

PROCEEDINGS OF THE
FLORIDA STATE
HORTICULTURAL
SOCIETY *for* 1921

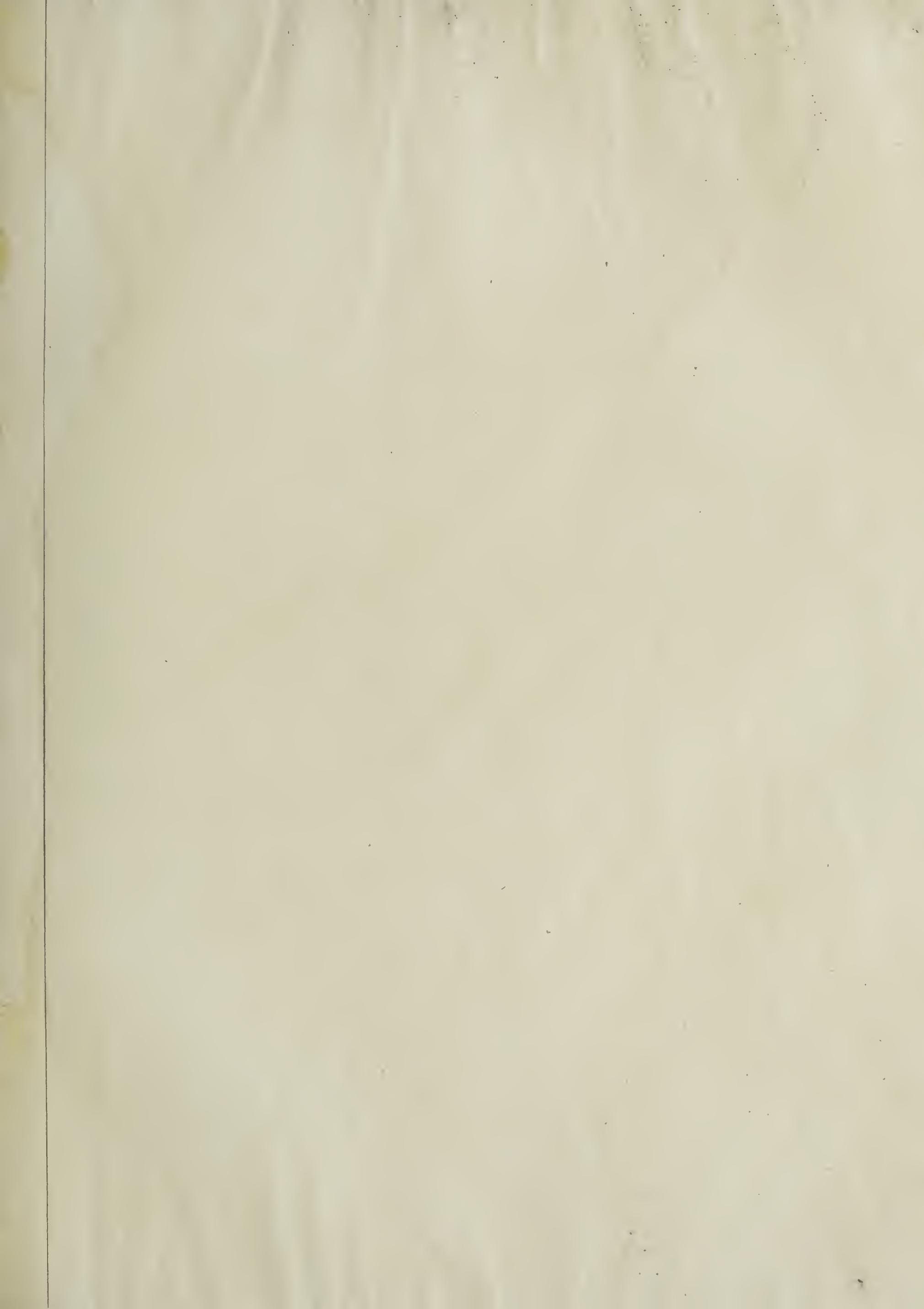


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PROCEEDINGS
OF THE
THIRTY-FOURTH ANNUAL
MEETING
OF THE
FLORIDA STATE
HORTICULTURAL SOCIETY
HELD AT
MIAMI, FLA., APRIL 12, 13, 14, 15
1921



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Florida State Horticultural Society

OFFICERS ELECT FOR 1921

PRESIDENT:

H. HAROLD HUME, Glen St. Mary.

VICE-PRESIDENTS:

L. B. SKINNER,	W. J. KROME,	S. F. POOLE,
Dunedin.	Homestead.	Lake Alfred.

SECRETARY:

BAYARD F. FLOYD, Orlando.

TREASURER:

W. S. HART, Hawks Park.

EXECUTIVE COMMITTEE:

L. D. NILES, Lucerne Park; FRANK STIRLING, Gainesville;
B. L. HAMNER, Tampa; President, Secretary and Treasurer, ex-officio.

Constitution

Article 1. This organization shall be known as The Florida State Horticultural Society, and its object shall be the advancement of Horticulture.

Article 2. Any person may become an annual member of the Society by subscribing to the Constitution and paying one dollar. Any person may become a perennial member of the Society by subscribing to the Constitution and paying the annual dues for five or more years in advance. Any person may become a life member of the Society by subscribing to the Constitution and paying twenty-five dollars. Any person or firm may become a patron of the Society by subscribing to the Constitution and paying one hundred dollars.

Article 3. Its officers shall consist of a President, three Vice-Presidents, Secretary, Treasurer, and Executive Committee of three, who shall be elected by ballot at each annual meeting. After the first election their term of office shall begin on the first day of January following their election.

Article 4. The regular annual meeting of this Society shall be held on the second Tuesday in April, except when otherwise ordered by the Executive Committee.

Article 5. The duties of the President, Vice-President, Secretary and Treasurer shall be such as usually devolve on those officers. The President, Secretary and Treasurer shall be ex-officio members of the Executive Committee.

Article 6. The Executive Committee shall have authority to act for the Society between annual meetings.

Article 7. The Constitution may be amended by a vote of two-thirds of the members present.

By-Laws

1. The Society year shall be co-extensive with the calendar year, and the annual dues of members shall be one dollar.

2. All bills authorized by the Society or its Executive Committee, for its legitimate expenses, shall be paid by the Secretary's draft on the Treasurer, O K'd by the President.

3. The meetings of the Society shall be devoted only to Horticultural topics, from scientific and practical standpoints, and the Presiding Officer shall rule out of order all motions, resolutions and discussions tending to commit the Society to partisan politics or mercantile ventures.

4. All patron and life membership dues and all donations, unless otherwise specified, shall be invested by the Treasurer in United States bonds. Only the interest on these bonds shall be available for payment of the current expenses of the Society. Perennial membership dues shall be placed on deposit at interest by the Treasurer. Only one dollar and the interest from each perennial membership fee shall be available for use in payment of the current expenses of the Society during any particular year.

FLORIDA STATE
HORTICULTURAL SOCIETY
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List of Members

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Rolfs, P. H., Bello Horizonte, Minas Gaeres,
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Brazil.
Taber, Geo. L., Glen St. Mary, Fla.

