fairly close, prune them, and feed them. Our 1 year trees are usually two feet high and 2 year trees are 4 to 5 feet high. We wholesale our trees mostly to mail order nurseries and [Pg 81] the largest had a 5% request for replacements.

There are troubles in growing Chinese chestnuts just as there are in most fruits and nut crops and, in a way, I am glad there are because I am of the opinion there is no such thing as harvesting without cultivation. For instance, if you plant them and let nature take its course—it will. It will on an apple, too.

We have found a few small lesions of chestnut blight which were removed by pruning and then painted with pine tar. They usually occurred at a previous point of pruning. Some of the transplanted seedlings have developed a twig canker at a bud, but I've never seen them kill one and even when we don't prune it out, the tree overcomes it by new growth.

The Japanese beetle attacks the chestnut but, although they were bad this year, one spraying of DDT was effective. The weevil (curculio) was bad enough last year so we are spraying this year. Small growers should put the nuts in metal containers and thus destroy the larvae, if any.

I would like to remark here that we are a nursery growing many ornamentals, and the Chinese chestnut, although low branched, is a very ornamental tree. I know of no tree that has a handsomer dark, shiny green leaf or one whose green color holds so well until frost.

Now I think you will agree I have reported the behavior of our trees fairly, the difficulties of raising the trees, and have emphasized that I doubt if you will get success with the Chinese chestnut without effort; yet in conclusion I would like to step into "fantasy". Our No. 19 tree bore 124 pounds; suppose you had 50 trees per acre bearing that quantity. You would get 6,000 pounds per acre. The European chestnut, which is not as good, brought 30c on the Baltimore market last year. That would mean $1,800.00 per acre. Imagine having 10 acres!

1947 CROP

Pounds of Chestnuts from Original Trees at Eastern Shore Nurseries, Inc.

No. 1, 78; No. 2, 58; No. 3, 51¼; No. 4, 7½; No. 5, 49; No. 6, 31; No. 7, 34; No. 8, 31½; No. 9, 63; No. 10, 40½ No. 11, 61½; No. 12, 64½; No. 13, 56; No. 14, 47½; No. 15, 74; No. 16, 60; No. 18, 106; No. 19, 25½—Total, 938¾ pounds.

Young Orchard: 225½ pounds.

Discussion after E. Sam Hemming's paper

Corsan: "Do you recommend the use of lime?"

Hemming: "We do not use lime. We use Vigoro at the rate of 1 to 1½ lbs. to inch of diameter per tree."

Corsan: "Why do you use Vigoro?"

Hemming: "No particular reason, just that it is available."

Member: "What time of year do you fertilize your trees?"

Hemming: "We fertilize during the winter—usually during December."

Crane: "Last year we used a method of storing Chinese chestnuts which proved very satisfactory. [Pg 82] Two thousand pounds of nuts were stored last year. Fall planting is good where one can use it but in a lot of areas it can not be used because of rats robbing the plantings. We have to store the nuts. The procedure we follow is to harvest every other day. Nuts are placed in tin cans with friction top lids. The lids should have one to three holes of 1/16" diameter in them to provide air. Cans are placed in storage at a temperature of 32 to 40 degrees F."

Stoke: "I keep chestnuts in the cellar in a can with an open top in what we call limestone sand. Keep wonderfully well. Chestnuts must have air."

Gravatt: "Down south we have a lot of trouble with decay. We take nuts right from the bur and

put them in the soil. They give much better germination."

Crane: "The Chinese harvest their chestnuts just as soon as the bur cracks. They do not wait for the nuts to drop from the trees but harvest the nuts from the trees and store in covered pottery jars. They plant in the fall of the year. They do not hold nuts for any length of time."

Corsan: "How about charcoal?"

G. Smith: "Charcoal is good to store nuts in. They are shipped from China that way."

Smith: "Would chestnuts stand carbon bisulphide for getting the weevil out, or is the hot water treatment better?"

Crane: "Carbon bisulphide treatment is dangerous, it will kill weevils but it will also kill the nuts so they will not germinate. Unless precautions are used it may cause an explosion and fire. Methyl bromide treatment is better."

Stoke: "The hot water treatment is the best. It consists of immersing the nuts in water at 120 degrees F. for forty minutes."

Hemming: "I have raised about 100,000 seedlings and have never seen blight on any of my seedlings."

Dr. Smith: "A tree needs usually to be as big as the small end of a baseball bat before the bark opens enough to let in the blight spores."

Stoke: "Blight begins where there is rough bark which provides lodgment for the spores. Rough bark and moisture result in blight, hence the disease usually starts near the ground."

Crane: "The blight problem in the growing of chestnuts has often been stressed. I think you will have more loss from sunscald and root rot than you will from blight. Blight is a minor trouble with us. The Chinese chestnut naturally grows with a low head. It is a mistake to cut off the low branches on the trees until they attain some size, they can then be cut off."

Stoke: "Regarding the protection of nut trees against winter sun scald, I find that if you take ordinary aluminum paint and paint the south and southwest side of nut trees it will last for two years."

Dr. Smith: "Chestnut trees have blighted for me where the water table was too high and trees of same origin or better drained ground nearby did not blight. Blight is often a sign that the tree wants something it lacks—much like disease in humans." [Pg 83]

Results of a Chinese Chestnut Rootstock Experiment

J. W. McKAY[4]

Introduction

The propagation of chestnut species by budding or grafting has been performed by different workers with varying degrees of success. Many have found that grafted trees could be produced and grown successfully but that graft union troubles developed in a certain percentage of the trees either soon after grafting or a few years later. The variety "Carr" is known to graft with difficulty in certain localities and to give a high percentage of poor unions both at the time of grafting and after a few years of growth. The question of relationship of scion and stock has been considered by many workers to have an important bearing on the success of grafting operations but no critical work has been done to determine this point. Some investigators hold that scions of one species may be grafted upon stock of another species without harmful effects. The results of the budding experiment with Chinese chestnut reported in this paper are the first of a series of tests designed to contribute needed information about stock-scion relationship in chestnuts.

Description and Results

The five seedling Chinese chestnut trees used in the experiment were selected because of their heavy-bearing tendency and because of the excellent keeping quality of the nuts. Two of the trees bear nuts of large size while the other three bear nuts of medium to small size. Seeds from the five trees were planted before the use of the seedlings as stocks in the budding experiment was planned, and since the seedlings from each tree were planted together replication of the experiment was not possible. However, the stock was grown in thoroughly mixed soil in a coldframe and differences in performance of seedlings could hardly be attributed to soil heterogeneity.

Buds from the five parent trees were placed on the five lots of their own seedlings in all combinations of budwood and stock. The work was done during the first week of September when the bark of both budwood and stock was slipping yet growth had slowed down to some extent. Buds were placed about two inches below soil level on the one-year-old seedlings and the

soil pulled back to cover the buds. Budding was done by means of the familiar shield or T-bud method and rubber budding strips were used as a wrap. Budwood was shipped from Albany, Ga., to Beltsville, Md., and was damaged somewhat by high temperature in transit, a factor which may be partially responsible for the overall low percentage of buds that grew.

In referring to the results presented in table I, it will be noted that considerable variation occurred in the performance of the five lots of seedlings as stock, as well as in the take of buds from the five parent trees. The totals in the last column on the right are all equivalent to percentage since 100 buds were placed on each lot of seedlings. In like manner, the totals in the bottom line are all equivalent to percentages since 100 buds of each parent tree were used. [Pg 84]

Seedlings of stock D were decidedly inferior to seedlings of stock C in take of buds, and both of these lots of seedlings originated from large nuts. Also, scion e gave a significantly lower take of buds on all lots of seedlings than scions c or d. The scion e tree produces small nuts whereas the scion c and d trees produce large nuts. Scions a and b are intermediate in take of buds, and the source trees both produce small nuts.

Discussion

At least one significant interpretation may be made from the results of this experiment, that may partially explain the difficulties encountered heretofore in propagating chestnuts. Using the take of buds as a criterion it can be stated that in this experiment the five lots of seedlings from known parents differed in their performance as stocks. Moreover, the five parent trees used as a source of budwood differed among themselves in the capacity of their buds to grow when placed on comparable lots of stocks. If these results are correctly interpreted it is clear that both the stock and the scion may influence the success or failure of propagation technique. Doubtless both of these variables have operated together in the propagation of existing varieties and, as would be expected, the results have been unpredictable. It seems likely that the grafting and budding of chestnut varieties should be worked out in the future on the basis of using understocks derived from the seed of special trees or clones found to be suitable sources by tests for grafting performance.

It should be pointed out that the five trees used in this work originated from two lots of seed imported from neighboring localities in China and probably are closely related. The fact that significant differences were obtained in this material furnishes basis for the belief that great variability in the budding performance of the Chinese chestnut is to be encountered in the many introductions that have been made into this country.

Table I. Results of budding each of five Chinese chestnut clones on its own seedlings and on the seedlings of four other clones. The figure for each combination represents the number of buds that grew out of 20 buds placed.

		SCION					
		a	b	c	d	e	Totals
S	A	4	6	4	5	0	19
T	B	3	2	8	4	0	17
O	C	0	3	8	9	5	25
C	D	1	2	3	1	1	8
K	E	2	2	7	9	2	22
	TOTALS	10	15	30	28	8	91

Discussion After Dr. McKay's Paper

Dr. MacDaniels: "A good scion on chestnut is one problem which we have not solved."

Dr. Smith: "I find both Carr and Hobson difficult to graft and have discontinued them." [Pg 85]

Dr. Crane: "In California and Oregon they are having quite a lot of difficulty with graft union failure with Persian walnuts. They have used the Northern California black or Hinds walnut as root stocks. Now they find that in some cases the union fails and results in what is known as the black line disease. At the present time this trouble is the most important cause of the loss of their trees."

Dr. Smith: "Zimmerman is a good bearing variety with a good nut. I find that soil makes some difference with this variety."

Breeding Chestnut Trees: Report for 1946 and 1947

ARTHUR HARMOUNT GRAVES[5]

The chief aim of this breeding work is the development of a chestnut tree of timber type to replace the now practically defunct American species, *Castanea dentata*. For the principal economic value of the chestnut was not in its edible nuts but its valuable timber, the loss of which means at present many millions of dollars subtracted from the assets of the American people; and when we consider the loss for all time in the future the figures become astronomical.

The Chestnut Blight in Italy. Early in 1946 we received a visit from Captain John B. Woodruff, of Wilton, Connecticut, who told us that while serving as Chairman of the Department of Agriculture and Forestry, and Instructor in Forestry at the Army University Study Center in Florence, Italy, he visited chestnut stands infected with the blight. *Endothia parasitica* was first discovered by Professor Guido Paoli in 1938 on a private estate in Busalla, about twenty miles north of the seaport city of Genoa. Since then the blight has been detected throughout the province of Genoa in the legion of Liguria; and other widely separated infections have been found. The fungus has been cultured and identified by Professor Biraghi of the Royal Pathological Station in Rome, as *Endothia parasitica*. It is believed to have been present in this region for from five to eight years previous to its discovery. The manner of its introduction into Italy is not known, but since Japan and the U. S. have carried on considerable commerce with Italy, either or both countries are possible sources.

The disease is spreading in Italy at a rapid rate. "By 1942 one half of the 190,000 acres of chestnut in the province of Genoa had been infected and spot infections had been discovered in the adjoining coastal province of La Spezia, also in the region of Liguria."

I am devoting some space to this situation because it means so much to the Italian people. In Italy fifteen percent of the forest is composed of chestnut. Not only does the country use the nuts as a source of food and income, approximately sixty million pounds being exported annually in former years, but the young coppice shoots are used for the weaving of baskets, older ones for poles for vineyards, still older for staves of wine casks, and the oldest for telephone and telegraph poles. "Before the war, chestnut flour was the principal food in many localities, but during the war a serious food shortage forced the people in many other areas to rely solely upon chestnut flour for weeks at a time." [Pg 86]

Professor Aldo Pavari, Director of the *Stazione Sperimentale di Selvicoltura* at Florence, visited this country in the summer and fall of 1946, under the sponsorship of the UNRRA, and spent four days with me at our plantations, learning our methods and getting acquainted with the blight resistant hybrids we have been developing by the breeding together of oriental and native chestnuts. Prof. Pavari visited also the plantation of the Division of Forest Pathology at Beltsville and elsewhere, and other plantations in the west. In December we shipped to Florence, Italy, nuts of our best hybrids, and in March, scions for grafting—also this summer (1947) pollen of some of our best trees. On October 15 of this year (1947) we sent another shipment of nuts. Thus we may be able to give Italy the advantage of the progress we have made to date.

Regarding the susceptibility to the blight of the European or Spanish Chestnut (*C. sativa*) we have had the following experience. Our winter temperatures appear to be too severe for this species. Dying back is sure to occur, at least at our Hamden, Connecticut plantations, marked more or less according to the degree of cold; and on the dead parts *Endothia* then appears, to later invade the parts still living. In 1932 I received nuts of *C. sativa* from France from Professor Hochreutiner of the Geneva Botanic Garden, from Professor Uldrich of the Berlin Botanic Garden, and also from France from Dr. Guillaumin of the Jardin de Plantes at Paris. Although I have given the resulting plants much attention they continually die back each year so that we have only two or three individuals that are more than six feet high. But Professor Pavari says in recent correspondence (July 15, 1947) "Referring to Spanish chestnuts, after we have been assured that the fungus we have found and observed on *Castanea crenata* in Spain is really *Endothia parasitica*, we must admit that our hypothesis may be exact that *Castanea vesca* [*sativa*] presents in Spain races or types resistant to the disease." He goes on to say that the fact that the chestnut blight is so widespread at Naples and Avellino is at variance with my theory that cold winters are the predisposing cause, for in the regions mentioned the winters are mild and "very warm in comparison with those of Connecticut." The essential fact seems to be that the European or Spanish chestnut is very susceptible to the blight, perhaps as much so as is our native species, but that evidently certain individuals or races exist that are more or less resistant.

During the early part of 1947 we had a visit from Professor Cristos Moulopoulos of the University of Salonika, Greece. Although the disease had not then appeared in Greece, the pathologists there would like to be ready for it when it does come.

Pollinations in 1946 and 1947. Without going into details, the general purpose of the pollinations during these last two years has been to incorporate more and more of the resistant Chinese stock into our hybrids. Beginning in 1937, we crossed our best Japanese-American hybrids with Chinese, and we now have a considerable number of young saplings of flowering age, which have the pedigree: Chinese x Japanese-American. Unfortunately, in this cross the Chinese is usually dominant as regards habit, but not always. We have some tall, straight-growing individuals of this combination which may well be the forerunners of a blight-resistant forest stock for America. [Pg 87]

Therefore, during 1946 and 1947 we have been crossing these fine Chinese x (Japanese-Americans) with the following:

1. Our best Chinese
2. American-Chinese and Chinese-American

3. American (C. dentata)
4. Our best Japanese-Americans
5. Among themselves

For it is the ultimate aim of this work to develop a race of tall, hardy, blight resistant individuals which will breed true and thus of themselves re-establish the chestnut tree in the forests of Eastern North America. As everyone knows, the re-establishment of the chestnut as a forest tree can not be done in a few years or even a score of years, but by continued breeding and patience and perseverance it can be done. The materials are at hand, i.e. tall, erect growth, and blight resistance; and with persistent effort the desired combination can be made.