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 Frentress, T. L., Haskell.
 Frey, John, Rockledge.
 Frey, Mrs. John, Rockledge.
 Friend, W., Palm Beach.
 Frierson, Ed., Elfers.
 Frierson, Hill H., Elfers.
 Frisbie, S. L., 411 Curry Bldg., Tampa.
 Fritch, E. D., Earman.
 Frizzell, J. B., Lutz.
 Froscher, Andrew, Titusville.
 Froscher, E. A., Homestead.
 Fuchs, Fritz, Miami.
 Funk, L. I., Rt. 1, Box 96, Tampa.
 Fussell, G. C., Leesburg.
- Gable, P. K., Merritt.
 Gaines, Geo. T., Jensen.
 Gainesville Furniture Co., Gainesville.
 Gallahn, E. H., R. F. D., Homestead.
 Gant, Henry, 131 Amelia Ave., Orlando.
 Gardner, Mrs. F. C., Lake Alfred.
 Gardner, F. C., Lake Alfred.
 Gardner, J. H., Vero.
 Garnett, A. W., Hypoluxo.
 Garr Citrus Plantation, Tavares.
 Garrard, J. A., Bartow.
 Garrett, Chas. A., Kissimmee.
 Garrett, L., Rt. 1, Orlando.
 Garrett, O. D., Sebring.
 Garst, J. H., Sebring.
 Gravey Bros., Ft. Myers.
 Gaunt, E. C., Miami.
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 Geier, Agnes I., Windermere.
 Geier, Wm. G., Windermere.

- Geitgey, A. A., Glen St. Mary.
 Gentile, L., Orlando.
 Gentile, Jos., Jr., Miami.
 German, D. J., Lake Worth.
 Gibson, S. S., Delray.
 Gilbert, Dr. Elsie M., R. F. D. 1, Box 89, Tampa.
 Giles, J. L., Orlando.
 Gilman, C. B., Lotus.
 Gilman, J. H., Box 678, Miami.
 Gilman, V. C., Crooked Lake.
 Gilson, Miss Lily H., Hawks Park.
 Gist, J. V., Key West.
 Glass, Rev. Jas. G., Orlando.
 Glenn, C. F., Wewahitchka.
 Gobert, Dr. H. T., Gainesville.
 Gocio, H. G., Bee Ridge.
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 Godwin, S. W., Gainesville.
 Goldberg, E. R., Homestead.
 Gomme, Wm., Bartow.
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 Goodrich, Chas., St. Cloud.
 Goodwin, R. L., Ft. Pierce.
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 Gossman, H. L., Homestead.
 Gottrau, Louis de, Lake Worth.
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 Green, H. O., Micco.
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 Griffis, J. W., Shiloh.
 Griggs, H. L., Oak.
 Griswold, A. W., Boynton.
 Grosse, Otto R., Merritt.
 Grossenbacher, J. G., Apopka.
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 Groover, Dr. W. R., Lakeland.
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 Hainlin, Neal E., Homestead.
 Hainz, Ed. L., Sebring.
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 Hall, W. Hervey, Yalaha.
 Hall, G. S., Oakland.
 Hall, C. E., Boynton.
 Hall, J. E., R. F. D. 1, Homestead.
 Hall, J. E., Ft. Myers.
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 Harvey, John, Glen St. Mary.
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 Hawthorne Plant Farm, Nocatee.

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 Hayes, Chas. L., Clearwater.
 Hayle, Seed Co., Miami.
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 Henderson, R. C., Lake Worth.
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 Hennessey, A. L., Fellsmere.
 Hentz, Mrs. Wm. B., Winter Haven.
 Herbst, Emil, R. F. D., Ft. Pierce.
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 Jeal, Geo. Crescent City.
 Jefferies, Jno. H., Lake Alfred.
 Jem Nursery Co., Lake Jem.
 Jenkinson, Sydney G., Miami.
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 Jensen, Carl M., Boynton.
 Jepson, John W. Tangerine.
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 Johns, H. D., R. F. D., Wauchula.
 Johnson, A. B., Glen St. Mary.
 Johnson, August P., Boynton.
 Johnson, Chris. Marco.
 Johnson, Claud F., St. Cloud.
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 Johnson, Jos. B., Box 15, W. Palm Beach.
 Johnson, J. E., Lakeland.
 Johnson, J. E., Goulds.
 Johnson, J. Lee, Sebring.
 Johnson, J. W., Jensen.
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 Johnson, O. F., Piedmont.
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 Jones, Geo., Lake Wales.
 Jones, John C., St. Lucie.
 Jones, Lyman E., Gardner.
 Jones, M. L., Box 92, Millville.

- Jones, O. A., Lake Wales.
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 Judy, G. W., Jacksonville.
 Juergen, Mrs. M., W. Palm Beach.
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 Katz, H. M., Kissimmee.
 Kaufman, E. J., Lakeland.
 Kaune, Amos A., Ft. Myers.
 Kay, Albert O., Ft. Pierce.
 Keck, Irving, Bowling Green.
 Keen, J. C., Delray.
 Kelly, E. L., Homestead.
 Kemp, Dr. C. F., Key West.
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 Kent, Edward W., Lake Hamilton.
 Kern, John F., Jupiter.
 Kerns, Frank W., Salerno.
 Keye, N. D., Orlando.
 Keyes, W. T., Winter Haven.
 Kieser, Fred, Lake Wales.
 Kimball, J. S., Eustis.
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 King, Wm. Avon Park.
 King, W. L., Lakeland.
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 Kirkpatrick, J. E., Lake Worth.
 Klemm, Arthur R., Winter Haven.
 Klemm, A. Richard, Winter Haven.
 Klemm, Mrs. A. M., Winter Haven.
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 Knight, J., Mims.
 Knight, J. M., Vero.
 Knight, Joe, Elfers.
 Knight, Robert A., Box 606, Pensacola.
 Knowles, Geo. I., Key West.
 Knox, L. B., Ormond.
 Knox, R. H., R. F. D. 1, Box 498, Miami.
 Knull Floral Co., Tampa.
 Koplin, Geo. E., Winter Haven.
 Kramer, L. H., Mammoth Groves, Lake Wales.
 Kreamer, H. W., Ft. Myers.
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 Kriechhaus, W. C., Dania.
 Krome, Mrs. W. J., Homestead.
 Krouse, Henry, Sebring.
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- Ladd, Frank H., Key West.
 LaDue, J. G., Mt. Dora.
 Lafon, N., Paisley.
 Lainhart, Geo. W., Box 189, W. Palm Beach.
- Laird, B. L., Sebring.
 Lake Garfield Nurseries Co., Bartow.
 Lamb, C. W., R. F. D. No. 3, Box 21, Wauchula.
 Lamb, Jesse L., Oneco.
 Lame, Chas. E., Box 70, Lake Worth.
 Lamkin, Ward, Arcadia.
 Lamphear, O. C., Lakeland.
 Landstreet, A. F., Orlando.
 Lang, Ed., Box 238, Delray.
 Langston, E. J., Smith Creek.
 Lanier, Virgil H., Box 1202, Jacksonville.
 Larry, Dock, Thonotosassa.
 Larson, Nels, Vero.
 Larsson, Jonas, Piedmont.
 Lauramore, H. H., Glen St. Mary.
 Lawrence, E. S., Gotha.
 Lawrence, Wyman, Crooked Lake.
 Layton, Miss Harriette B., Tallahassee.
 Lazonby, J. L., Gainesville.
 Leach, Robert, Seminole.
 Lee, C. S., Oviedo.
 Lee, O. N., St. Cloud.
 Lee, Mrs. Thomas G., Crooked Lake.
 Lee, Wm. Justice, Box 378, Jacksonville.
 Leesburg Realty Co., Leesburg.
 Lejune, Chas., Rt. A, Miami.
 Lenbrook, F. L., Delray.
 Lenfest, R. E., Winter Park.
 L'Engle, Mrs. John C., 314 Market St., Jacksonville.
- Lent, Victor, Sorrento.
 LeRoy, Merton, Box 301, Lake Worth.
 Lester, E. S., Delray.
 Lestina, Otto, Haskill.
 Liles, A. G., Terra Ceia.
 Lilly, Louis, W. Palm Beach.
 Lincoln, L. F., Box 718, W. Palm Beach.
 Lindner, Chas. A., R. F. D. Box 38, Homestead.
 Lindner, Ross W., Largo.
 Linderman, R. H., Lake Wales.
 Linhart, R. A., Valrico.
 Linsley, C. C., Ft. Myers.
 Lipsey, L. W., Blanton.
 Lloyd, Wm. G., Box 199, Lake Worth.
 Loeffler, Frederick, W. Palm Beach.
 Loennecke, H., 315 Wildmere Ave., W. Palm Beach.
- Logan, Frank H., Oak.
 Lord, Chas., Orlando.
 Lott, Millard, Sebring.
 Loveland, Clifton W., Satsuma Heights.
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 Lowery, Dr. S. L., Tampa.
 Lowry, E. A., Box 1138, Miami.
 Lowry, Mrs. Irena B., 110 W. Duval St., Live Oak.
- Lucas, C. Potter, Useppa Island.
 Luckie, J. M., Box 13, Florence Villa.
 Lukert, Wm., Salerno.
 Lundberg, Ed. V., Orlando.