For (1) above we were fortunate in 1946 in receiving a supply of pollen from tall-growing Chinese trees, through the kindness of Mr. Michael Evans of Greenville, Delaware and Professor Maurice A. Blake of the New Jersey Agricultural Experiment Station.

As a result of our pollinations in 1946, in which 72 combinations were made, we harvested and planted in our cold frames in October 479 hybrid nuts, a large proportion of which germinated, so that this summer (1947) we have set out in our nurseries about 325 hybrid seedlings.

In 1947 we have made 58 combinations in which 213 branches were bagged; October 10-13 we gathered 380 hybrid nuts resulting from these cross pollinations. The large yield of 1947 is doubtless the result in part of a good growing season, for there was plenty of rain—at times almost too much—in southern Connecticut. One drawback was the cold period during the latter part of June. From the fifteenth to the twenty-sixth the minimum temperatures were 55 or below —on three days as low as 50. This set back the flowering period four days to a week later than usual, depending upon the species or hybrid.

Cooperation in Diller's Underplanting and Girdling Method for the Establishment of Chestnut Forest Stands. In the 37th Annual Report of our Association for 1946 is printed a paper by Dr. Jesse D. Diller of the Division of Forest Pathology, U.S.D.A. entitled "Growing Chestnuts for Timber" pp. 66-68. Many people seem to think that all you need to do when planting a tree is to stick it in the ground—just *any* ground. This may be true of some kinds, but is certainly not true of the chestnut. For best growth and development the chestnut requires a fairly deep, well-drained soil, rich in mineral elements and humus, with a fair degree of moisture and plenty of sunlight. Two things chestnuts will *not* endure are shallow soil and drought, the latter often depending on the former.

As tree indicators of the kind of site required for the establishment of a chestnut forest Dr. Diller has chosen yellow poplar, northern red oak, white ash, sugar maple, and yellow birch, with spice bush as a shrub indicator and maiden hair fern, bloodroot and other herbs as herbaceous indicators. Using a small area of about one eighth of an acre, Dr. Diller's plan is to girdle all the trees and then underplant with chestnut seedlings. He says: "As the girdled overstory trees die they gradually yield the site to the planted chestnuts in a transition that does not greatly disturb the ecological conditions, particularly of the forest floor. Rapid disintegration of the mantle of leaf mold is prevented by the partial shading which the dead or dying overstory, girdled trees cast." This may seem to some a rather drastic method, but when so much is at stake, namely the re-establishment of the chestnut in our forests, it would seem a justifiable experiment on a small area. [Pg 88]

In March, 1947, we supplied Dr. Diller with one hundred seedlings, one or two years old, of our best stock, for underplanting in two of these selected sites, fifty seedlings each, namely on the estate of Mr. E. C. Childs at Norfolk, Connecticut, and on lands of the T. V. A. at Norris, Tennessee. Our best wishes for a successful blight-resistant future go with these little trees.

Grafting Work. We are continuing with our method of "inarching" young "suckers" from below a blighted area into the trunk above the lesion, the diseased tissue of the lesion being first cut out. This method (see Brooklyn Botanic Garden Chestnut Breeding Project. 35th Annual Report of Northern Nut Growers Association for 1945. pp. 22-31—1945) is entirely successful in case we desire to preserve partly resistant hybrids of good parentage for future breeding and for scions. (Figs. 1 and 2) But inarching of the native chestnut is for the most part unsuccessful because the fungus grows too rapidly and girdles the stem, killing the parts above before the inarched tips of the suckers can take hold. There seems to be a certain relation between the amount of disease resistance in the tree and the possibility of restoring it to health by the inarching method.

By the common ordinary cleft-graft method, using Japanese, or better, Chinese stock we are adding to the supply of our most desirable hybrids.

Insect Pests. The spring canker worm, *Paleacrita vernata*, has not been destructive either in 1946 or 1947 and no special preventive measures have been taken. Japanese beetles have done a little damage. This year the first one appeared July 11. We find the best method with these is to pick them off at dusk after they have settled themselves for a night's sleep, dropping them into kerosene oil. Under these conditions they will usually slip readily off the leaf into the oil. One thing I should like to emphasize (which probably others also have noticed) is that new beetles keep coming, day after day. Apparently the adults are issuing from the ground all summer. Last year I found a few Japanese beetles in November. So one must keep continually on the job all through the season. This summer (1947) we have had a spray program of three sprayings, August 15, 30, and September 10, with "Deenate" (fifty percent DDT) to destroy the chestnut weevils which appeared for the first time rather extensively in our Hamden plantations last year. (See E.

R. Leeuwen; DDT for chestnut weevils, American Fruit Grower 67: 28. 1946) This spray, which we have used on the ground as well as on the young burs, kills Japanese beetles as well as the weevils. This fall I have seen very few weevils in our whole crop of nuts.

The louse, *Callaphis castaneae*, appeared on July 5, 1947, at least the leaves became so much curled that its presence was then noticed. Two spraying on successive days with nicotine sulphate ("Black Leaf 40") were sufficient to control it. With us this insect attacks leaves of American stock only. Japanese-American hybrids are also susceptible, but not Chinese-American or American-Chinese. The lice, of an orange color, congregate in great numbers along the midrib of the leaf, sucking out its juices.

This summer, perhaps on account of the unusual almost tropical weather conditions—hot and humid with continually recurring showers—we have been harassed by a new pest which has appeared in one of our plantations only sparingly for five or six years—a mite, which Connecticut Agricultural Experiment Station authorities say is *Paratetranychus bicolor*. Affected leaves have a whitish or grayish color chiefly along midrib and principal veins, due partly to the deposit of the creature's shells on molting, and partly to injury to the tissues of the leaf. Hexa-ethyl tetraphosphate, known in the trade as "Killex 100," was used effectually twice as a spray. Unfortunately this chemical has no ovicidal properties, so that a second spraying was necessary to kill the mites newly hatched out from thousands of eggs. We are informed that DN 111 will kill the eggs as well as the mites and will kill aphids at the same time. The mites seem to prefer Chinese chestnut leaves, but this summer they didn't seem particular and spread from one badly infested tree as a center. [Pg 89]

Fig. 1—Japanese-American hybrid chestnut (Hammond 86-31) 34½ feet in height, 16 years old. This is the same tree three years later as that shown in figures 1 and 2, in 35th Ann. Rept. of Northern Nut Growers Assoc. for 1944. Note healthy development, as shown by foliage and long yearly growth. Hamden, Conn. Photo. Sept. 13, 1947 by Louis Buhle.

Chinese Chestnuts. I am enthusiastic about Chinese chestnuts as a nut substitute for our old native chestnuts. The Chinese are quite blight resistant. They are attacked by the blight fungus—at least most individuals suffer at some time in their lives, and yet the fungus doesn't thrive and the trees are able to overcome its attacks, in many cases forming a healing wound callus around the lesions; in others the lesion becomes simply a granular mass in which the fungus appears to be living only in the outer bark. Cultivation, fertilization, and judicious pruning certainly help these trees to withstand these fungus attacks. We harvested a bumper crop last year and this from trees given us in 1929 by the Division of Forest Pathology, U.S.D.A. [Pg 90]

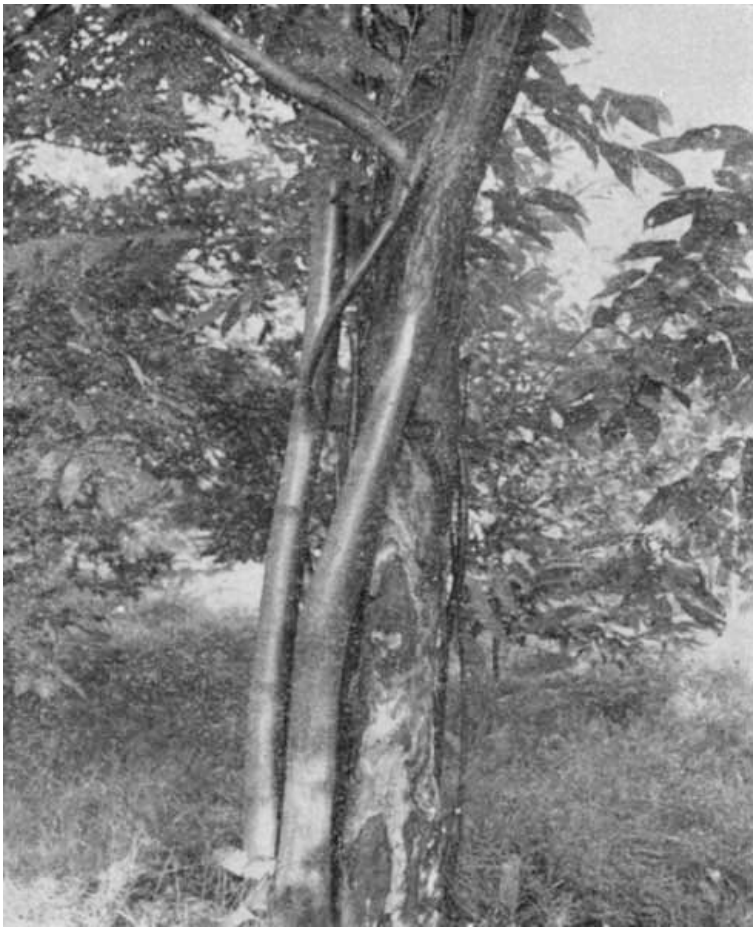

Fig. 2.—Close-up of lower part of tree in fig. 1, showing inarched basal shoots which at the beginning were as slender as the leafless shoot now showing on right side, below, coming from base of trunk. Note exposed dead part of trunk showing old canker disease. Photo Sept. 13, 1947, by Louis Buhle.

Public Interest in the Problem. Last fall, September 1946, in an article in the Yankee Magazine, I asked for nuts and pollen of the American chestnut. As a result the following persons from many different parts of the country sent in nuts: Mr. Henry Hartung, Methuen, Mass.; Mrs. Marie [Pg 91] Garlichs, Brooklyn, from Lake Minnewaska, N. Y.; Mr. Charles Ericson, Brooklyn, nuts from Staten Island, N. Y.; Mrs. Jay B. Nash, N. Y. City, from Lake Sebago, Sloatsburg, N. Y.; Mr. H. W. Donnelly, Tacoma, Wash.; Mr. George M. Hindmarsh, Kent County, R. I.; Mrs. Steiner, Niota, Tenn.; Miss Marjorie Bacon, New Haven, Conn. from Litchfield, Conn. through Dr. Edgar Heermance; Mr. Harold E. Willmott, Bethel, Conn.; Mr. W. F. Jacobs, Tallahassee, Fla. (*Castanea crenata*); Mr. P. P. Pirone, New Brunswick, N. J. (*C. crenata*); Mr. Morton F. Sweet, Seattle, Wash. (*C. sativa*), nuts, and scions in March '47; Mr. John I. Shafer, Sparta, Tenn. This lists shows not only the widespread interest in the subject but also that the chestnut sprouts are still bearing nuts. In some cases the nuts were "blind," i.e. sterile, containing no kernel or embryo. In order to develop a good nut there must be two chestnut trees within a reasonable distance of each other so that cross fertilization may take place. Isolated trees will usually not bear nuts. In other words, the chestnut is usually self sterile. We are still planting all nuts received, labeled with the name and address of the sender. The resulting trees are being set out in the Yale Forest in Tolland and Windham Counties, Conn. under the direction of Mr. Basil Plusnin, Forester in charge. Thus the possibility is being explored of the existence of blight resistant strains of the American chestnut. When nuts are sent they should be mailed within a few days after harvesting and wrapped in moist cotton, peat moss or something similar. Drying of the nut kills the embryo so that it will no longer germinate. Nuts should be mailed to me at Chestnut Plantations, Wallingford, Conn.

Pollen of the American chestnut is getting scarce. After scouring the vicinity of Hamden, Conn. this summer, we found a good supply at Bethany, Conn. from native shoots. The following persons also sent us American pollen, for which we are indeed grateful: Mr. George Gilmer, Charlottesville, Va.; Mrs. M. E. Garlichs, Lake Minnewaska, N. Y.; Mr. Alfred Szego, Pine Plains, N. Y.; Mr. Seward Pauley, Sumerco, W. Va.; and Mr. Charles W. Mann, Fennville, Mich. To ship the pollen it is necessary only to wrap small branches bearing the catkins in oiled paper and mail to me, preferably by air mail. The catkins should be ripe, i.e. shedding the pollen.

Acknowledgments. It is a pleasure to have this opportunity to express our appreciation of the cooperation of the above mentioned persons. The interest of these and many other persons and institutions is encouraging. During 1946 and 1947 this project has been sponsored by the Connecticut Geological and Natural History Survey, and we have as usual enjoyed the cordial cooperation of the Division of Forest Pathology, U.S.D.A. Dept. of Agriculture.

Beginning as of October 1, 1947, the work is also being sponsored by the Connecticut

Agricultural Experiment Station, New Haven, Conn. On July 1 I retired from my position as Curator of Public Instructor at the Brooklyn Botanic Garden and shall now be able to devote my entire time to the chestnut work. My permanent address will be: Chestnut Plantations, Wallingford, Conn. [Pg 92]

Chinese Chestnuts in the Chattahoochee Valley

G. S. JONES, Route 1, Box 140, Phenix City, Alabama

(Excerpts from letter to Secretary, Oct. 23, 1947.)

Growing trees is a work dear to my heart for I have been interested in it since childhood. Dr. J. Russell Smith's book on "Tree Crops" is one of the best I have ever read along the lines of growing trees to produce food for man and beast as well as producing many other useful products, and much of the work of your Association seems to be along the same line. I am sure we can live easier and better on this earth when we learn to use the trees in their proper place. Man often acts in a shortsighted way by depending largely on annual crops for the main source of food for himself and his animals and neglects the long lived trees which may not have to be planted but once in a lifetime and which, if given a little intelligent management, will improve instead of deplete his land and at the same time make a far more beautiful landscape.

I only have a few trees (maybe 200 or 250) in my nursery which I usually dispose of at the farm or use to set on my place. I have not attempted to grow many seedlings as I don't wish to get into this phase of work. It would take too much time from other work which I like to do. This fall I have sold over 600 pounds of nuts to various nurseries for planting so I would prefer that they grow and sell trees from my orchard. I gather planting nuts from the trees which show the best qualities, consistently, and sell the nuts from the other trees for eating purposes. The trees from which I sell eating nuts have some bad qualities such as some of the nuts being retained in burs, irregular or poor production, and nuts that seem to be too dry at ripening so I would not offer these for sale although the pollen from these trees does mix with the others causing some of the nuts to carry these bad features, a thing which will hardly be avoided in open-pollinated seedlings.