- Lyman, E. C., Ruskin.
 Lyman, Mrs. Etta, Lantana.
 Lyman, H. C., Altamonte Springs.
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 Mack, Chas., Sharpes.
 Mackay, Geo., Ocala.
 Magoon, C. H., Dade City.
 Majewski, L., Monticello.
 Majority, Chas. J., Manatee.
 Mallett, C. M., Orlando.
 Manatee Hammock Fruit Co., Manatee.
 Mandeville, Paul., Dixie Apts., Orlando.
 Mangels, H. E., Box 347, Miami.
 Mangold, J. A., 174 Central Ave., St. Petersburg.
 Manley, Lester B., Miami.
 Mann, W. W. & Son Co., Winter Haven.
 Mapp, Edward, Stuart.
 Marford, Geo., Grand Island.
 Markle, Geo. W., Winter Haven.
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 Martini, C. A., care S. A. L. Ry., Tampa.
 Martin, G. B., Sebastian.
 Martin, Geo., Sebastian.
 Martin, S. H., Oak.
 Martin, W. E., Orlando.
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 McDonald, J. A. Co., Miami.

 McElroy, Dr. Sylvan, Orlando.
 McGragar, C. D., Winter Haven.
 McGuire, Wm. A., Ocala.
 McKissock, Mrs. John L., Lake Worth.
 McLaughlin, W. C., Terra Ceia.
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 Ott, John, Vero.
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 Overstreet, M. O., Orlando.

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 Padgett, Wm., Enterprise.
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 Palmer, J. C., Windermere.
 Pancoast, Thos. J., Miami Beach.
 Pamer, J. B., Ft. Myers.
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 Park, Geo. W., Dunedin.
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 Parkinson, Edward, Alva.
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 Register, H. H., Lakeland.
 Register, S. T., Groveland.
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 Robinson, G. A., Lake Wales.
 Robinson, Tom R., Orlando.
 Robinson, T. Ralph, Terra Ceia.
 Robinson, Mrs. T. Ralph, Terra Ceia.
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 Schumacher, Henry E., Homestead.
 Schumacher, E., Lotus.
 Schumacher, H. P., Homestead.
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 Seminole Seed Co., Gainesville.
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 Shooter, C. C., Earlton.
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 Sommer, Carl A., Citra.
 Soper, J. J., R. F. D. No. 1, Homestead.
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 Southern Fert. Co., Orlando.
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 Stoadwin, E. W., Hypoluxo.
 Stokes, C. R., Sebring.
 Stockett, A. W., Bee Ridge.
 Strait, O. W., Thonotosassa.
 Stratton, G. H., City Point.
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 Superior Nurseries, Orlando.
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- Taaffe, R. A., Leesburg.
 Taber, G. L., Jr., Glen St. Mary.
 Tabor, Mrs. G. L., Glen St. Mary.
 Talbot, W. O., Goulds.
 Tarter, C. R., City Point.
 Tatum Bros. Co., Miami.
 Tatum Land Co., Miami.
 Taylor, Mrs. B. W., Jupiter.
 Taylor, Mrs. Jas. A., Oak Hill.
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 Tillman, J. M., Winter Haven.
 Tinstman, B. E., Ft. Myers.
 Tippin, Gus T., Vero.
 Titus, H. S., Dunedin.
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 Townsend, J. F., Lake Wales.
 Townsend, Miss Kate, Istachatta.
 Townsend, J. W., Merritt.
 Traxler, Leon W., McIntosh.
 Trevor, Benj. D., Key West.
 Trimble, F. H., Orlando.
 Troup, J. L., Delray.
 Troxler, T. W., Ocala.
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 Tucker, Mrs. Helen S., Merritt.
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 Wakelin, Mrs. M. W., Tavares.
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Zimmerman, F. J., Oldsmar.
Zurn, H. A., Orlando.

Proceedings of the Thirty-Fourth Annual Meeting of the Florida State Horticultural Society

One of the most enjoyable and profitable features of the Miami meeting was the presence of Dr. David Fairchild, Agricultural Explorer in charge of the Office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry of the United States Department of Agriculture, whose address during the evening of Wednesday, April 13th, and whose active participation in the discussions of the meeting was a source of much pleasure and inspiration to every member present. The average fruit grower in Florida has had little knowledge and appreciation of the great work which Dr. Fairchild and his co-workers have been carrying on for the benefit of Florida Horticulture. Traveling in the distant corners of the earth under great difficulties and at times at great hazards, they have brought back seeds and plants of great value to the farmers and fruit growers of America. His men are at the present time searching in tropical countries for hardy varieties of avocados and other fruits with which to build up a new fruit industry in Florida.

Unfortunately his work has not had the hearty support that it should have. It is only through great enthusiasm for their

work and a vision of the wonderful future that lies in the development of temperate and tropical agriculture in America, that they have been able to make such progress under the great odds of meager appropriations and lack of moral support. His address on the "Horticultural Pioneers of the Tropics," which is published in full in this Proceedings, will be of great inspiration to every Florida horticulturist and make him proud to be a Floridian.

As usual the attendance at the annual meeting was not at all proportionate to the total membership which has, at time of going to press, reached the 2,000 mark. There was, however, an enthusiastic crowd in attendance and an enjoyable and profitable meeting. There were but few coming from the central and west coast sections who had realized the wonderful development that the cities of Miami and Miami Beach had made since the time of our annual meeting there nine years ago. The beautiful plantings about the many homes and on the large estates were an inspiration that will doubtless lead to similar developments in other parts of the State.

So many individuals contributed to the success of the meeting, that it is difficult

to give credit by naming all. A most attractive exhibit of exotic plants in the parlors of the Halcyon Hotel, arranged by James Donn of Miami, assisted by N. A. Reasoner of Oneco, deserves favorable mention. It is hoped that exhibits of this sort will be made at future meetings and that these will in time lead to the establishment of an annual Flower Show under the auspices of the Horticultural Society, at which prizes of such importance can be offered to attract the best growers. Since Florida is the Land of Flowers, it is quite logical that it should have an annual Flower Show that will be surpassed by none in America.

A small but excellent exhibit of very fancy fruit was arranged and shown by different marketing agencies. This also should be a feature at every meeting of the Society.

The large membership that the Society enjoys is due largely to the efforts of Mr.

Frank Stirling and his co-workers. An indefatigable worker, he devoted his whole energies at personal sacrifice for the benefit of the Society. Few people realize the difficulties and expense entailed in building up a large membership. Unless the expense can be reduced during the coming campaign, it will be necessary to ask the Society at its next annual meeting to increase the annual membership fee. The members can help to avoid this situation by remitting their annual fees for 1922 to the Secretary at Orlando, Florida, promptly upon receipt of this Proceedings or of the first notice that the annual fee of one dollar is due and payable.

The Proceedings of the Florida State Horticultural Society should be in the home of every fruit grower in Florida. The Society should have a membership of more than 5,000. It can have this number if every member will help.

OPENING

H. Harold Hume: The Thirty-fourth Annual Session of the Florida State Horticultural Society will now come to order. We will have an opening prayer by the Reverend Merrill.

Prayer.

H. H. Hume: It is usual as a part of our program at the opening meeting to have an address of welcome and the address tonight is to be made, not by Mr.

Sewall whose name is on the program, but by a man who has been deeply interested in the development of Florida for a good many years; a man who has in many ways done much to advance the horticultural interests of the State; a man who is almost a resident of Florida. It is my pleasure to introduce to you for this address Dr. David Fairchild.

Address of Welcome

Dr. David Fairchild, Coconut Grove

I don't know why I have been asked to welcome you to this southern tip of Florida. I am not a resident of the State, though I would be if I could and shall be some day. Perhaps those who chose me to speak felt sure that I would tell you something which would make you feel that you are doing a great work in the world.

I am conscious of the compliment and I am grateful for the opportunity, though had I my way I should have brought the greatest man in America to do honor to you, for in my opinion no praise is too high for those of you who are making of the sandy and rocky and swampy lands of this State one of the greatest garden spots which the world has ever seen.

There was once a time, ladies and gentlemen, when to scribble more than one's name on paper was to be a contemptible scrivener in the eyes of the then leaders of society. There was a time when to perform a surgical operation was to be classed among the barbers—a class which then begged for admission to the household at the convenience of the patron. There was even a time when to watch the stars and speculate with regard to the universe was to be cast into dungeons for heresy. There was a time, and it was not long ago, when to work with one's hands among the plants was to be classed

with the horse jockies whose stable talk shut them out of polite society.

But as civilization has advanced it has brought with it a better understanding of the value of things and tonight, if I were a prophet, I would promise you, ladies and gentlemen of the Florida Horticultural Society that your time is nearly here. And by your time I mean the era when any educated man will be as much ashamed of not knowing an elm from an oak as he is today of not knowing the capitals of the principal countries of the world.

If I were a prophet I would even promise you your share of the honor which is due you for saving from extinction the rarest and most beautiful of living things which still exist on this planet and which the populations of future ages will prize and cherish with a love which we in our present state of development are totally incapable. I mean the trees and shrubs and flowering plants, which are threatened with extinction.

In my many years of travel I have met all kinds of men and women and I feel a certain confidence when I say to you that in so far as you are enthusiasts and investigators in the great field of horticulture you are already above any class of people in the world—the one class to be envied.

You live in the deeper levels of life; in a world which is filled with more than the flitting shadows of human personalities; in a world of forms and colors more fascinatingly wonderful than the shifting clouds at sunlight because each shape, each color has a meaning which you have learned to understand. Yours is the fuller life, and though you may see around you the glittering luxuries of existence beyond your reach, you have in your plant companions a solace and comfort which no amount of wealth can give.

You, in your passion for plants, are the envy of many a millionaire who has trodden Wall Street so long that he cannot quit it; of thousands of those who, looking out from their office windows over crowded, smoky cities, long for the shade of an orchard tree or for that drink of water flavored by the thirst of a tired body.

No. You who live in your own homes, surrounded by your own families, among the plants which you love, are following what is to become the chosen profession of some of the highest intellectual beings which this world is to produce.

But I am not here to tell you *who you are*, even though I do think we need to be reminded sometimes that we are doing more than merely earn an honest living. It helps us to hold our heads above the crowd; to raise high, where the world can see it, the profession which we believe has such a mission to perform for the human race.

But I am here to welcome you to Miami and tell you that every citizen in this region is interested in what you are doing, and in your getting a correct idea of

what this civilization here is, and in your having a good time.

Ladies and gentlemen, you are among open minded people here and I suppose I am voicing the opinion of the men of Miami when I say that you are at liberty without any offence to draw any invidious comparisons which you wish with regard to the width of our streets and the lack of parks. I feel sure that I am not offending those who live on Miami Beach when I say you are more than welcome to the sand there. I know that the residents of Redlands section will point out to you themselves the fact that there are a few rocks in the soils there. I am confident that there is not a settler on the Glades who would wilfully deceive you into thinking that the temperatures never go below freezing there. I know, because I live there myself, that the residents of Coconut Grove do not want you to go away with the impression that their town is trying to rival Miami in size.

No. The long training and severe experience which these people of South Florida have had with men and women like you has taught them that there is no permanency in anything but the truth; that you are not to be deceived by appearances. And yet when I remember my first visit to Miami; when I bring back into the foreground of my mind a picture of some holes blasted in the rocks near the ragged edges of the half cleared hammock into which I was expected as an Agricultural Explorer of the Government to pour seeds and plants, gathered from various parts of the world, I am forced to admit that one must be very careful in

judging of appearances for they are deceiving.

But I dare not tell you how enthusiastic I am about this region for after all as a government official who has fascinations in every State it would be indiscreet and I would be playing false to those plant pets in other States which are just as interesting and just as promising as the tropical ones which are making their little beginnings here; plants which are at personal risk and strenuous effort being hunted for by explorers of the Department of Agriculture in various parts of the world.