Your letter made me more proud of my orchard than ever when you made the statement that my last year's production of 1,722 pounds for 22 trees so young as mine may have set a record for production. [See 1946 NNGA Report, p. 128—Ed.] I had little idea how my trees compared with other orchards, for Mr. Gravatt had not told me anything about this. In fact I have never seen him nor did I take the trouble to write and ask this question. I knew my trees were producing much better than an orchard of the Soil Conservation Service at Auburn but I attributed that to the better type of soil (for chestnuts) in which my trees are set, and better air drainage. I had also heard about an orchard near Blue Springs above Columbus, Ga., which was not doing so well because the soil was maybe too heavy or damp. I can say one thing and that is that my Chinese chestnuts have surely surpassed my fondest hopes and dreams, for that small area has certainly made me lots of money and has given me much joy in tending it and watching it grow.

You asked me to give some information about my 1947 crop. This has not been quite as large as last year as I have harvested only a little over 1,554 pounds (I say a little over for it is hard to get all the nuts) of weighed nuts. This includes some that were beginning to spoil. I include these since it is sometimes due to my failure to gather promptly and I think can be fairly included in production records. I might state here in fairness to last year's report of a yield of 1,722 pounds [Pg 93] of nuts that I recorded 1,557 as being sold which leaves a difference of 165 pounds, which were either discarded as spoiling or were unaccounted for. This gives me a loss of approximately 10% for last year.

Although my total production was lower than last year I had one tree (ML No. 2) which produced 150 pounds of weighed nuts and a few pounds more (maybe 2 or 3) which were not included. This tree has been a consistent heavy bearer for several years but I had not checked its yield separately before. Since it is so early it was easy to keep the nuts separate (as I was keeping these to sell for seed nuts). In about 2 weeks time it had produced about 130 pounds so I made a special effort to check the remainder since I was astonished at so large a yield. When most of the nuts had fallen I had the above figure, to my surprise.

The tree in size is not my largest but about average being 12½" in diameter 3' above the ground with a limb spread of 30' and a height of 24'. It has a very symmetrical shape with enough rigidity in the limbs to hold them off the ground so the tree does not appear very large.

I just had to laugh when I got a letter yesterday from Mr. Ralph D. Gardner, whom I had written previously about the yield of this tree and sent 2 pounds of nuts from it, asking me if the tree produced two crops in one year. He said Mr. James Hobson had told him that he gets two crops from his tree each year. Mr. Gardner had a good reason to ask this question since knowing about the Hobson chestnut, but I reckon he might have thought about what I would have thought under similar circumstances, i.e., surely a tree so young (13½ years from setting) couldn't produce that many nuts at one time, so must have two ripening periods to contain the fruit. I will have to say that all these were produced in one crop. Most of these ripened in just a little over two weeks. I

might say that I do have one tree (ML No. 1) which has on a few occasions bloomed the second time and had burs which remained green until near frost but these did not amount to anything and I consider it undesirable. I have never seen No. 2 tree produce late blooms and burs.

I might tell a few things as to how I handle my nuts. As is well said by Mr. Reed in his 1946 article about chestnuts they should be gathered daily (although I sometimes don't carry this out). After weighing I dump the nuts in a tub of water. The nuts which are beginning to spoil will practically all float and the sound nuts will sink. This is where the largest percentage of my culls is eliminated. Some good nuts will float but very few if the nuts are gathered daily. I then put 20 to 25 pounds of nuts in a coarse mesh burlap bag. I use chicken scratch feed bags mostly as these are a nice size, and ties a string near the top of the bag. Then I place these on a lath frame which is about 12" above the ground under a large pecan tree which furnishes shade about ¾ of the day. I arrange the nuts in the bag so it will be flat, which does not allow more than 2 or 3 nuts to be on top of each other.

On days of moderate temperature I wet these bags thoroughly with water once a day but on very hot or windy days I often wet them twice. This keeps the nuts moist most of the time and lowers the temperature considerably from the evaporation. In this way I can keep the nuts days and days and even weeks with very little change except a slight drying. If any spoiled nuts were missed by the water these too will show up in about 10 days with specks of white mold and can be eliminated. The other nuts seem to be as good as the day they were gathered. I only use this to keep them temperarily (as it is some trouble to wet them) and mostly for the eating nuts until I [Pg 94] can take them to market or put them on cold storage (30° to 35°F.) If I attempt to hold seed nuts about a week or more I pack in damp sphagnum in crates and keep these under the shade tree with excellent results. This year I used green sphagnum with all its water and the nuts seemed to keep well in it. Some nuts have been in damp sphagnum for over 5 weeks now and are in excellent shape except for a few that spoiled at first (which I am quite sure were bad to begin with). If too much water is used some nuts will begin sprouting but it is surprising how much they can stand and show no tendency to sour.

I am of the opinion that the chestnuts in my section get ripe prematurely and that at a time when we often have our hottest and dryest weather. These nuts seem to need a period to continue their ripening under cool moist conditions which the wet sack treatment gives (or the damp sphagnum.) Even if this is not the case I have had splendid results with it whereas before I began using this method with lots of water I often became so discouraged that I thought I would have to abandon trying to put my chestnuts on the market. Now if I can get them gathered promptly I have little trouble holding them until I am ready to dispose of them.

I failed to tell you that the bad feature about my ML No. 2 tree which produced the 150 pounds of nuts is its early ripening period (the latter part of August and first part of September) which causes some of the nuts to be spoiled almost when they fall. A few hours of too hot sun seems to start the spoiling process. The tree has no other objectionable features except the nuts are only small to medium in size but nearly every one falls freely from the burs. [Nuts about 70 to the pound.—Ed.]

Some Results with Filbert Breeding at Geneva, N.Y.[6]

GEORGE L. SLATE New York (Geneva) Agricultural Experiment Station

This paper reports the results of attempts to improve filberts by hybridization at the Experiment Station at Geneva, N. Y. The filbert project was started at Geneva in the spring of 1925 when a collection of varieties from American sources was established. In later years additional varieties from European and other sources were added until about 120 were under test. As soon as the varieties had fruited for several years it became evident that many of them were inferior and not adapted to New York conditions. A few exhibited considerable merit and the range of characteristics in the different varieties indicated that it might be worth while to start a filbert breeding project with the object of combining the desirable characteristics of the better sorts.

It was decided first to cross Rush, a selected form of *Corylus americana*, with the best varieties of *Corylus Avellana*, Rush contributing the hardiness of the native hazel, possible resistance to filbert blight, and the hybrid vigor that sometimes results from the crossing of two species. The European filberts were expected to furnish large-sized nuts as well as dessert and cracking quality. [Pg 95]

The first crosses were made in 1930 when two trees of the Rush variety growing on Dr. MacDaniels' place in Ithaca were pollinated with pollen of several varieties of *Corylus Avellana* that was brought from Geneva. Additional crosses were made at Ithaca in 1931 and 1933. In 1932 the pollinations were made at Geneva, using a Barcelona tree covered with a tightly woven cloth. No pollinations have been made since 1933.

In the spring of 1932, 535 seedlings were received from Willard G. Bixby, of Baldwin, Long Island, N. Y., which had resulted from crosses made by C. A. Reed of the United States Department of Agriculture, at Baldwin. Including these U.S.D.A. seedlings and those resulting from the breeding work at Geneva, 1,999 seedlings have fruited.

The nuts from these crosses were stratified in sand in a cold frame, dug up, and planted in the greenhouse in early March. After one transplanting they were moved to the nursery to grow for two years, when they were moved to the seedling orchard. The nuts from one year's crosses were planted directly in the nursery but germination was low due to drought.

The seedlings were spaced 10 x 5 feet in the orchard. This spacing was satisfactory if the trees came into bearing the fourth year, but if unfavorable weather eliminated the first or second crops the trees became too crowded to permit satisfactory fruiting. Usually, however, the trees fruited sufficiently to make it possible to evaluate them and remove the inferior trees so that the better seedlings would have enough room to remain for several additional crops.

During the first few years the orchard was clean cultivated until cover crops were sown in August. In later years the orchards were not cultivated but nitrogen fertilization was substituted. Satisfactory growth was maintained, but the grass and weeds made harvesting more difficult. No pruning was done except at planting time as the seedlings were all evaluated before pruning was needed. Suckers were removed around the young trees, but as they became older this was not done and some of the plants now have several stems.

Evaluating the Seedlings

The nuts were harvested in the fall after they had dropped, or, with the later maturing seedlings and those which tended to cling to the tree, they were harvested by picking or shaking them from the tree. As soon as practicable the nuts were husked and the crop of each tree weighed and recorded. Samples of nuts of every seedling fruiting were placed on paper plates, each population being by itself, and eight or ten nuts of each sample were cracked and left on the plate. The seedlings were then divided into three classes, those that were obviously good, those that were poor, and an intermediate class that received further attention. The poor seedlings were marked for discard and if so marked for two or three years they were pulled out.

The good seedlings were then examined more carefully and sorted into three groups, as follows:

1. Those that were outstanding in both nut and tree characters.

2. Those that were good enough to propagate for a second test, but not equal to the best.

3. Seedlings good enough to keep for further observation. These were usually good in one or more characteristics but deficient or doubtful in one important feature. If upon further testing these third group plants proved to be outstandingly productive or hardy they were given a higher rating. [Pg 96]

In examining the nuts, emphasis was placed on size and color of the nut, the large, bright brown nuts being considered more desirable than the smaller, duller colored, pubescent nuts. The amount of space between the shell and the kernel was important. If the kernel fitted tightly it was easily broken or chipped in cracking the nut. Thickness of shell was of minor importance as only a few were thick enough to make cracking difficult.

The kernel characters were of most importance since the kernel is the reason for producing the nut. The kernel must be plump, smooth, light brown in color, and free of the superfluous pellicle, or fibrous material that is characteristic of the Barcelona kernels. Generally, seedlings with Rush as one parent had very little of this superfluous fibrous material and the best of them were much superior to Barcelona in appearance and dessert quality. Flavor received less consideration since most of the seedlings were reasonably good in that respect.

Given a good kernel, and there were many of them, it became necessary to rely upon other characteristics to eliminate the less desirable of these seedlings. It was here that the records of yields and catkin hardiness were valuable. After several years it became evident that certain seedlings were consistently high yielding while others were low yielding. Hardiness of catkin also varied greatly and rather consistently from year to year. Weather conditions influenced catkin killing greatly. Catkin hardiness is important since the pollen is necessary for nut production and must be present in abundance as its movement in the orchard is subject to the vagaries of the wind, and only a small percentage of that in the air ever comes in contact with the stigmas of the other varieties.

It is the purpose of this paper to indicate the value, insofar as it may be estimated from the available data, of the different varietal crosses in obtaining desirable filbert hybrids. Table 1 contains a list of crosses made, the number of seedlings raised, and the percentage of these which were of sufficient merit to be retained for further study. The percentage of seedlings propagated indicates even more definitely which crosses are of the greatest value in producing superior seedlings as only the outstanding seedlings were propagated for a second test. Selections included in Table 1 are there by virtue of their all-around merit.

Crosses between Rush and Littlepage and Rush and Winkler produced nothing of value. The populations were small, but other equally small populations from other crosses produced seedlings of value. The inter-crossing of selections of *Corylus americana* does not appear to be a promising line of attack in filbert breeding where hybrids with *C. Avellana* will thrive.

Rush and Barcelona were each used as seed parents in crosses with the same eight varieties. In the crosses involving Rush 1,232 seedlings were produced and of these 39, or 3.2%, were good enough to propagate. Of the 306 seedlings raised from the same varieties combined with

Barcelona only 4, or 1.3% were worth propagating. None of these Barcelona seedlings are among the best. Under the conditions of the experiment it would seem that Rush is much superior to Barcelona as a parent in crosses with varieties of *Corylus Avellana*.

The cross between Kentish Cob and Cosford failed to produce any seedlings of outstanding merit. [Pg 97]

In considering the productiveness and hardiness of the catkins of the seedlings resulting from the different crosses the data have been assembled in Tables 2 to 5, each table containing the summarized records for different plantings. These plantings were started at different times and the records are not directly comparable as they are for different years and varying lengths of time. In Table 1 the total number of seedlings is given, but in Table 2 to 5 only the data for the selections are used. Records for the selections are available for several years, whereas the inferior seedlings were discarded and limited data only are available. Furthermore, the filbert breeder is interested primarily in the worthwhile material that may be taken from populations of known parentage.

Assuming that we have a fairly good nut productiveness is the most important characteristic in a filbert. If the plant is productive it must of necessity be reasonably vigorous and hardy. For that reason much emphasis has been placed on productiveness in the final evaluation of the selections.

The selections in Table 2 are from the U.S.D.A. Bixby plants which were the first to fruit at Geneva. Considerable variation in productiveness is evident in the different populations. Rush x Kentish Cob and Rush x White Aveline selections were only about half as productive on the average as Rush x Barcelona, Bollwiller, Red Lambert, and Daviana. Rush x Italian Red also failed to produce high-yielding selections. In a later planting in the same orchard, as shown in Table 3, the Rush x Kentish Cob selections performed no better, the Rush x Red Lambert selections outyielding them by a substantial margin. The Barcelona x Italian Red selections were very low yielding.

In orchard 22, as shown in Table 4, where Rush and Barcelona are crossed with the same varieties, the resulting selections from the Rush crosses are about one third more productive if mean yields are considered, or one-half more productive if only highest yielding selections are considered than with the Barcelona crosses. Cosford has been outstanding in transmitting productiveness in crosses with Rush, Italian Red, and Nottingham. Rush x Kentish Cob selections in this orchard as in the other planting, were only about one half as productive on the average. In the crosses with Barcelona the combination with Medium Long, Red Lambert, and Italian Red were considerably more productive than crosses with Purple Aveline, Halle, Daviana, and Bollwiller.

The Kentish Cob x Cosford cross was less productive than most of the other combinations made. Kentish Cob definitely appears to transmit unproductiveness when crossed with Rush, Barcelona, and Cosford.

In orchard 8 as shown in Table 5, the trees soon became very crowded as the discards were not removed and the yield records were less reliable than in the other plantings.

Winterkilling of catkins were recorded on the selections for several years. In early April the percentage of winter-killed catkins was recorded by estimate. Tables 2 to 5 contain the mean of these estimates and a considerable variation in catkin hardiness in the different populations is evident. Red Lambert, which had the hardiest catkins of any variety of *C. Avellana* tried at Geneva, produced a higher proportion of catkin-hardy seedlings than any other variety. Cosford was fairly good in this respect and in orchard 16 Bollwiller, Italian Red, and Barcelona when crossed with Rush produced selections with moderately hardy catkins. [Pg 98]

Winter injury of catkins was nearly always very high in crosses between varieties of *Corylus Avellana*.

Of the 1,970 seedlings included in Table 1, 340 or 17%, were retained for further observation and of these, 52, or 2.6%, were considered good enough to propagate for a more extensive test. Of these 52 a few thus far have been outstanding when compared with the others. Possibly the best and most productive selection is No. 1265, Rush x Purple Aveline, that is the heaviest yielding of all and the nuts are also among the best, being of medium size, plump, and free from fiber. This seedling is far superior to any others from the same cross. Nos. 1408 and 1467, both selected from a Rush x Cosford population, are close seconds to No. 1265. In the Rush x Cosford population are several others nearly as good, the general level of merit in this combination being fairly high. Farther down the list, but still among the best, are No. 110 Rush x Kentish Cob, and No. 157, Rush x Barcelona. Filbert breeders working under similar conditions would probably find it worthwhile to make these crosses and also to produce more seedlings from Rush x Red Lambert than were raised at Geneva.

No crosses have been made at Geneva in recent years, but all of the nuts from the selections, sometimes several hundred pounds a year, have been planted by the Soil Conservation Service and the resulting seedlings planted in various parts of the country. Undoubtedly, if these could be examined when in fruit, some worthwhile selections could be made. Those in New York State will probably be worked over during the next few years.

Table 1. Results from filbert crosses.

Cross	Number of Seedlings Fruited	Number Retained	Percentage Retained	Number Propagated	Percentage Propagated
Rush x Kentish Cob (Du Chilly	430	63	14	11	2
Rush x Cosford	447	52	12	11	2
Rush x Bollwiller	165	18	11	6	3
Rush x Italian Red	118	17	16	2	1
Rush x Red Lambert	36	10	28	6	16
Rush x Daviana	13	2	15	2	15
Rush x Purple Aveline	12	3	25	1	8
Rush x White Lambert	11	0	0	0	0
Rush x Barcelona	119	20	16	3	2
Rush x White Aveline	54	10	18	3	5
Rush x Imperial deTrebizond	24	5	21	1	4
Rush x Nottingham	23	7	30	2	8
Rush x Brixnut	8	2	25	0	0
Rush x Littlepage	12	0	0	0	0
Rush x Winkler	6	0	0	0	0
Barcelona x Kentish Cob (Du Chilly)	42	21	50	3	7
Barcelona x Cosford	57	27	48	1	2
Barcelona x Bollwiller	11	2	18	0	0
Barcelona x Italian Red	66	9	13	0	0
Barcelona x Red Lambert	41	12	29	0	0
Barcelona x Daviana	21	5	24	0	0
Barcelona x Purple Aveline	25	8	32	0	0
Barcelona x White Lambert	43	1	2	0	0
Barcelona x Medium Long	45	16	35	0	0
Barcelona x Early Globe	78	0	0	0	0
Barcelona x Halle	12	6	50	0	0
Barcelona x Red Aveline	9	1	11	0	0
Kentish Cob (Du Chilly) x Cosford	35	22	63	0	0
Total	1970	340	17	52	2.6

Table 2. Yields and winterkilling of filbert catkins, Orchard 16, 1935 1937, 1938 and 1939. Yields are 4 year total. Catkin injury is 5 year mean

Cross	Number of Selections	Mean Yield per Selection in Ounces	Highest Yield per Selection in Ounces	Mean Percentage Catkins Winter Killed per Selection	Lowest Percentage Catkins Winter Killed
Rush x Bollwiller	18	81	143	21	4
Bush x Kentish Cob (Du	38	117	36	3	

Chilly) 12					
Rush x White Aveline	9	44	73	42	0
Rush x Barcelona	6	94	147	26	8
Rush x Imperial de Trebizond	5	81	100	28	10
Rush x Italian Red	3	79	80	15	3
Rush x Red Lambert	3	88	116	7	3
Rush x Daviana	2	82	110	33	26
Rush x Purple Maxima	1	37	37	17	17

Table 3. Yields and winter injury of filbert catkins, Orchard 16, 1937-41 inclusive.

	No. of Selections	Mean Yield per Selection in Ounces	Highest Yield per Selection in Ounces	Mean Percentage Catkins Winter Killed per Selection	Lowest Percentage of Catkins Winter Killed
Cross					
Rush x Kentish Cob (Du Chilly)	26	38	102	68	5
Rush x Barcelona	14	52	89	90	38
Rush x Red Lambert	5	67	117	12	5
Barcelona x Italian Red	3	18	20	83	73

Table 4. Filbert selections. Orchard 22. Yields 1939, 1940, 1941, 1942, 1944, 1945 and 1946. Catkin injury records 1939-42, inclusive. [Pg 100]

	No. of Selections	Mean Yield per Selection in Ounces	Highest Yield per Selection in Ounces	Mean Percentage Catkins Winter Killed per Selection	Lowest Percentage of Catkins Winter Killed
Cross					
Rush x Cosford	26	129	229	42	0
Rush x Kentish Cob (Du Chilly)	25	68	185	70	13
Rush x Nottingham	7	96	180	31	14
Rush x Italian Red	3	114	181	45	30
Rush x Purple Aveline	3	114	240	42	25
Rush x Red Lambert	2	90	127	21	8
Rush x Brixnut	2	49	51	62	58
Barcelona x Cosford	27	90	138	62	32
Barcelona x Kentish Cob (Du Chilly)	21	69	126	69	25
Barcelona x Medium Long	16	93	257	83	71
Barcelona x Red Lambert	12	83	147	52	13
Barcelona x Purple Aveline	8	50	73	78	55
Barcelona x Italian Red	6	84	133	90	81
Barcelona x Halle	6	52	79	52	23
Barcelona x Daviana	5	53	75	67	59
Barcelona x Bollwiller	2	66	94	62	58
Barcelona x Red Aveline	1	91	91	56	56
Barcelona x White Lambert	1	103	103	5	5
Kentish Cob (Du Chilly) x Cosford	22	62	151	64	33

Table 5. Filbert selections. Orchard 8. Yields 1940, 1941, 1942 and 1944. Catkin injury records 1940, 1941 and 1942.

	No. of Selections	Mean Yield	Highest Yield	Mean Percentage	Lowest Percentage

		per Selection in Ounces	per Selection in Ounces	Catkins Winter Killed per Selection	of Catkins Winter Killed
Cross					
Rush x Cosford	26	25	47	30	2
Rush x Italian Red	11	25	39	27	0

Discussion after Mr. Slate's paper—

MacDaniels: "Of the 1999 seedlings tested at Geneva, 52 are being carried on for further observations. Prof. Slate is doing a fine work."

J. R. Smith: "I want to express my appreciation of the work Prof. Slate is doing. To care for 1999 seedlings and keep the performance records is a big job and just the kind of thing on which progress depends." [Pg 101]

Nut News from Wisconsin

CARL WESCHCKE

This year at River Falls, Wisconsin, which is only 35 miles southeast of St. Paul, Minnesota, the season started off with much rain and a delayed cold spring. All the grafting had to be postponed from two to four weeks later than normal. The stored scion wood suffered some because of this long storage period, and some of it was quite dry when taken out. This was particularly true of the Weschcke butternut and these scions looked so dry that I was tempted to throw them all away, but instead I gave them to two young horticulture students to practice with. None of them grew, however, so we had a 100% failure on butternut grafting. About a dozen years ago I had much success grafting butternut on black walnuts and was unimpressed, therefore I did not make any notes as to the process I used. This was a mistake for apparently I have lost the art. The last five years has probably produced only about five or six plants successfully grafted on black walnut. Hickories respond much better and I usually get about 50% successful grafts on my native butternut stocks.

Although the insect pests, such as the butternut curculio, were delayed in their attacks, they eventually caught up and destroyed most of the big butternut crop and did their usual damage to heartnut and Persian walnut growth. I noticed in the American Fruit Grower that plum curculio was controlled in the peach orchards through the use of hexaethyl tetraphosphate. If this chemical poison controls plum curculio, it ought to control any of the curculio family, such as the hazel curculio, chestnut curculio and butternut curculio. The butternut and hazel curculio appear to me to be the same insect. I am not troubled with the chestnut curculio yet, but if this chemical gives control over the curculio insect family we will certainly be able to raise large crops of all of the nuts mentioned.

Quite a few of my grafted test trees, both in the forest and in the orchard, which in some cases were grafted on bitternut hickory stocks fifteen years ago, are beginning to bear. These varieties are the Woods, Fox, Taylor, Platman and Davis. Others which have borne a few times previously also have good crops set. These are Bridgewater, Glover, Beaver, Kirtland, Deveaux and Fairbanks. The trees setting the largest crops of hickory nuts are the Weschcke, and they are the only ones that I can really count on maturing early enough to escape our usual early fall frosts.

I derive great pleasure in observing new seedling plants of filberts, hazels and their hybrids coming into bearing for the first time this year. There are about two hundred of these new varieties. Of course most of them will be worthless commercially. The ideal hybrid hazilbert has not yet appeared, but when it does we will propagate it for sale as rapidly as possible.

At this date, August 20, we have suffered from an extremely dry August and will apparently lose many trees that we cannot reach by irrigation or some other means of watering.

We have been busy at the farm and nursery erecting a small pilot plant for grinding filbert butter which we expect to be able to put on the market between October 15 and November 1.

There is about a one-fourth crop of black walnuts in my orchard trees, with the Thomas leading. Many of the Ohio trees are barren. Usually the Ohio bears freely. [Pg 102]

It is my observation here that the wild hazels and some of their hybrids will drop their crop of nuts when it becomes too dry. This probably is an excellent feature from the standpoint of the plant as it no doubt saves the plant from being killed by drouth.

There is no doubt in my mind but that the hazel-filbert hybrids (hazilberts) will make a large agricultural crop in the corn belt. When these crops are shelled in local plants and ground into

butter the industry will fall into much the same category as country creameries. However, we have not reached the point where we have the right commercial plants for this purpose and for the time being will have to use the Pacific Coast filberts until such large crops of the ideal hybrids appear.

Home Preparation of Filbert Butter and Other Products

MRS. JEANNE M. ALTMAN, Bellingham, Washington

Filberts may be prepared in different ways at home to make a delicious food. To make filbert butter first shell a roasting pan two-thirds full of kernels and put it in a 325° oven. Stir the kernels thoroughly and often to get an even tan. Cut a few in half to determine when they are brown enough. Cook about thirty minutes. Do not leave in oven any longer than necessary because the kernels begin to brown rapidly upon further cooking. Cool and stir when not too hot. Most of the brown pellicle can be removed by rubbing kernels between one's hands. Run the kernels through a food chopper or meat grinder to make a Crunchy butter. To make a more delicious product, however, first run the kernels through a coarse knife, salt them and then run through a fine knife. This results in a butter with enough oil of its own to make a delicious dish. It takes lots of nuts to make much filbert butter.

In preparing salted filberts in quantity I cook them in a strainer in a kettle of deep fat. Check the temperature with a thermometer and do not let them get too hot. Cool them quickly by putting them into a cold dish and stirring. When salting the whole kernels put only enough fat with them to coat the pellicle. After they are sufficiently brown take them out and salt them as they are cooling. Stir just enough to coat the kernels with salt. Eat pellicle and all; it holds the salt. Stirring too much tends to remove the salt.

You can treat a pound of nuts at a time in a heavy iron skillet on top of the stove stirring constantly. When we follow that practice we eat them salted just as they were instead of grinding them. I think they are better than salted peanuts.

I sent a recipe to one of our west coast papers and they added a note to drain them on a paper towel. That is wasteful and unnecessary. A Bellingham dentist put whole nuts into his false-teeth baking oven in the evening. I do not know what temperature was maintained but it must have been low because he left the nuts there all night and the next morning he found them all roasted and ready to eat.

Filberts, even the green ones just as they come from the tree, may be boiled and then salted and buttered. They may be used to advantage in many cooking and baking recipes. [Pg 103]

Notes from Central New York

S. H. GRAHAM, Ithaca, N. Y.

This summer has been a difficult one for black walnuts. A late spring delayed starting and three freezes during the week beginning Sept. 22 prematurely checked development so that poor filling seems to be the rule. The Persian walnuts again demonstrated their ability to ripen their nuts in a short season.

Some of our Persian walnut trees are growing in the partial shade of larger black walnut trees. We prefer to keep these larger trees as they may be valuable stocks to be grafted to the superior varieties that one is always hoping will appear later on. This condition gives a good opportunity to observe the effect of shade. There seems to be no doubt that even light shade is detrimental in our latitude to the Persian walnut and results not only in more spindling and unsymmetrical growth but also interferes with proper ripening of the wood making it more subject to winter injury.

One difficulty with the Persian walnuts in the East is premature falling of the nuts. The female flowers on the young Persian trees that we have seen are usually more numerous than with black walnuts of the same size and age, but even hand pollinating often fails to give a good set of nuts. Last spring we took pollen from eight of our Persian trees to the pomology department of our State College of Agriculture for germinating. The best sample showed 45% viable pollen; the next best 15% and the rest from O to 5%. This had been collected and stored for several weeks according to the methods given by Dr. Cox in the annual report for 1943, page 58. It is possible that this lack of viability may be due to some soil deficiency such as insufficient lime or boron. Prof. Schuster of the Oregon station writes that they find that Persian walnuts readily accept good Persian pollen but not black walnut or butternut pollen. If the viability of the pollen falls below 50% they consider it unsatisfactory. On some of the Oregon soils an application of boron in the form of ordinary borax under the trees in the spring has greatly helped in getting a crop of nuts. This should be well worth trying in the eastern states.

The filbert crop this year is better than usual. Out of over a thousand crosses between Rush and Winkler with European and Pacific Coast varieties, in our estimation, only one has proven worthy of propagation considering size, flavor, abundance of bearing and resistance to filbert blight. Some growers think lightly of blight but our experience in fighting it through the years in cutting out cankered wood has convinced us of the futility of this means of control in infested areas. Control measures may apparently succeed for a time but when conditions of moisture, heat and air movement are just right it can spread like wildfire. Therefore, to us, resistance to this disease (Cryptosporella anomala) seems of paramount importance. The prevalence of blight has been almost universal in the scattered plantings which we have visited in central New York, usually without the owner knowing why his trees were dying. All our European and Coast varieties, as well as most of the hybrids, take blight readily but there is an occasional hybrid that is clearly resistant. Bixby is one of these.

We have always used a knapsack sprayer equipped with a mist nozzle for our trees but this is inadequate as the trees grow taller. This summer a much more satisfactory nozzle was found that may be quickly adjusted to throw a mist for low trees or a far reaching one for the taller trees. [Pg 104] This is made by the D. B. Smith Co. of Utica, N. Y.

From time to time articles appear on insects injurious to nut trees. Frequently mentioned are the web worms and the walnut caterpillars. With us, the damage they do is as nothing compared to that caused by the curculios, the strawberry root worm beetles and the leaf hoppers. We are getting the upper hand of the curculios by the use of cryolite spray but the root-worm beetle problem is still unsolved. Until Rev. Crath wrote of leaf hopper damage (Annual Report 1938 p. 111) we had not regarded them as at all serious. Subsequent observation has convinced us that he was right and that they are often the cause of the blackening and dying of the tender young leaves of Persian walnuts and the curling up of older leaves. We were especially impressed during the Wooster, Ohio, field trip last year and, later on, in seeing how Mr. Sherman had overcome this trouble on the Mahoning Co. farm simply by adding DDT to his spray mixture.