But you are more than simply the Florida State Horticultural Society, ladies and gentlemen. You are the largest body of men and women in the whole world which is interested deeply in the subject of tropical horticulture. And during the deliberations of your Society which are to come I sincerely trust that you will look upon yourselves not merely as one of the State Horticultural Societies of America but as that one to which has been entrusted the vast and fascinating problems of the horticulture of the tropics.

You are in a very peculiar sense experimenters. There is scarcely a single one of you who has not growing in the door-yard of his home a tree or shrub of some kind which he is watching with the clear eyesight of early morning. Its behavior as a little seedling, its first leaves even, its first blossoms, its first fruit, the insects which first find and attack it, and its first fungus disease, as well as its response to the feeding with commercial fertilizers which you give it, are all things to you of the keenest intellectual interest.

Your interest in these things is not that of a bystander but that of a parent who wants the plant to grow for it is your particular plant and in your imagination you see it as it will be perhaps when you are old.

Nothing can take the place of an observation of occurrences. It is the direct way and you who are living close to the plants are the ones to find out things about them.

And let me say to you without any desire to flatter you that it is your interest in those new plants which my associates and I have had the great pleasure of importing for you during the past twenty-three years, which has furnished the continuous stimulus and encouragement to our explorers in foreign countries to undergo hardships in order to get the new plants.

And now you have come together to exchange your observations and get acquainted with each other and see what kind of men these are who publish about what they see and especially what they think.

It is in your power, ladies and gentlemen, to make this a great meeting.

I have attended many scientific meetings in my life and some religious gatherings. I have gone away from both lifted up and enthused or disgusted and irritated, depending upon occurrences which though trivial in themselves, contaminated with personal criticism and sarcasm the whole atmosphere of the assembly.

I recognize that we cannot in scientific matters be uncritical, that pride of opinion has really no place in science, that humility and perfect frankness make rapid

progress possible. But I also feel sure that the weakness of our organizations lies too largely in the fact that the coefficient of irritability is too high with most of us and we indulge in destructive criticism of each other which is reflected in the public's attitude towards us and we do not get the hearing which we deserve, nor the money which we need and should have.

If I only knew you all personally I would like to introduce you to each other. I hope that those of you who are bothered with a natural reserve will recollect that this is a meeting for the purpose of making new friendships, that you have come for that purpose, and, reserve or no reserve, will introduce yourself to anybody who you think can advise you or who in any way interests you.

Before turning you loose, so to speak, on each other and on the community, there are two facts which it seems important to emphasize.

The first is that the Plant Introduction Garden on Brickell Avenue, which I hope you will all see, is not an Experiment Station, and it is not an arboretum. It is a plant propagating garden primarily where mother plants are kept from which propagating material can be taken for budding and grafting onto small seedlings which are sent out all over the United States—wherever they can be grown. It is under the auspices of the Federal Department of Agriculture and the Bureau of Plant Industry and is one of six similar gardens located in various parts of the United States and maintained by the Office of Foreign Seed and Plant Introduction. The new plants which the ag-

ricultural explorers of that office find in gardens are first made available to the experimenters in the State Experiment Stations and then to private experimenters who apply for them to the Washington central office.

It cannot avoid being a center of information but it publishes no bulletins of its own and carries on no plot experiments with fertilizers and makes no pretense to anything but what it is; a place where the new plants which are imported through the international machinery of the Federal Department of Agriculture are maintained and increased as rapidly as funds and the nature of the plants will permit.

It contains only 6 acres of land which are leased for a nominal sum from Mrs. Mary Brickell and the lease has only eight years more to run. It was started in 1898.

Through the generosity of Mr. Charles Deering a new site consisting of twenty-five acres at Buena Vista has become the property of the government and on it there have already been assembled many new plants which will be interesting to the members of this society. Unfortunately, shortage of funds and the war have seriously interfered with the rapid development of this new garden.

The superintendent of these two gardens is Mr. Edward Simmonds, too well known to many of you to need any introduction. His assistant is Mr. Steffani, and it will be their pleasure as well as my own to meet any members of this Society at any time of day at the older of these two gardens—that on Brickell avenue, below Twentieth street.

The second fact which I would impress upon your memory is that since the first of January Miami has had a scientific institution known as The Miami Aquarium and that its director, Mr. Mowbry, welcomes you to it as members of a scientific society. The badge of the Society will admit you at any time of day to a sight of the most remarkable under-sea scenes which have ever been arranged

and you should not fail to give yourself the pleasure of seeing the gorgeous tropical fishes and other remarkable sea creatures which are on exhibition there.

On behalf of the citizens of this whole community, extending from Little River to Homestead, I have been requested to extend to you the heartiest welcome of which its residents are capable.

Response

B. L. Hamner, Tampa

Mr. President, Dr. Fairchild, Ladies and Gentlemen:

On behalf of the Florida State Horticultural Society, Dr. Fairchild, I want to express to you and the citizens of Miami our deep appreciation of the hospitality which you have so generously expressed. I know that our visit here will be attended both with pleasure and with profit. With pleasure because hospitality is synonymous with Miami, and the opportunity for hospitality in Miami is great by reason of your proximity to Bimini and to Cuba—the oasis in an arid country.

I know it will be attended with great profit because you have many, many object lessons here. I believe that one of the great object lessons which you present in Miami is the lesson of co-operation. The causeway which leads from Miami to your beach was only built through the co-operation of your citizens.

I believe that we will learn here the lesson of vision because a few years ago your beach and the islands which are arising in your bay were but a sandbar and a mangrove swamp which to men of less vision would have appeared to be without value and without use. And when we have seen the wonderful things which you are doing with it I know we are going to accede to you the right to the title of "The Magic City."

I believe that we will learn the lesson of faith because one could not ride over this city and out to Coconut Grove without knowing that it was a combined citizenship which helped build those beautiful homes; and that they had faith in Miami and that without faith they could not have built.

I believe that we will learn the lesson of courage because we know something of the struggle that it has taken to acquire these things and to accomplish the things which you have. You have shoudered burden after burden of indebtedness which to men without vision and without faith would seem staggering. You have built in advance of your time and I know that it takes a great amount of courage to do the things that have been done here.

We are also going to learn common sense, because in Dade County you have had foresight. You have made this a tick-free county and you have acquired for yourself common sense and reasonable laws respecting fences.

I believe that we are going to learn optimism because people could not take the rather uninviting looking mangrove swamps that you had along your shore and along your bay and work them into the beautiful things that you have here

without a wonderful amount of optimism.

Now, I believe that these lessons which will be learned will be of great benefit to the State because the members of the Horticultural Society are really builders and if they can catch some of this spirit and send it out over the State it will mean that the State will build as you have built a city. I am glad that you appreciate the value of the membership of the Horticultural Society and I hope that the people of Miami will catch something of your broad grasp as to the understanding that these people have. To my way of thinking, the Horticultural Society has been the promoter of the best thought that has been in the State; and the ideas that have built the State to its present greatness in agricultural and horticultural lines have come forth from this Society. I know that the best thought and that the best experiences on the subject of agriculture and horticulture have been brought out in the thirty-four annual meetings of

this Society. So I know that the people here will feel that the hospitality which they have expressed and which they will show has not been ill spent.

I regret on behalf of a number of the members of the Society that your Mayor was not here to express a welcome as he did to the insurance men but he has passed the word along—along subterranean channels we will say—that if one becomes tired and dry and feels that this is an arid country he has but to approach the first policeman that he meets on the street and if he does not from him acquire the information for which he seeks to please report it to the Mayor and he will not be without a friend. Now I merely repeat that so those who have not heard it through subterranean channels will get it direct.

I again express to you our great thanks and I know that we will all enjoy our visit here and as I said the meeting will be attended with great pleasure and with great profit. I thank you.

President's Annual Address

H. Harold Hume

We refer to our various crops, to their size and importance in the agriculture of the State, to the number of carloads we ship, to the amount of revenue we derive from them, and this Society is interested in all of these. But there is another crop, which, measured by any standard we may set up, surpasses in value potential or actual all these—our boys and girls, the youth and children of Florida. No one can measure their value in the development of the State. We speak of our broad tilled acres, of our undeveloped resources, but what are these without men and women? And these boys and girls are the future men and women. What they do, what they will become, is what Florida will do and become. Granted they are well born, as they have a right to be, their value is potential, it is not active. They are only possibilities; they are not developed and their development for usefulness in various lines of endeavor, depends upon ourselves and the training we give them.

In Florida, compulsory education has recently come into effect. It should have come long ago, and no citizen with the right point of view would have it otherwise. But the very fact that we have compulsory education puts an added responsibility upon us. If, as in the past, we said to a child, "Here is a school, you may attend it or stay away from it," we

might with some show of reason be less concerned about the conditions in that school than we can be now, when we say to the child, "Here is a school, you must go to it." Operating under compulsory education, we have undertaken an added obligation to see that proper buildings and equipment are provided and that trained teachers are placed in charge.

Moreover, if we are to measure up to the needs of our cosmopolitan population, we must see that our educational facilities are of the best. We are anxious to attract to our State, as more or less permanent residents, the best people from other sections of the country; but these same people have the welfare of their children most at heart and will not come unless we have schools of the right standard to take charge of their education. In many of the rural districts of Florida, a school year of six months is the rule and we cannot expect people to relinquish the opportunity to send their children to better schools which are open nine or ten months and come to Florida. Ways and means must be provided for putting our public schools on the proper footing. Do not mistake me, the improvement in our public schools in the last two decades has been very marked and in many parts of Florida, the schools rank with the best. But we should not rest in our efforts un-

til all are equal to the best. We are not on the right footing when public schools in one part of the State are good and in another poor.

There is another phase of this question which is also worthy of our attention. The better the condition of our public schools and the more pupils who make their way through them, increased in numbers by compulsory education if you will, the greater the demand upon our institutions of higher learning.

The first of these demands is a demand for trained teachers to take charge of elementary school work. At the present time Florida is drawing very largely upon other states for her teaching forces. In schools of first rank in the State, it is, perhaps, not too much to say that eighty-five to ninety per cent of our teachers come from and receive their training in other states. Fortunate we are that they can be secured, but methinks the State in a larger measure should be meeting its own requirements. Sometimes it is an advantage that teachers should have been trained in something of the State's traditions, something of its viewpoint, something of its necessities, something of its own peculiar problems.

Upon our institutions of higher learning there is also a demand for increased facilities to care for larger student bodies and it is to this latter phase of the question that I now desire to call your attention. Never in the history of our country was there so great a demand for trained men and women as there is now. If the war taught us anything, it taught us the need of training. We realize, of course, that training is not an end, it is

but the means to an end. The trained man can go more swiftly and certainly to his object than the untrained.

The development of our State most certainly lies along agricultural lines. We cannot hope to reach that development which our resources make possible without trained men and women to take up the work. Training and knowledge they must have or fail. These they must get, either in the school of experience at their own or someone else's expense, a slow method at best; or they may get it at a well equipped school. To meet our agricultural requirements this training can be secured nowhere else than in Florida. Our conditions are peculiar, not duplicated elsewhere. Our crops, our soils, our climate, our entire environment are all different, or our problems are different in their handling from what they may be elsewhere. Unless the tiller of the soil brings to his work, a knowledge of applied Florida agriculture his chances of success are, to say the least, greatly reduced.

Many failures have been made in Florida, in this you will agree, though generally we magnify our successes and minimize our failures. Most of these failures have been due to lack of knowledge. If our State is to grow and develop, we must have men trained in the many different branches of Florida horticulture and agriculture, and this training cannot be done so well elsewhere as in Florida. A man may follow the vocation of farming in North Carolina, and take it up with equal facility and with equal chances of success, but not so in Florida. We must have men trained to work with Florida

plants under our own peculiar, and pardon me for saying it, exacting conditions. Even though this training might be secured elsewhere, it would still have to be had in an agricultural school and such schools are almost without exception state-supported schools. We therefore place ourselves in the position of beggars, asking other states to do for our youth what we will not do for them ourselves.

Now, what of our important state schools? No institution in this country ever had a more efficient and patriotic corps of teachers than is to be found at our State University at this time. But efficiency, loyalty, and patriotism, though they may carry teachers far, are not all. These men lack space; they lack equipment; they are too few in numbers for their task; they are overworked to the breaking point, and woefully underpaid. Nothing but deep and abiding interest in their work, their belief in their mission and their hope in the future keeps them at it. What has been said of the force at our own University, is true in like measure of the instruction personnel of our State College for Women. In scholarship, in quality of educational work, there are no institutions in America that rank higher than these. But they are unable to adequately meet the demands made upon them and ultimately this teaching force, an asset of first importance to our State, must have relief, or go elsewhere. The question plainly put, is, shall we maintain these institutions on their present plane, give them sufficient funds to pay the teaching force a living wage and enable these schools to meet the needs of the youth of the State; or shall we allow

them to degenerate into second rate schools and turn from their doors those seeking preparation for their life work in building a greater Florida. Florida can answer this question only one way, and with your help, in the right way. Florida has at no time a more vital problem to solve, and none for which a correct solution is of so much importance in the development of our commonwealth.

Now the correct solution of these questions means increased taxation. Increases or readjustments in taxation are not viewed with popular favor. Taxes are always regarded as a burden. But here is a situation where the welfare of our children is at stake, where the development of our State along broad lines is in question. We must therefore take a different view of the whole matter. Our forests may be removed, our mineral resources may be depleted, but so long as Florida's soil and Florida's incomparable climate last so long will the products of our fields be numbered first among Florida's resources. We can hope to maintain our position only with the help and leadership of trained men.

The financial readjustments through which we have been and are passing, have been felt in Florida, of course. While some people are pessimistic over present conditions, yet from a horticultural point of view, it may help us to remember that our State, our Florida is not in such condition as it was in the spring of 1895. Profits may have disappeared, during the present season, but the principal still remains; whereas in the spring of 1895 both principal or investment and profit had been wiped out. Again if we com-

pare conditions in our State with conditions as we find them in other parts of the world, or even of our own country, we have reason to be well pleased and we have moreover good grounds for taking an optimistic view of our financial conditions. Florida is a State of many and varied resources, and the conditions through which we are passing are not permanent. They will pass away ere long, leaving us on a sounder footing than ever before.