In closing, we would like to call the attention of new members to the wealth of information that is to be found in the old Association annual reports.

Experience with the Crath Carpathian Walnuts

GILBERT L. SMITH, Wassaic, New York

In the spring of 1935 we purchased from the Wisconsin Horticultural Society two pounds of the nuts which Rev. Paul Crath had imported from Poland. We planted these nuts in the nursery row. Sixty-two seedlings resulted. We assigned a number of each of these seedlings and transplanted them when they were two years old. Here we made our first mistake. We selected what proved to be a very poor site for them, adjacent to and nearly surrounded by woodland, in which were a goodly supply of butternut curculios which we have found to be by far the worst insect enemy of the Persian walnut. It attacks the terminal growth doing some damage by feeding but principally by laying eggs in the terminals and the fleshy base of the leaf stems. From these eggs grub-like larvae hatch which bore into the terminal and the leaf bases, greatly dwarfing the terminal growth. We have found as many as six larvae in a single terminal. Of course they also like to lay their eggs in the young nuts which then drop from the tree in mid-summer.

In the spring of 1937 we started to graft from these seedlings on black walnut stocks, giving each the same number as that of the seedling from which the wood was taken. It is too bad that we did not start this work sooner as we lost a few of the seedlings, largely through the ravages of the curculio, but possibly some of them were just not rugged enough to stand our climate. We still have 49 of these varieties living, either as grafts or the original trees. To this collection we have added a few varieties, securing wood from seedlings being grown by others. We have had living grafts of some of the named Crath varieties which we suppose developed from some of the wood imported from Poland by Rev. Crath. All of these have failed with us except one, Carpathian D. Apparently they were not hardy enough for our climate.

So far we have had only one severe test of our Crath seedlings, as to hardiness. This was on [Pg 105] February 16th, 1943, when the temperature at Mr. Benton's farm was thirty-four degrees below zero. This was not official but was registered by two thermometers which Mr. Benton knew to be very accurate. Many of our Crath seedlings showed no injury at all on this occasion while others showed varying degrees of injury. Our grafts of Broadview were damaged quite severely, Carpathian D to just about the same extent. One other named Crath variety, Crath No. 1, was killed outright. Only one of our seedling varieties showed as severe injury as did Broadview. This was S 12. This tree has now fully recovered but we will not grow any trees from it except for more southern latitudes and then only if it shows exceptional merit when it begins to bear. Therefore, according to our experience so far, there is quite definite evidence that these Crath seedlings are hardier than Broadview. McDermid was killed outright.

We have found that practically all Persian walnut trees, when young, will bear pistillate blossoms for several years before they bear staminate blossoms (catkins). This fact has delayed us in securing nuts from these seedling varieties and has compelled us to resort to hand pollination.

However, they are now beginning to produce both kinds of blossoms.

The first one to bear was in 1944, when one tree bore twelve nuts which had resulted from hand pollination with pollen sent us by Mr. Reed. This variety appears to be the most promising one that has borne so far. We have named it Littlepage and have had a booklet printed which describes it fully. We will be glad to mail a copy to anyone who wishes. We have now found a good pollinizer for Littlepage, our No. S22 seedling. This variety produces pollen at just the right time, some of which I used this spring to hand pollenize the Littlepage tree. A fine crop of nuts is now on this tree as the result of this pollination.

Last year (1946) we had a few nuts from each of five other seedling varieties. While we did not consider any of them equal to Littlepage, they were all worth growing and compare quite favorably with English walnuts as found in our markets. This year we have nuts on each of eleven varieties, five of them and the same ones that bore last year and six new ones. Now that these seedlings are beginning to bear we are able to cull out any that prove to be very inferior. As our facilities are far too limited to thoroughly test the promising varieties, we have started to propagate them and offer them in many parts of the country and subject them to many different conditions. Thus it should be only a matter of time until the truly worthy varieties will prove themselves. If we were wealthy we could propagate them and distribute them free of charge but I doubt if it would prove as satisfactory as it is to charge for them, as it seems to be a trait of human nature to take better care of that which costs us something. We will not name these new varieties at present but will put them out under their test numbers. Later the ones that prove best can be named.

To facilitate the distribution of these new varieties we are getting out a folder showing natural size pictures of the nuts of the six varieties which were produced last year, with a brief description of each. I am very sorry that I was unable to get these folders from the printer before coming to this convention. However we will have them very soon and will be glad to mail a copy to anyone who requests it.

As stated before we have found that the butternut curculio is a very bad pest with the Persian walnuts, also heartnuts and butternuts. It does not injure the black walnut at all. There are also several other insects which feed on the Persian walnut, most of these chewing insects that simply [Pg 106] injure the foliage more or less severely. Last winter I was advised by Dr. Dean of our experiment station staff, to try benzene hexachloride (hexachlorocyclohexane) for control of the curculio. He stated that in California they have found out that the Persian walnut is quite susceptible to arsenical injury when a spray containing arsenate of lead is used on it. Also tests so far indicate that D.D.T. is not very effective against the apple and plum curculio, therefore not likely to be effective against the butternut curculio. So last spring we secured a supply of benzene hexachloride. Just as we were about to spray the trees I discovered a swarm of orange colored insects with black wing covers, feeding on them. So I checked the compatibility chart in the February issue of the American Fruit Grower and found that benzene hexachloride and D.D.T. were compatible when used together in the spray mixture. I thought it would be well to use a double barreled dose. So we made up a spray of four pounds of benzene hexachloride, four pounds of D.D.T., 50% wettable powder, and 6 pounds of wettable sulfur to 100 gallons of water. This first spray showed a slight burning of the leaves, which I suspected was due to the sulfur. We omitted sulfur from the later sprays and did not note any more burning. We put on three sprays at about two week intervals and a fourth spray about the middle of July. The result of these sprays appears to be excellent. I have found only one nut showing any insect injury and this one was only slightly injured, whereas last summer we lost a considerable percentage of the nuts from curculio injury. A day or two after applying the first spray, I wanted to secure a specimen of the orange-colored insects with black wing covers, but I could not find a single specimen.

We did not apply our first spray quite soon enough and curculio larvae had already invaded a few of the terminals. The first spray should be applied about as soon as the leaf buds separate and quite likely should be followed by the second spray in about a week, as new growth is very rapid at this time and the scant foliage at the time of the first spray would hardly hold enough of the chemicals to give control for more than a few days.

Observations on Hardiness of the Carpathian Walnuts at Poughkeepsie, New York

STEPHEN BERNATH

In our section we have very good Persian walnut varieties of Carpathian and other European sources. I have planted some of all strains and varieties. My place faces northwest on a good elevation. My experience with trees there is that we have no winter injury. We can grow trees there that cannot be grown on some place which is situated low, and therefore does not have enough air circulation. Damage is done after heavy frosts when the sun comes out suddenly. That is what damages the trees—not the cold.

If you take trees and put them in a temperature of 35 to 40 degrees below zero and bring them out to thaw gradually no harm is done. Most people buy trees and plant them in low places; that

is the error. We have planted trees where the wind is very heavy throughout the winter and in the spring I found that these trees stood up wonderfully well; whereas, we have European walnut trees with a trunk diameter of about 12 to 14 inches that in one year froze two to six feet—about three to four years growth. If you plant your trees on a fairly good elevation you can be assured of a good nut crop. In planting nut trees I do not know what kind of fertilizer you use, but I always use well decayed cow manure and put a little right around the root system. I never use fresh manure and never use poultry, sheep, or horse manure. They are bad for trees as they are very high in ammonia and this does damage to the trees. [Pg 107]

Discussion after Graham, Smith, and Bernath Persian walnut papers.

Corsan: "Is using lime a good idea? I always use a lot of wood ashes."

Stoke: "Use ground agricultural limestone. Burned lime may cause injury."

J. R. Smith: "Barnyard manure is the best."

Stoke: "With the Carpathian walnuts there is no uniformity in winter injury. I have had the Crath variety kill back to two inch wood. Most others have never shown winter injury."

Corsan: "When is it practical to take mulch away?"

MacDaniels: "If you take mulch away too late you will get more injury than if you don't take it away at all."

Member: "Why does my young walnut tree not bear?"

Bernath: "English walnut trees may produce pistillate blooms for a number of years before they produce pollen so that if you have only one tree it may be due to lack of pollination."

Member: "With English walnut is more than one tree necessary for pollination? The male blossom appears a week or 10 days before the female."

Crane: "Persian walnuts should be used to pollinate Persian walnuts—do not depend on black walnuts. In growing Persian walnuts it is best to have trees of two or more varieties in a planting so as to provide cross pollination."

Stoke: "Persian walnuts may not pollinate black walnut, but black walnut has pollinated the Persian walnut in known instances."

MacDaniels: "Control or uncontrol of pollination is very complex."

Crane: "We find that we can not readily produce Persian x Eastern black hybrids under conditions of controlled pollination. We have found a number of natural hybrid trees but they bear very few nuts." [Pg 108]

Nuts About Trees

R. E. HODGSON, Superintendent, Southeast Experiment Station, University of Minnesota.

When hiking with a Boy Scout troop, they often asked me, "What tree is that?" In summer I could usually tell an oak from a box elder but had never had much reason to go further into the subject until the boys exposed my ignorance. In self defense I began to hunt up the names and found it a most interesting hobby.

The University of Minnesota has a branch experiment station some 80 miles south of the Twin Cities and it is here that a few acres have been roped off as a testing site for whatever trees of interest we can persuade to grow. My job is with field crops and livestock but my golf, fishing, hunting and bridge are mostly played with a spade and pruning shears or wandering around in the brush somewhere looking for something new. Our soil is a heavy clay loam of Clarion type containing plenty of lime but often poorly drained. It is very rich and productive being at one time part of Minnesota's big woods. Native trees are basswood, oak, elm, ash, walnut and their associates.

My ignorance concerning trees is still profound and becomes more apparent as acquaintance matures, but it has been a lot of fun to start about 130 varieties of trees and shrubs and watch their development. The Latin names are mostly a mystery to me, but their habits, methods and rate of growth along with soil preferences and winter survival have furnished more entertainment for me than picking shot out of a dead bird or furrowing the turf on a putting green. It has been a real thrill to see cypress, sycamore and even a few yellow poplars, survive our rugged winters.

The project began with an attempt to collect native trees and expanded to make room for some exotics, just to see what would happen to them. Detours and by-paths included attempts to grow various conifers from seed and persuade cuttings to root. Somewhere along the line nut trees

began to enter the picture and now these have an alcove all to themselves. Perhaps it started when a neighbor offered me $5.00 if I could tell whether a young sprout in his yard was butternut or walnut. He died before I found the answer which was probably common knowledge to most people. The color of the pith did not seem reliable, but at last a book pointed out the little moustache a butternut wears just above each leaf scar. It worked, and the thrill was equal to catching a 10 pound wall eye!

I was raised on the prairie part of southwestern Minnesota and it was a delightful surprise when I moved 140 miles east to find that one could gather almost any desired quantity of black walnuts from remnants of the old forest. After a few years these trips to the woods became less glamourous and the pickeruppers more critical. Many of the wild nuts were small and hard to crack. Perhaps a friend's Thomas tree in full bearing with its heavy crop of huge, tasty nuts inspired a wish to grow bigger and better producing trees near at home.

It looked easy to transplant vigorous, 6 foot black walnut whips which could be had for the digging. It took 10 years to learn that nuts properly planted would make larger trees in a decade than transplants. Digging 2 deep holes to move one tree seemed a waste of labor when one planted nut would better serve the purpose. Of course nut planting led to a contest of wits with the squirrels. [Pg 109]

It was a funny sight to watch a helper carefully placing nuts at regular intervals in an open furrow and a big fox squirrel following 10 feet behind him, removing the prizes as fast as he could scamper up and down a nearby hollow oak. Our ideas concerning appropriate locations for walnut trees did not coincide with those of Mr. Bushytail. We learned that the simple way to plant walnuts in the woods was to pile a half a bushel here and there. The tree climbers took their toll, but did a good job of planting. Survival seemed better than when we placed individual nuts and "stepped them in."

The desire for bigger, better and more useful nuts led to the planting of a couple of acres to seed from various trees of known value. These will not come true of course but it is hoped that some day they may serve as material for a small nut breeding project in which an attempt will be made to combine some of the more desirable chromosomes into a single tree that retains the best of what we have in present selections, and adds a little more hardiness between growing seasons. Who can tell? We might find a tree that the walnut worms didn't like!

The squirrels didn't fancy our plans to grow trees in rows according to parentage, so they tried to improve our technique. We almost called in the F. B. I. to circumvent their machinations. Jamming an open tin can over the planted nut seemed to help. When the sprout came up we turned up the edges of the split can bottom just enough to let the tree through, but the sharp jagged edges seemed to discourage marauders. A lot of other methods were also tried.

From the Wisconsin Horticultural Society we obtained a pound of English or Persian walnuts in 1937. So far we have some 23 seedlings struggling to keep alive. They range in height from 18 inches to 7 feet and are definitely out of their range. Some years they grow 4 feet of new wood and some winters it all kills back. There seem to be differences in hardiness and—who can tell?—they might even bear a nut some day. Bark injury, which may be winter sun scald, has damaged some of the trees. One tree of the Broadview selection is alive after four years and may make a go of it.

Hickories grow wild in certain parts of Minnesota, but this doesn't happen to be one of those parts. They seem to do best where soil is acid in reaction and here we are amply supplied with lime. That may account for the slow growth of a grafted Hales hickory tree. It was 3 years old when set out in 1921. For the first 9 years it had just 2 leaves per year. Now approaching 30, the tree is 7 to 8 feet high and going up at the rate of 8 to 12 inches a year.

Nuts from Wisconsin, Michigan, and Minnesota wild hickories, have done better. At 8 years the trees are from 1 to 2 feet high, with a couple of Shakespeares, (geniuses) towering a foot above them. This may not be hickory country, but, by gum, they're growing! A couple of years ago, Dr. Brierley from the Central Station, Division of Horticulture, who has nut propagation as one of his minor projects, gave us 7 seedlings of shellbark hickory, (Carya laciniosa), from a tree planted many years ago by Peter Gideon of Wealthy apple fame. After 2 winters, these 7 seedlings are still with us and seem to grow faster than the shagbarks (ovata).

Other attempts to vary our diet (if we live long enough) are a few Chinese chestnut seedlings. A couple secured from the Nut Tree Nurseries, Downington, Pa., in 1940 are now 3 and 4 feet high and apparently in a good state of health. They are leisurely growing, which may be a good thing. [Pg 110] Trees like the Manchurian walnut which grow 6 to 8 feet of new wood in a year, seem to freeze back and start over more frequently than the trees which poke along but harden their wood before cold weather. In 1946, a few more seedlings from D. C. Snyder, Center Point, Iowa, were set out and most of them have survived the first winter. Carl Weschcke reports that chestnuts do best for him at River Falls, Wisconsin, in sandy soil with an acid reaction. If I ever raise a chestnut, I'd like to send him one.