No one acquainted in a general way with Florida during the past quarter of a century can fail to be impressed with the very remarkable material development which has taken place during that time. Villages and towns have sprung up where there were none before; towns have become cities and cities have added tens of thousands to their population. New industries have come into being, vast areas of land have been brought into cultiva-

tion, and wealth has increased many fold.

But if because of the present temporary conditions, we fail to care for the educational needs of the State, we do a permanent and lasting injury to coming generations and to our State, an injury which subsequent favorable action will not remove.

The situation must be met now. The present session of the State Legislature should take the necessary steps to permit counties or school districts to say what their school millage should be. They should make ample and adequate provision for own State institutions of higher learning even though taxes be increased and new ways of taxation invented. Education is of fundamental importance and our State can advance only as its education is advanced. Thousands are flocking to our schools and we must provide necessary facilities for their training.

Horticultural Pioneers of the Tropics

WHAT THE FEDERAL GOVERNMENT IS DOING TO HELP THEM

David Fairchild, Agricultural Explorer in Charge of Foreign Seed and Plant Introduction

Horticulture is an expression of human intelligence. It does not differ in this respect from sculpture or architecture. They all result in the creation of forms. There is this difference though. Horticulturists are working with living, growing things, whereas sculpture and architecture are concerned with materials which stay for ages where man puts them. But just as piles of rock or banks of clay do not make architecture and sculpture, so plants do not make horticulture.

The tropics are filled with plants but there is amazingly little horticulture in the tropics. The great living persistent intelligences are not there.

Look the tropics over and what do you find? Here and there some lonely, flickering, intellectual light which refuses to be put out by that wet blanket of indifference which will sooner or later smother any but the most brilliantly burning flame.

It has been my peculiar position during the past twenty-two years to be in touch with these lonely intellects of horticulture scattered throughout the tropical world and the picture of their struggle continually stirs my emotions.

They are building little places which, like the small clearings of some tropical

forest, grow up again to weeds and lianas as soon as the wood chopper dies. They select new varieties of fruits or vegetables but these are lost again. They plant variety collections of their pets but when they die who cares for them?

Around government-owned and operated gardens of the Tropical Colonies of various European countries there are little centers of horticulture which rally now and then the few congenial spirits who for short periods happen to be located there as officials or business men. As a rule, however, these are show gardens with laboratories attached to them in which research work for the planters is done on some of the staple tropical crops of the colony. Of tropical horticulture there is amazingly little.

But if you have agreed with me that horticulture is the expression of human intelligence it can be easily shown why there is so little horticulture in the tropics. There are so few people there of the kind of intelligence necessary for its development. We are inclined to overestimate the white populations of the tropics. I wonder if many of you know that scattered over the whole group of islands in Hawaii there are only 30,000 white people; that Jamaica has only a little over

15,000; and Trinidad about the same; and that in the whole Dutch East Indies which stretches for 3,000 miles around the globe at the equator there are only 80,000 Europeans and half castes. The Straits Settlements have not much over 8,000; and Natal with its 35,000 square miles has only 98,000 whites in it, whereas Queensland with over half a million square miles of territory has only 380,000 whites and the largest city in it which is the largest white city in the tropics has only 168,000 inhabitants.

When you remember how small a proportion of people are interested in horticulture anyway and how scattered the populations of the tropics are I believe you will be prepared to accept my statement that *there are more people in Florida who are interested in tropical horticulture than in any other place in the world.*

At a risk even of offending those tropical regions of both hemispheres, therefore, I believe it is perfectly proper to address you, gentlemen horticulturists of the Florida Horticultural Society, as the horticultural pioneers of the tropics.

But you are so by reason of your position rather than by reason of your accomplishments, great as those have been; and it is my pleasure to address you today with a view of helping you go ahead and prove what I believe you have already proved, that you are the chosen people, the great pioneers of tropical horticulture.

We all know that Florida can scarcely claim to have even her nose inside the region of tropical lowlands. She might be compared with some great Mesa rising

from some tropical plain with her plateau visited by the cold winds and frosts of the 8,000 foot altitude. She is too cold for the plants, but ideal for the people; and settling there like blackbirds on a rice field, they come in swarms. The whites have found a climate just above the tropics where they can live and work out of doors. This is one reason why you will be great pioneers. Horticulture is peculiarly an art of the hands. Who ever heard of a horticulturist who could not bud and graft and perform all of the necessary operations connected with the propagation of plants.

But there is another great reason why you will be the pioneers. It will pay you. The product of your art will have a commercial value. It will pay its way. Compare the lure of \$750 profit from a single avocado tree or \$130 from a mango tree with the lukewarm interest which a better variety of either of these fruits produces when offered in a market swarming with inferior varieties.

"What is the use?" said Dr. Kraemers from Java as he was eating some delicious Florida oranges and bewailing the fact that they never had any good oranges in Java. "The people would not pay any more for them if I introduced them."

Mr. Popenoe wrote me from Ecuador that he had found a plantation there of the most delicious of all tropical fruits—the Mangosteen, but that the fruits were rotting on the ground. Imagine it, gentlemen, fruits of the mangosteen, which has been rightly called the Queen of Tropical Fruits, going to waste in the only respectable sized orchard of that

fruit in the Western Hemisphere. No market.

What developed the horticulture under glass, of Belgium, where one could travel for hours under acres of whitewashed panes? The London and other markets which were willing to pay any prices almost for Gros Colemans, Black Hamburg grapes or wall nectarines. No horticulture will develop unless those engaging in it can make a good living out of it, for those who can produce good fruit belong to the most intelligent people in any country and they will not live on the ragged edge of society. They must have the necessities and some of the luxuries of an intellectual life or they will drift into other occupations. This is why you find in the tropics generally such inferior fruits and vegetables. Nobody of intelligence wants to engage in their production. It does not pay.

But there is still another reason. People have to learn to like tropical fruits and vegetables. It is one of the strange phenomena of life—this acquiring of a taste for something new. When I first returned from a stay in the eastern tropics where I had formed a liking for many interesting tropical fruits I was annoyed to find on every side people who had the idea that there was something mawkish and over sweet about the fruits of the tropics. The ridicule to which some of the very finest of them all were subjected was enough to discourage anyone; and had we not become so involved in their fate in this country by starting out to grow them, I sometimes wonder if we would have persisted in a study of them. It used to seem as though my friends

were purposely antagonistic towards these beautiful fruits and many an unhappy hour did their jibes and ridicule cause me.

But it was all unnecessary, for theirs was the perfectly natural reaction towards something new and time has taught me that even the lower animals and the insects at first refuse almost any new food to which they are not accustomed. But why then should this difficulty present an advantage to Florida. Because of all the peoples in the world the American is least fixed in his food habits. How this has come about I do not know. Whether it is a part of the general adaptability of this mixed race which is developing under this climate with its tremendous temperature changes would be important to know. That it is a fact I believe can be proven.

If we take a look at the development of British horticulture or French horticulture we get a picture of fashionable garden parties and flower and fruit shows; of royalty appearing at this one and awarding medals or at that taking prizes for their gardens. It is wealth and the rivalries of competing gardeners of great estates which have produced some of the finest varieties of flowers or fruit. Millions have gone into this horticulture of Great Britain—many millions. Think of the craze for hyacinths and mulberries, and orchids, and rhododendrons; or the costly fruit houses where at one time even the mangosteen was fruited; or the ferneries and now the rock gardens for whose crannies explorers would scale the crags of the Himalayas or brave the wild men of the land of the cross bow.