Fooling with nuts has led to another activity which has been pleasant though not very practical so far. Each spring, Dr. Brierley spends a couple of days with me trying to graft some of the named varieties to our available wild trees. We have raised nuts on some of the hickory scions grafted to the plentiful native bitternuts, but in general our grafts have failed. We have had good advice from many sources and have tried most everything but our successes have not been numerous

enough to cause any inflation of the ego. We're inclined to think that the sudden wide variations of temperature which are common here in May, can be the controlling factor. We've made a few walnuts, hickories, and hicans grow, but still have too many zeroes for any complacency. This year may be our bonanza. Most of the grafts on some 40 trees are shooting buds. Perhaps it's the grafting tape we tried this spring. In 1948 we'll be able to write it all down in the book—and try again.

Nuts are not the only food crops growing on trees. We have read the glowing reports of sweet pods of honey locust grown on such varieties as Millwood and Calhoun, as told by John Hershey and J. Russell Smith. Our Millwoods all killed the second winter and this year we're trying Calhoun. Meanwhile, we're hunting for a hardy, northern grown sweet tree. Miss Jones asked nut growers to tell me what they had and several interesting replies and samples were received. The quality of the pods varied all the way from the sweet Millwood to our native honey locusts, most of which are so bitter and astringent that they remind us of a combination of green persimmons and red pepper. No sensible animal will touch them. Cions were received from a tree in Omaha, Nebraska, through the courtesy of F. J. Adams. These were grafted on local trees this spring and perhaps they will answer all of our needs.

Our attempts to grow better nuts in southern Minnesota have not caused even a ripple in the local economic situation, but it has been a lot of fun. Perhaps the greatest return so far is the interesting correspondence with like minded people in many localities. Amos Workman of Hurricane, Utah, sent seed of his best black and Persian walnuts, pecans and figs. The figs didn't even start (probably my ignorance), but we have trees coming from all the rest. J. Russell Smith has been most helpful with suggestions and the "Minnesota Horse Thief" as he calls me, has enjoyed his letters immensely. John Hershey has passed along some of his enthusiasm for trees and many others have contributed to the pleasure of a fascinating hobby.

It's fun to grow trees even though some of the unusual things provide only exercise and entertainment. Our persimmons grew from seed, were transplanted and came through the first winter! One pawpaw is still trying to get ahead of the winter set-backs, and a Macedonian white pine (said to produce edible nuts) is doing fine. Perhaps I'm the biggest nut of all, but I'm happy about it! [Pg 111]

Report on Nut Trees at Massillon

RAYMOND E. SILVIS, Massillon, Ohio

I will first give an account of plantings observed recently in or near Massillon, and, secondly, a condensation of my own introduction to nut growing.

Louis Bromfield in his richly descriptive book "The Farm" writes, "On the way one passed the big orchard which was Jamie's pride, and beyond one came to the field where the big hickory stood. It was a memorable tree, famous in the countryside for bearing enormous nuts with shells so soft that the faintest tap of a rock or a hammer would lay open the bisque-colored kernels." He also writes a reference to the ingredients of candy making at Christmas time in which a good many recipes called for hickory nuts and walnuts.

In Massillon Mr. Alvin Schott, when he drove by the farm of Mr. Lester Hawk and read his sign, "Chinese Chestnut Trees for Sale," thought of the chestnuts he used to eat. Since he, like the rest of us, cannot go out along the road in the fall and pick up chestnuts as of old, he declared to plant some nut trees on city park land so that the younger generation could in a small measure recapture that which now is only a memory.

After making numerous talks and speeches to all the lodges, civic clubs and P. T. A.'s, he received donations and publicity to help him in his project. He enlisted the help of other civic nut-minded personnel to help him select the trees and locations for planting. Boy Scouts and school children dug some of the holes. When it rained (it seems to rain every time a shipment came in) Mr. Schott would call us away from our work and have us dig holes. We have planted in city parks: 13 Hawk chestnuts, 10 Thomas black walnuts, 8 hazel, 4 mulberries, 2 Broadview Persians, 2 Josephine persimmons, 3 pecan seedlings, 1 hican, 9 large seedling black walnuts and several hickories.

We have additional money for another spring planting. Thus Massillon has joined the list of cities that own trees that will produce something else besides leaves.

On August 17th Mr. Gerstenmaier and I drove to Ira, Ohio, to visit Mr. Cranz and take advantage of his invitation to inspect his nut planting. At this moment I believe that his invitation was made with the subtle purpose of bragging about his excellent crop of Thomas black walnuts and filberts. The trees were originally planted by squirrels and later grafted by Mr. Cranz. They grow at the bottom of a huge hill or escarpment 200 feet high at the top of which is his planting of 20 *mollissima* chestnuts. It's a long climb through his neatly scythed pathways on a hot day. Afterwards I felt like I needed the can which he usually carries.

Recently I found a young black walnut which I hope may be a good selection for further work. It is too early to make any predictions, but I can assure you that a careful check on the tree's

performance will be interesting. Thin shell, good kernel cavity, etc.

Near Bolivar, Ohio, stands a young shagbark hickory which bears a nut about the size of a Pleas hican with a very smooth kernel cavity and a thin shell. Even though small this is another nut which will bear watching.

I believe the greatest interest in nut trees will develop when a definite program of controlled crossing is instituted. [Pg 112]

When I became a member of this organization in 1939 I was managing almost 1,000 acres of farm land. My own 90 acre farm was being farmed up and down the hill because the fences were built that way. My plan was to change over to a contour operation. After reading "Nut Growing" and "Tree Crops" I decided to plant nut trees at 100' intervals along the edges of the contour strips. I had a twofold purpose, to produce more revenue and preserve the contour method of farming.

I ordered grafted nut trees from Jones Nurseries, Crath seedlings from Graham and 200 northern pecan nuts from Wilkinson. Homer Jacobs, really "sold me" on the Nut Growers Association and then sent me scions of the Wilcox hickory. I was successful in getting two to grow about 100' apart. Miss Jones sent me Pleas hican wood and one graft grew between the two Wilcox. All were grafted on shagbark stock, breast high using the late Mr. Fickes' method. The pecan nuts were stratified and given the usual nursery care and at three years of age were transplanted to the farm along with 200 seedling black walnuts and 100 chestnuts. These seedlings were to be used as stocks for grafting the newer and superior productive varieties. This was 1943. The farmer became dissatisfied with my soil conservation tendencies and moved away. The war developed in earnest and I matriculated at a defense plant. The farm just grew up. I was not dissatisfied. I was just tired. I couldn't find enough time to manage 1,000 acres of farm land 20 miles south; work at a defense plant 20 miles north and operate my insurance and real estate business. So I sold all the farms including mine with the nut trees.

Now it is 1947. It was only two years ago that I made a decision to relinquish the 90 acre farm. A short time ago I found all the grafted trees bearing fruit except the hickories and hican. The grafted Zimmerman, Stoke and Hobson chestnuts have died and most of the pecan, walnut and chestnut seedlings planted on the contour strips have succumbed to the mower, etc. I could find none of the grafted hickories purchased through the years except one Fairbanks. The present owners are enthusiastic over the early bearing chestnuts and are taking care of all the remaining survivor trees.

I have reached the conclusion that any farm in this section of the U. S. with enough hope to warrant contour farming is usually marginal land. This is land which barely pays the cost of working or using; land whereon the costs of labor, coordination and capital approximately equal the gross income. I believe that a planting of grafted nut trees on the edges of contour strips will increase the value of that farm and should have the attention of every county agent and farm owner.

I am no doubt the worst "grafter" in the business. When I get one out of 20 sets to grow I am startled, not so much with the statistical percentages but because a small stick of wood from Kentucky can make its home on the roots of an Ohio cousin. I believe that scion storage is important and I wish to report that the method which Dr. Shelton explained in the 1945 report is very satisfactory. The next best is John Gerstenmaier's apple storage cellar, which he and I have used ever since my interest in nut bearing trees brought us together.

It is still 1947. I'm still in the real estate business. I recently purchased 160 acres of land in an adjoining county and placed title in my son's name. He is six years old. I should be free of any inclination to sell this for fifteen years. Since there are no buildings I won't have a tenant problem. This spring I purchased and planted grafted hickories and grafted black walnuts and set [Pg 113] them in supposedly favorable locations where I hope they will maintain themselves. In addition I planted about 200 Hawk seedling chestnuts spaced about 20 to 30 feet apart. These were planted in three different locations. One group was planted under the canopy of a locust grove, another on an exposed hilltop which faces the prevailing westerly winds. The third is on a broad hilltop field which does not have the best drainage since the top soil is clay underlaid with sandstone shale. All of these groups grow on land abandoned some years ago. The soil fertility is generally low. Volunteer native growth of cheery, ash, dogwood and hawthorn prevails.

If I can continue to plant for the next fifteen years I should have quite an orchard, or else my son will have a good hardwood forest. I hope that all of us here can meet there then.

Discussion after R. E. Silvis' paper.

Mr. MacDaniels: "It is a good idea to have nut trees established in the parks. In your home town there is usually a park in which nut trees can be used. Very often it just takes initiative to get these things started. Boy Scout organization is very good at starting projects like this. Chestnuts are more difficult to establish than other trees."

Dr. Gravatt: "Nut trees should not be grown along the curbs because people will gather the nuts that fall on the road. This is very dangerous where there is much traffic."

Stoke: "Walnuts are much more satisfactory as park trees than Chinese chestnuts. People are so

prone to break off branches bearing immature chestnuts."

Dr. MacDaniels: "Wire guards are excellent to keep mice, rabbits, etc., away from your nut trees."

Planting of Nut Trees on Highways Undesirable

R. P. ALLAMAN, Harrisburg, Pa.

Having always opposed this practice when it was under discussion, I have been asked to prepare an article on the subject. This paper was prepared in collaboration with Mr. Wilbur H. Simonson, Senior Landscape Architect, U. S. Bureau of Public Roads, Washington, D. C.

Since the beginning of the roadside improvement demonstration program in 1933 the policy of the Public Roads Administration has never favored planting of the showy, garden type of fruit and nut trees on highway roadsides for several reasons:

1. **Traffic Hazards**—Dropping of fruits and nuts on pavements tends to make surface conditions slippery and dangerous to traffic.

2. **Police Problems**—Ripening of fruits and nuts tends to invite passing motorists to stop on side of highway pavements to gather the fruits, adding to traffic hazard. Also such trees tend to invite vandalism by boys together with clubbing the trees to get down the fruits with the possible results of not only injury and damage to the trees themselves, but throwing sticks, stones and clubs into the tree branches is likely to result in hitting or striking passing motorists and otherwise cause loss of control of vehicles by drivers, a very dangerous road condition especially because it is an unexpected situation to have clubs or fruit come down on the highway when driving through. [Pg 114]

This all means more intensive policing of the highway by the responsible authorities with added costs in maintenance budgets.

3. **Maintenance Problems**—Not only do dropping of fruits, and the results of vandalism, cause extra cleanup of pavements and drainageways, (clogging of pipes and gutters with debris from the trees) all hazardous to traffic; but also the questions of insects and disease problems are added. This all complicates public maintenance problems and especially the proper pruning and spraying of the trees.

It is not considered a proper function of public authorities to carry on operations that compete with private property developments.

Administrative policy and procedures shall encourage the planting of shade tree types along public highways, and avoid the above described difficulties that are **bound** to occur if nut-bearing types of trees are placed on highway areas.

References: Bennett's book on Roadside Development, 1929, pages 6 and 52, also page 527 of the proceedings for the twentieth annual meeting of the Highway Research Board in 1940, regarding the selection and use of trees on highway areas, as recommended by the Committee on Roadside Development. I quote from these the following extracts:

"Profusely flowering fruit or nut-bearing trees are not desirable, as a rule; very showy garden types of flowering, fruit or nut-bearing trees should be avoided in roadside planting. Experience indicates than vandalism is encouraged by planting any species of tree commonly used in garden, commercial fruit, or nut orchard planting."

"Trees which drop heavy masses of petals, fruit or nuts on highway surfaces are not desirable. Horticultural varieties of flowering trees (particularly those of exotic origin such as the Japanese cherries) should be avoided in roadside planting because a too garden-like appearance of planted roadsides will usually indicate excessive annual maintenance costs, and probably heavy future losses of planted material because of competition with superior and more rugged native tree species." *Re:* Vandalism, parents are responsible for acts of their children and public plantings should not encourage children towards acts of a vandalistic nature, with trouble not only for the tree but also for the parents in keeping the children in order.

Nut Growing for the Farm Owner

H. GLEASON MATTOON

It is with trepidation that I present a paper on nut growing before a group so much more learned in the subject than I. But two things impel me to do so. First, the firm conviction that nut trees, carefully chosen, properly planted and intelligently cared for, have a place on many farms as a cash crop for the market and a food crop for the farm family and, second, the poor results from

many nut tree plantings on farms. As may be imagined, my conviction is not based upon results seen but upon the possibilities I know are inherent in nut trees. [Pg 115]

When the first wave of publicity for soil conservation was at its zenith back in the late 30s, I listened to a talk, the substance of which was that there are no such things as submarginal land, and problem areas. There are only submarginal people and problem people. Land does not destroy itself nor is squalor self-created. Human qualities create both conditions. Therefore the problem to be tackled is the ignorance, cupidity or stupidity of those who create such conditions.

This made a profound impression on me. It has influenced my thinking in all things connected with our renewable resources. Our success in growing anything, whether it be cotton, corn or nut trees, depends largely upon ourselves. If we mix three parts of intelligence with one part of effort, the yield will be manifold.

Much of this intelligence should be of the "green thumb" variety, a mixture of common sense and keen observation. The one using this kind of intelligence would plant black walnuts in a deep, rich, well-drained loam, because he has observed that this species grows best and yields more heavily in that type of soil. He would plant the trees with top roots not more than one inch under the surface of the soil because he has noted that is the way they grow naturally. He would strive to keep foliage on the tree as long as possible because he knows that the leaves are the manufacturing part of the tree. Without them the tree could not grow and would not produce filled nuts. He would do many other things essential for proper tree growth and yield.

But unfortunately several of the farm nut tree plantings I have seen show a woeful lack of "green thumb" intelligence. I recall one in particular because of the condition of both the trees and the owner. The planting originally consisted of twenty Chinese chestnuts, fifteen named black walnuts, four hicans and four Persian walnuts. The owner originally was an enthusiastic convert to nut growing. Today the planting is a failure, while the owner is an irate backslider who would not plant another nut tree even though it bore ten dollar bills. Four years after planting, nineteen of the twenty chestnuts, all hican, three Persian walnuts and ten black walnuts were dead. Of the remaining seven trees only one could be called healthy. Examination soon focused the picture. Most of the trees had been planted on an eroded hillside deficient in humus. In addition, many of them were planted from three to ten inches too deep. The only thriving walnut was planted at the proper depth and in a pocket of top soil at the base of the slope. Under questioning, the owner said that he had purposely planted them deep to "keep their roots cool." That is a widely held horticultural fallacy which is unconsciously fostered by many nurseryman. In their instructions they say to plant the tree one inch deeper than it was in the nursery. Too many laymen reason that, if planting the tree one inch deeper will help, then the tree should do even better if planted six inches deeper.

After eighteen years of trying to learn why transplanted trees do not thrive, I am convinced there are four main causes. I list them in the order of their prevalence. First and foremost, too deep planting. Second, fibrous roots allowed to become dry. This may occur in transit, in the hands of the purchaser or because of air space around the roots after planting. Third, deficiency of moisture due to low humus content of the soil or drought. Four, rodent damage. While some nut trees are possibly more difficult to re-establish than a few other species, if care is used to see that none of these four conditions occurs, there is no reason why a well-rooted tree should not grow and remain healthy. [Pg 116]

Up to this point I have been dwelling on the negative side. Though it must be confessed that the preponderance of such planting has not fulfilled the owner's expectations, we must remember that the fault does not lie in the trees but in the human element. If the purchaser of nut trees has received proper instructions and carries them out faithfully, the trees will grow. Not all of the fault, however, can be placed upon the purchaser. The nurserymen should remember that there is a place for gilded pictures and glowing generalities but that place is not in the directions for planting and care. These directions should be practical, precise and detailed, with no implications of Midas returns from a half acre grove. Every grower of nut trees knows that problems and troubles continue to arise which tax his knowledge and experience. How much more baffling such difficulties are to the layman who is just embarking on the venture of growing trees.

I have planted nut trees and have seen them grow to maturity and yield bountifully. I have seen a few farm tree plantings which have more than repaid the time and effort. Though the varieties now grown by nurserymen are inferior to those that I am confident will be produced at some future time, they still have sufficient merit to warrant planting.

You who are interested in nut trees which thrive in the northern states, must recognize that two factors contribute to the development of superior strains. One is hybridizing and the other sport development. The former is a long term project which should have institutional backing. The opportunity for the latter, that is, chance development of a superior or unique variation, is in direct ratio to the number of nut trees growing in the area. Successful farm nut growers, dotted over the region, will, therefore, increase the chance that finer strains will appear.

But whether the farm nut grove ever abets science and produces the long sought superior nut, is of little importance compared to its value to the farm. It is incumbent, therefore, upon every nut enthusiast, who has a hand in bringing to the attention of farm owners the value of nut trees, to be meticulous in giving instructions for their planting and care.

Tree Crop and Nut Notes from Southern Pennsylvania

JOHN W. HERSHEY

Broadview English Walnut—This hardy variety seemed so good it took a lot of effort to keep from recommending it commercially. The oldest tree in our section, owned by my brother, bore lightly for several years. With its fine flavor, tree beauty and hardiness it edges closer and closer to where we can recommend it commercially. In its seventh year it bore a half bushel; the 8th, this year, it's really loaded. I have planted 30 trees.

A Southern Persian Walnut The northern man in the south loves the cool climate, Persian walnut. I have found chance seedlings here and there, even down to northern Alabama. One tree, northeast of Knoxville, Tennessee, had a good quality nut and was seemingly resistant to sun [Pg 117] scald. Starting late in the spring it avoids the late frosts so damaging to horticulture in the south.

Cornell Black Walnut—This new variety, a Thomas seedling, named Cornell by its originator at Ithaca, New York, bore one nut for us in 1946. The boys at Cornell like it because it fills even in an abnormally cool season of the Finger Lakes region when natives fail. You can't decide an issue with one nut, but our specimen was as large and full of high-flavored, white meat as the Thomas, and as thin-shelled as the Stabler. So attractive does this variety appear that I am reserving it this fall in order to plant several in orchard form to produce scion wood.

Honey Locusts—The latest report on their performance comes from J. C. Moore, Soil Conservation Service at Auburn, Alabama, on February 3, 1947. Their laboratory tests of Millwood show a sugar content of 36.65%, and Calhoun 38.95%. The animal husbandry department of the Alabama Experiment Station at Auburn has found the pods equal to oats, pound for pound, in a dairy ration. A team of mules fed for 30 days on pods showed satisfactory results. Cows and hogs showed equal success. At 5 years of age, Millwood averages 58 pounds and Calhoun 26 pounds per year. At eight years, Millwood bore 200 pounds, and Calhoun 60. The pods fall from October 15th to December 30th. Lespedeza sericea planted between the trees yields 2½ tons per acre annually. This gives us courage to continue emphasizing their great value for pasture and rough land planting. The trees we planted in our swampy, worn-out meadow are doing fine.

Mulberries—This great chicken, bird and hog feed will some day fill a definite place in the sun of the American farmer, just as it does in Asia. The drawbacks are lack of hardiness and short bearing season in the north. The Hicks variety bears for six to eight weeks but is not hardy north of the Mason-Dixon line. This year we have grafted eight varieties of which seven are new. One from southern Indiana, an American seedling selected by a mulberry enthusiast, bears for six to eight weeks. Will it be hardy farther north? We shall know soon. Six are from select seedlings of L. K. Hostetter, of Lancaster, Pa., the mulberry king of America. The other is a fine white, a chance seedling from 75 miles north of Pittsburgh. It has not borne yet but was far hardier than Downing last winter. I have a few of these to sell this fall. Mulberries need sweet soil to prevent winter killing. On worn out soils we have discovered that they do well until established, by applying a few handfuls of lime around the tree at planting time. Not only are they excellent for the above mentioned uses but the right varieties are better than raisins when dried.

In 1945 we set a leaky corner of sandy meadow to honey locusts. I saw them growing in semi-swamp land in Alabama, but here all but two of the 18 trees died. When replanted in 1946 also they died. I found the two that were living were carelessly planted too shallow, with the top roots sticking out of the ground. We replanted more trees in the spring of 1947 with the top roots above the ground level, mounded soil over them about 6 to 10 inches, then mulched. They are all growing fine.

Starting a Tree Crop Farm. What Is It?—It consists of a blended, balanced program of cattle, hogs, poultry and sheep pasturing under mulberries, honey locust, persimmons, oaks, etc., plus the hog feed from the refuse chestnuts, walnuts and Chinese dates. The great secret of nature is [Pg 118] that your security lies in a balanced land use between animal and plant production with crops for animals, and animal manure for the crops, with a margin of each for the profit book. I bought this abandoned swampy, rocky, sandy soil farm of 72 acres, to show how it can be done on land too rough for the plow. The first requirement was to work out a program with permanent crops to bring in a continuous return, while planting and developing the slower bearing nuts and crop trees. I have found you must live on the farm a year to learn which soils and sites are best for a species. For instance, the field that fitted my plan to plant walnuts is too wet, so there we shall plant the hickories, pecans and hicans with persimmons as fillers. The place where I wanted walnuts was too sandy, so we shall plant chestnuts and filberts, and where I wanted chestnuts the soil is good for walnuts.

Starting a Profit Cycle—To create a return as quickly as possible on such a cycle we started a small flock of chickens, ducks and geese. The next step was to decide what to plant of a permanent nature to make a succession of crop income from spring until the nut crop comes in autumn. In the spring of 1945 we planted an acre of asparagus and one of raspberries. In 1947 both started bringing in returns. In 1948 they will be in full production. In 1946 and 1947 we set an acre or more of blueberries. Half of the blueberries were planted in a semi-swamp, useless to farm or pasture, but the home of blueberries after we drained it. These will start bearing in 1948 and increase in production for ten years. We have 2 cows for family milk as I nearly live on it. The

surplus we use in vealing calves as well as to start a herd.

The first year we took in about $100, the second $150; to date we've taken in $850, plus an inventory increase of 5 nine months old bulls and 6 year old heifers. No soil can live without manure and, due to the results of over 20 years of organic soil management, we use no chemical fertilizers. Hence, we need lots of manure. I can not afford to buy straw so we use shavings and sawdust for bedding.

We apply to the manure in the stables about 100 pounds per animal of raw phosphate rock a week, which sweetens the dust and helps feed the soil. We also buy straw for seven riding horses for the manure, as this is great fox hunting country. While this young stock is supplying manure for the soil it is increasing in value. Our program is expensive because time needed in the nursery and orchard prevents us from growing grain, but when you start you can grow grain. We shall soon be having stock to sell each year which will add to our income.

While these crops are contributing to our keep, our time is used in developing the slower-bearing, permanent tree crops, 600 mulberries for hogs and cattle, 350 honey locusts, nearly a 100 persimmons, 50 oaks, 50 Chinese Jujubes and 90 filberts, all going well. To this we added in the spring of 1947 5 acres of Persian and black walnuts with chestnuts interplanted in the row. These are our future feeds for a bigger and cheaper hog, cattle, sheep and poultry feeding program, as well as providing food and cover for wild life. We have yet to plant 5 acres of mixed hickory, hicans and pecans interplanted with over 100 seedling persimmons and a six acre boulder field of black walnuts interplanted with chestnuts and a 5 acre sandy field of chestnuts interplanted with filberts.

The rest of the farm will be in nursery, hay and cereals. Now hold in mind these vital factors. To get rich just planting a farm of nuts or any other one crop is a delusion, with the bankers [Pg 119] eventually holding the bag, the soil and owner taking a licking. Nature is a balanced force, soil undisturbed is a delicately balanced flour barrel of never ending life. Learn of nature how to protect this soil, that shallow insulation board between man and disaster.

After feeling our way over 3 years this is what we found best in handling trees. In the meadow where we planted honey locust, and on a rocky knoll with oaks, the first year we applied a shovelful of night soil and a light mulch of leaf compost. The second summer we mowed, raked, and forked the hay to the tree in a wide circle. It was amazing the life activity that was created under this mulch by the next spring. Mice were controlled by pulling the mulch 3 inches from the tree in early fall and with poisoned wheat under the mulch. In the spring of 1947 we mulched a 4 to 5 ft. circle around each tree with manure two or three inches thick. You should see the trees growing. One-half was mowed for hay and on the other half electric fences were put up along the tree rows and the field was pastured. We planted the walnuts and chestnuts in a sod of natural white clover and timothy. Walnuts were planted in 60 ft. rows with a chestnut tree every 30 ft. Here, three rounds were made with the plow and disk and the ground was manured before the trees were planted. After planting one shovelful of night soil, or two or three shovelfuls of cured slaughter house tankage, were applied to each tree. The rows were kept clean until June and then sowed to soy beans. Sufficient manure was available to make it possible to complete a manure mulch around these trees. The field where the hickory and pecans are to go has the tree rows plowed, manured and soy beaned ready for planting. We plan to use the same method in future plantings.

Notes from the New Jersey Section of the Northern Nut Growers Association

MRS. ALAN R. BUCKWALTER

(As a suggestion to some other State Vice-Presidents the editors print parts of a letter from Mrs. Buckwalter whose husband was long a valued and active member of the N. N. G. A.

"After receiving the annual report I sent reply post cards to each of the members in New Jersey. I received answers from about one-third of them and have assembled some of their reports and questions to send you, along with a few notes about our orchard.")

Wm. M. Daugherty of Princeton reports that his three hundred ten-year-old black walnut trees had a fine set of nuts this spring. However, a hail storm in midsummer stripped the trees of both leaves and nuts.

From Saddle River, Dr. Harold Blake reports that his black walnuts are doing well, but a late spring frost killed the catkins on the Cosford, Medium Long and Italian Red filberts. Mr. Blake suggests a theory of bark rot and asks the opinion of other nut growers. He noticed that in several instances of bark rot on Thomas and Stambaugh black walnuts the diameter of the scion was larger than that of the stock. He concludes that the scion was taken from a faster growing tree than the one that was used for the stock and that the so-called bark rot is cambium rot due to the fact that the smaller stock does not completely feed the cells of the naturally faster [Pg 120] growing section. Dr. Blake therefore suggests more study of the compatibility of scion to stock, especially in regard to growth and bearing. He notes that in fruit trees the root stock is of

importance in this regard and it may be that the variance in reports from different localities on black walnuts and other nut trees may be due to the difference in root stock as well as climate and soil conditions.

Edward Fuhlbruegge of Scotch Plains has long tried to grow pawpaw seedlings with no success. He wants to know if any other New Jersey members have been able to raise pawpaws from seed.

> (Ed.—He should keep the seedbed moist through the summer. These seeds germinate slowly and the seedlings cannot emerge through a hard soil surface.)

The observation of Gilbert V. P. Terhune of Newfoundland is that the native chestnuts continue to sprout and occasionally produce nuts. He predicts that in years to come we will again have our native chestnuts. [Ed.—Someone should carefully save his nuts and grow trees from them.]

John H. Donnelly of Hoboken asks other nut growers for their opinion of using cut grass as a mulch for nut trees. [Ed.—Excellent.]

From Fairlawn J. L. Brewer states that his black walnuts do not seem to have any bad effects on raspberries and strawberries, thus adding another note to the long controversy as to the deleterious effects of black walnuts on the soil. His Texas pecan and Indiana hickory seedlings, although planted in favorable location, have not made a good growth. [Ed.—Did he feed them?]

Louis P. Rocker of Andover reports his Thomas and Stabler walnuts had a good crop in 1946 but this year have few nuts.

This planting (Buckwalter) consists of *Castanea mollissima*, *mollissima* hybrids and *Japonica* (crenata). Due to circumstances during the war years, we have not been able to do much with this orchard; however, we hope gradually to build it up.

In 1946 the part of the chestnut crop that was harvested was infested with the chestnut curculios. About fifty per cent of the nuts were affected. No infestation had been noted in previous years, although in 1945 the crop was not harvested at all. [Ed.—That gave the worms their chance to propagate.]

We will not be able to spray our entire chestnut orchard this year; however, a few of the trees will be sprayed to determine the effectiveness of DDT as a control. In the December, 1946 issue of "The American Fruit Grower" it was stated that DDT as a wettable power (four pounds of fifty per cent DDT to one hundred gallons of water) should be used. Three applications gave best results, and this will be tried on our trees.

This year we have a good crop of nuts and hope to select the best of our trees, which will be included in next year's report.

Report of Resolutions Committee

The Northern Nut Growers Association, Inc., is bringing to a close the 38th annual convention with deep appreciation of the complete and satisfying hospitality which we have enjoyed at the hands of our hosts, the Ontario Agricultural College. We have enjoyed the beautiful, well kept, and spacious grounds, the substantial and well planned buildings, the thoughtful and pleasant help of all of the personnel with whom we have come in contact, especially Dr. J. S. Shoemaker, head of the Department of Horticulture in whose building we have had satisfactory meeting place, display room, use of lantern and operator, and the esthetic satisfaction of looking at beautiful flowers harmoniously arranged. [Pg 121]

We have been well nourished with good food, well prepared and expeditiously served.

We especially appreciate the courteous entertainment that the faculty ladies have so kindly arranged for the ladies who accompany us.

For many years Clarence Reed has been one of the "war horses" of the N. N. G. A. We were expecting to see him cap this long service by presiding over this session, and it was with great sorrow that we learned of his inability to be with us.

Your Resolutions Committee wishes to call attention to the excellent manner in which Dr. L. H. MacDaniels has conducted the sessions of this convention.

It is with great regret that the members of this Association learned of the resignation of Miss Mildred Jones as Secretary. Her work in that office has been of an unusually high order of efficiency and devotion. It was the kind of work which shows the enthusiasm that arises from deep personal interest. Her services will be greatly missed.

Dr. W. Rohrbacher,
Dr. J. Russell Smith,
Wm. Hodgson.

Report of the Necrology Committee

JOSEPH GERARDI

Mr. Joseph Gerardi, 78 year old nurseryman, died at his home in O'Fallon, Ill., on April 3rd, 1947.

Mr. Gerardi was an enthusiastic and especially well informed student of nut culture. He was always looking for new and better seedlings, some of which were named as they were found worthy. His Gerardi hican is probably one of the best in that group. He also introduced the Gildig pecans (Gildig Nos. 1 and 2) and the Fisher pecan. Mr. Gerardi was quite successful as a propagator and always tried to have nursery stock of the best varieties. His loss will be keenly felt. His son, Louis Gerardi, will continue the propagation of nut trees at Caseyville, Ill.

(The following notes are supplied by Louis Gerardi.—Ed.)

Joseph Gerardi was born in the year 1868 on the old Hagamann farm, five and one-half miles northwest of Lebanon, Ill., in O'Fallon Township. He was the fourth child of John and Catherine (Haas) Gerardi.

When he reached the age of five years, his parents moved on a farm three and one-half miles southeast of Trenton, Illinois, in Clinton County. His early schooling was obtained in the McKee School near his home and in St. Mary's School in the town of Trenton, Illinois. After graduating from the eighth grade, he helped his father through the spring and summer months with the farm work, but in the winter attended McKee school. [Pg 122]

In the year 1894 at the age of 25 years he left the home farm in Clinton County, and moved to a farm two and one-half miles southeast of Jerseyville, Illinois, in Jersey County. Here he began the study of fruit growing, and became an agent for the Stark Bros. Nursery.

In 1907 he married Eleanor Collignon of Trenton, Illinois. To this union six children were born: Eleanor Barbara, Sharlotte Catherine, Eugenia Ruth, Louis Joseph, Bernice Marie, and Gertrude Beatrice.

In the spring of 1918 he sold this farm and moved to Trenton, Ill., where he worked with his father-in-law, John Martin Collignon, doing construction work. During this year he searched for a farm with soil suitable for fruit growing.

In 1919 he purchased a 110 acre farm situated two and one-half miles west of O'Fallon, Illinois. The next year he set out twenty acres of Stark Bros. trees.

While living on this farm in the fall of 1920 the little family had its first great loss. Here the oldest girl, Eleanor Barbara, died from a railroad accident.

Julius Rohr, watching him work with his trees, encouraged him to start his own nursery because he knew so much about trees. With this encouragement, he started his own nursery in 1923. As demand increased he added a general line of nursery stock.

Being interested in better varieties of fruit trees, he also became interested in better varieties of nuts. Having some native nut trees on his farm, he began to buy the better varieties of nut trees grown by other nurseries. When these came into bearing, not being satisfied with the known varieties of nuts on the market, he began his search for better nuts.

In the fall of 1930 while searching in the river bottoms of Clinton County, Illinois, he discovered the Gerardi hican, and began its propagation and distributed it among other nurseries. It is now known the country over.

A few years later while hunting in the same river bottoms with a friend named Frank Gildig, he was shown a very fine pecan which now bears the name of the Gildig pecan. And also the Queens Lake Pecan originated in the same locality. These were introduced in the year 1936. His health failed and in 1942 he discontinued growing general nursery stock and grew only nut trees, until his death, which was caused by cancer in the spring of 1947.

MAJOR HIRAM B. FERRIS

Our Major Hiram B. Ferris, of Spokane, Washington, died May 14th, 1947. He was a valued member, and his loss is keenly felt. He has been a source of inspiration, and a highly esteemed bank of information and instruction. His passing is very much regretted.

(Submitted by George L. Denman, Spokane, Washington.)

Mrs. William Rohrbacher,
Mrs. John Hershey,
Mrs. J. F. Johns.
(*Committee Members*) [Pg 123]

Exhibitors At the Annual Meeting of the Northern Nut Growers Association, Guelph, Ontario, Sept. 3, 4, 5, 1947

A. B. Anthony, Sterling, Ill.
Black walnuts, Anthony shagbark hickory.

Mrs. F. L. Baum, Yellow House, Pa.
Black walnut kernels.

G. H. Corsan, "Echo Valley", Islington, Ont.
Black walnuts, Persian walnuts, Japanese walnuts, heartnuts, filberts, shellbark and shagbark hickories.

H. H. Corsan, Hillsdale, Mich.
Black walnuts, Persian walnuts, Japanese heartnuts and walnuts, pecans, hicans, butternuts, butternut hybrids, shagbark and shellbark hickories.

Dr. R. T. Dunstan, Greensboro College, Greensboro, N. C.
Black walnuts, filberts, shagbark hickories, pecans.

Fayette Etter, Lemasters, Pa.
Black walnuts, Persian walnuts, Chinese chestnuts, filberts, shagbark and shellbark hickories.

J. U. Gellatly, Westbank, B. C.
Hybrid filberts, hybrid butternuts, photographs.

A. G. Hirschi, Oklahoma City, Okla.
Pecan clusters, various varieties.

E. F. Huen, Eldora, Iowa.
Black walnuts.

G. J. Korn, Kalamazoo, Mich.
Black walnut kernels, black walnuts, Persian walnuts, Persian walnut hybrids, shagbark hickories.

Dr. L. H. MacDaniels, Ithaca, N. Y.
Black walnuts, Japanese heartnuts, Turkish filbert, shagbark and shellbark hickories.

J. C. McDaniel, Nashville 3, Tenn.
Shagbark hickories, heartnut, Texas walnut.

Papple Brothers, Brantford, Ont.
Black walnuts, Japanese heartnuts, filberts. [Pg 124]

Jay L. Smith, Chester, N. Y.
Filberts, Japanese chestnuts.

H. F. Stoke, Roanoke, Va.
Black and Persian walnuts, heartnuts, filberts, shagbark and shellbark hickories, Chinese, Japanese, American and hybrid chestnuts, papaws, chestnut grafts.

Kenneth Thomas, Baltimore, Md.
Black walnuts.

Lynn Tuttle, Clarkston, Wash.
Persian walnut nuts and shield buds, filberts.

U. S. Department of Agriculture, Plant Industry Station, Beltsville, Md.
Persian walnuts, heartnuts, pecans, Chinese and Japanese chestnuts, Allegheny chinkapin.

Vineland Experiment Station, Vineland, Ont.
Persian walnuts, filberts, almonds.

J. F. Wilkinson, Rockport, Ind.
Black walnuts, hicans.

Pictures Made on the *1947* Tour

The photograph on this page was taken by Sterling Smith, those on pp. 126-7 are by Dorothy Milne. Groups of NNGA members are shown examining nut trees and other items of interest on G. H. Corsan's place, "Echo Valley," Islington, Ontario.

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Attendance

Mr. and Mrs. Royal Oakes, Bluffs, Ill.
Mr. and Mrs. Henry Gressel, Mohawk, N. Y.
Mr. and Mrs. F. L. O'Rourke, East Lansing, Mich.
Mr. Ford Wallick, Peru, Ind.
Mr. Carl Prell, South Bend, Ind.
Dr. Arthur S. Colby, U. of Ill., Urbana, Ill.
Rosamond H. Waite, M.D., Perrysburg, N. Y.
Mr. and Mrs. Raymond E. Silvis, Massillon, O.
Mrs. Herbert Negus, Mt. Rainier, Md.
Mr. and Mrs. G. F. Gravatt, U. S. Plant Industry Sta., Beltsville, Md.
W. M. Churchill, Chicago, Ill.
Edwin W. Lemke, Detroit, Mich.
Wm. C. Hodgson, White Hall, Md.
Ivor H. Harrhy, Burgessville, Ont.
Gordon Porter, Windsor, Ont.
Dr. and Mrs. Wm. Rohrbacher, Iowa City, Ia.
Betty Rohrbacher, Iowa City, Ia.
Anne Clarke, Columbus, Ohio.
G. L. Slate, Geneva, N. Y.
Mr. and Mrs. John H. Connelly, Milford, N. J.
J. F. Wilkinson, Rockport, Ind.
Dr. L. H. MacDaniels, Ithaca, N. Y.
Sterling A. Smith, Vermilion, Ohio
D. C. Snyder, Center Point, Iowa
Dr. J. Russell Smith, Swarthmore, Pa.
Mr. and Mrs. H. F. Stoke, Roanoke, Va.
Eugene F. Cranz, Ira, Ohio
Victor Brook, Rochester, N. Y.
George Salzer, Rochester, N. Y.
Dr. and Mrs. H. L. Crane, Hyattsville, Md.
Spencer B. Chase, Norris, Tenn.
Ira M. Kyhl, Sabula, Iowa
Mr. and Mrs. R. P. Allaman, Harrisburg, Pa.
H. A. English, Duncan, B. C.
Wm. J. Little, St. George
W. J. Strong, Vineland, Ont.
Harry R. Weber, Cincinnati, Ohio
G. J. Korn, Kalamazoo, Mich.
Roy E. Ferguson, Center Point, Iowa
Elton E. Papple, Cainsville, Ont.
Merle H. Papple, Cainsville, Ont.

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E. F. Huen, Eldora, Iowa

C. C. Lounsberry, Ames, Iowa
Ralph Emerson, Highland Park, Mich.
Joseph C. McDaniel, Nashville 3, Tenn.
Mr. and Mrs. Blaine McCollum, White Hall, Md.
H. W. Guengerich, Louisiana, Mo.
J. S. Shoemaker, Guelph, Ont.
Mr. and Mrs. Stephen Bernath, Poughkeepsie, N. Y.
William S. Clarke, Jr., State College, Pa.
E. Sam Hemming, Easton, Md.
John Rick, Reading, Pa.
Lewis E. Theiss, Lewisburg, Pa.
Ralph Gibson, Williamsport 15, Pa.
Gilbert L. Smith, Wassaic, N. Y.
Levi Housser, Beamsville, Ont.
Mr. and Mrs. Philip S. Moyer, Harrisburg, Pa.
Ernest Chitton, Norwich, Ont.
H. Lynn Tuttle, Clarkston, Wash.
Mrs. J. A. Neilson, Guelph, Ont.
Mildred Jones, Lancaster, Pa.
J. R. VanHaarlem, Vineland Station, Ontario

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Announcements

Publications

Fall, 1947 and Winter, 1947-48 numbers of "The Nutshell", news bulletin of the NNGA, have been issued by the Secretary's office. It is intended to have this bulletin distributed to members four times a year. It will carry news of the Association's activities, supplementing the "Nut Growers News" column in the American Fruit Grower magazine, as well as reprints of items from other sources that concern nut growers in the northern two-thirds of the United States plus southern Canada. Beginning with the Winter, 1947-48 issue, advertising is being accepted in "The Nutshell." Members who have not received the first two issues, and others who want additional copies, may obtain them by writing to the Secretary.

This Report is a few pages short of its anticipated size, because of the withdrawal for additional entries of a "Bibliography of References on Nuts of Special Interest in the North." We hope to have this brought up to date for publication in the next Annual Report.

Publicity

All members can contribute to the strength of the Northern Nut Growers Association, Inc., by showing its publications to their neighbors, and by calling them to the attention of local farm paper and newspaper editors.

Several of our members have helped swell the NNGA membership by mentioning it in nut tree articles for local and regional publications. As an example, Mr. H. F. Stoke wrote a short article on Chinese chestnuts for the "Southern Agriculturist", February, 1948 issue. At the end he stated that a list of nurseries selling Chinese chestnut and other nut trees could be obtained from the NNGA Secretary's office. To date (January 26, 1948) more than 50 requests have been received and each day brings more. Along with the nursery list, these correspondents receive information about the Northern Nut Growers Association, so any sudden increase in our membership in the States from North Carolina to Texas can be ascribed to this bit of publicity.

Style Manual

Mr. Clarence A. Reed, our retiring President (1946-47), has a suggestion for writers for publication:

"An authoritative guide for writers is the *STYLE MANUAL* issued by the U. S. Government Printing Office (Washington 25, D. C.) Its use by Association writers would go far toward standardizing their papers and in simplifying the work of editing. The 1945 edition contains 435 pages. Cloth bound $1.50. Paper cover 35c. There is no charge for postage."

1948 Meeting

The dates selected by the Directors for the 39th Annual Meeting of the Northern Nut Growers

Association, Inc. are September 13, 14, and 15. The place is Norris, Tennessee. Norris is about 25 miles from Knoxville.

J. C. McDANIEL, Secretary,
c/o Tennessee Department of Agriculture,
Nashville 3, Tennessee. [Pg 129]

Hybrid Walnut Scions Offered for Nut Breeding

(The following note seems to me to belong in the NNGA Report, even though it wasn't on the program. It is an invitation to the experimenters to get something they might want.—J. Russell Smith.)

Thomas R. Haig, M.D., 3344 H. St., Sacramento, California, reports a promising cross of northern California black X Persian walnut: "The nuts are fertile. This hybrid produces **pistillate flowers only**, lending itself easily to pollination with the various varieties of Persian. Should any experimenter wish scions he is welcome. Such scions could save considerable time.

"The tree is now 9-10 years old. I obtained 5 nuts in 1947, by back-crossing the hybrid to Persian walnut. One seedling obtained previously by this hybridization is not yet bearing."

Other members who have available scions of promising hybrids or other new varieties of nut trees are invited to communicate promptly with the Secretary. A list of these will be published in **THE NUTSHELL** for Spring, 1948.

Hybrid Oak Information

Mr. Thomas Q. Mitchell, 16 East 48th Street, New York 17, New York, calls our attention to his article on "Hybrid Oak Crop Trees," in Harper's Magazine for February, 1948. He adds: "A much longer article is in preparation (in collaboration with Mr. Charles Morrow Wilson) for Scientific Monthly. Can you report any hybrid or exotic oaks there, or put me in touch with any Dendrophiles interested in oak hybrids as crop trees?" [Pg 130]

FOOTNOTES

[1] Division of Fruit and Vegetable Crops and Disease, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture.

[2] Canadian measure.

[3]

$$\text{Score I} = \text{Weight (grams)} \quad \frac{\text{1st crack} + \text{Total weight (grams)} + \frac{\text{Number quarters} + \text{Number halves}}{4}}{2}$$

$$\text{Score II} = \text{Weight (grams) 1st crack} + \frac{\text{Total weight (grams)} + \frac{\text{Number quarters}}{2}}{2}$$

[4] Associate cytologist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture.

[5] Consulting Pathologist, Conn. Agric. Expt. Station; Special Agent, Conn. Geological and Natural History Survey; and Collaborator, Division of Forest Pathology, U. S. Dept. Agriculture.

[6] Journal Paper No. 719, New York State Agricultural Experiment Station, Geneva, N. Y.

Updated editions will replace the previous one—the old editions will be renamed.

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