These things have not come in the tropics to any extent because there were too few people. But they will come and the question which I wish you to look at today is whether the horticulturists of Florida are not really destined to be the pioneers in this new horticulture of the tropics.

They have a climate in which they can work with their own hands all the year round. They have around them in increasing numbers each year the people of means. They have large numbers of young people to recruit their ranks from. They have a public more willing to take new fruits than the world ever saw before. That public goes and comes from the great centers of a great country which is of all the countries in the world the greatest fruit eating one. The drift of dietetics is towards a greater vegetable diet among people of middle age and they are the people who have their hands on the money.

I am of course aware that many here come from parts of the State which are too frequently visited by frosts to have the same interest in strictly tropical plants which the citizens of Miami and vicinity have but the question of frost and protection from it is connected with every agriculture no matter where you travel on the earth's surface.

What are the horticulturists trying to do on the bleak plains of Canada? Produce a plum which will ripen before the frost can get it in September. What are the almond growers of California staying up nights for? Waiting to see if the late spring frost has killed their Jordan almond blossoms and spared their IXL

variety. What is the experiment station in Luleo, Sweden, doing? By extensive breeding experiments, trying to produce a shorter season barley for Lapland.

So, although most of us try to push into the background, when we talk with Northerners, the question of frost, instead of admitting that it is a factor connected with all agriculture except that actually below the isotherm of 32 F., it is a fact that Florida horticulturists will always be striving to produce hardier forms which can be grown farther north; and that with their production will come wider areas of their cultivation just as the production by Prof. Saunders of the early-maturing Marquis wheat by hybridization and selection extended the area of this cereal tremendously in the Canadian Northwest.

But still, what has all this to do with horticulture and its development in the real tropics? Just this. The tremendous stimulus of a great people of 100,000,000 consuming the horticultural products of the tropics. Nothing great that I know of started large. It had its little beginning. I had the pleasure in 1898 of talking with Captain Baker in Port Antonio and of hearing from his own lips the story of his first schooner load of frying pans which he took to the West Indies and of how in desperation he bought a load of bananas and peddled them in Boston. The banana was so rare a fruit in Germany and France in 1895 that three of us American students in Bonn disgraced ourselves by laughing out loud in the course of a serious botanical dissertation of how to eat one. The great American public took up the banana. It

would have it. It was willing to pay money for it and the satisfying of this demand has had a greater influence on tropical horticulture than almost anything else since the discovery of the uses of the juice of the rubber tree.

As our fathers and mothers were in at the beginning of the banana so we here today are standing at the threshold of another tropical industry which in magnitude may in the lifetime of some here rival that of the banana itself. I refer to the avocado.

But there are many who will talk here of that remarkable fruit and I shall only allude to it to help me prove what I started out to prove to you—that the pioneer work in tropical horticulture is here and not somewhere off in the sweltering, malaria-infested lowlands, or even on the isolated, inaccessible slopes of some tropical volcano, alluring as those places most certainly are to the collector and the laboratory research man.

If the tropics is the place where tropical horticulture will develop why is it that there is not a single large orchard of *budded* avocados anywhere in the West Indies or Central America whereas there are hundreds of acres of them here?

But someone will say I have chosen as an example a fruit with which California has done more than Florida, which is true. But my explanation of the reason is that California has had the wealth and the people.

But let us take a more strictly tropical species, the mango, and see what the situation there is. It is one of the most highly prized fruits of India. I have discussed its varieties with the wealthiest

Parsee of that vast country, sitting in his marble palace as he gave me the promise of plants of his best sorts. Its culture there is centuries old and the Mahrad Jas fostered its cultivation and built up variety collections, but they did little to study its diseases and nothing which we can discover to produce by careful breeding and selection the finest varieties of which the species is capable. No such question as that of the best stock on which to graft or bud it had been worked out and even the old and expensive system of inarching was the only known method of its propagation in vogue there. With millions of square miles of territory where giant mango trees could be grown in the tropics of the Western Hemisphere was it not to be expected that there would have developed orchards of the finest varieties to be found in India? Varieties without any fiber which could be eaten as easily as a canteloupe? We have searched the tropics of South America and Central America in vain. The finest mango of Brazil (Mango de Rosa) is too full of fiber to merit classing as even a fair variety. The call has come in from these countries for the fine Florida mangos such as that remarkable seedling, the Hayden, than which there is none approaching it in commercial character, and thousands of budded plants of these and our imported varieties have been sent into the western tropics.

Some of you perhaps know the struggle which resulted in the saving of the mother of the Hayden, the Mulgoba. It would be hard to imagine such a struggle and such patience over a new variety of fruit inside the tropics. I wish I could

read to you one of the last letters of that early pioneer, Prof. Gale, which he wrote to me after, for the third time, his Mulgoba mango (the only tree in America) had been killed to the ground. I asked him if he wasn't discouraged and he came back with that optimism which seems to be characteristic of the old fighting American stocks of eighty years, saying that now he felt convinced that Mango growing was going to be an industry in South Florida. I think of that letter when I see thousands of budded Hayden mangos and hear the accounts of big profits from single trees which were made last year.

But I have a more serious undertaking than would be indicated by such examples as the Mulgoba mango. These are days when the question of a food supply is uppermost in people's minds, particularly the minds of the legislators.

I sat one afternoon in the woods of Maryland with Mr. Hoover. It was just after the crisis had been passed with regard to our supply of quinine and we had suddenly realized that Holland had a complete monopoly of that indispensable drug. I was tremendously interested in Mr. Hoover's conception of the growing importance of the tropical food supply and of the speed with which other countries were pushing into them in search of the vast wealth which lies in those vegetable oils which every year in immense quantities can be produced there. His long experience in tropical countries has made him realize their tremendous potentiality and I shall miss my guess if he does not bring into a prominence which

few here realize the great future for Americans in its exploitation.

The discovery of a use for a tropical raw material is the first step in its exploitation is it not? How are new uses discovered? By the action of those intellects which through experience in a certain field have come to know what is needed in that field, in another way. The presence of the intellects is as necessary as the presence of the raw material and here is where Florida comes in. She has the people. She has coming here every winter hundreds of thousands of people who spend their lives in close touch with the most specialized industries in America. Men who have made their fortunes by discoveries. These men are scattering out all over the country getting the only kind of rest which such men take—a change of interest. Why is it unreasonable to suppose that with the bringing in around them of all sorts of these tropical plants their attention should be attracted to their possibilities, and out of their interest in them come the development of a demand for them which will extend into the tropics and lead to a great tropical industry?

These things do not seem so speculative to me as they perhaps would had I not stood with Ridley in his first little plantation of Para rubber and caught in a mustard tin the latex which hardened into an eraser which I still use and which every time I do use it reminds me of the fact that since I caught that juice over 500,000 acres have been planted to that tree, many coming from seeds from that very tree; and that after supplying every motor car with a tire the juice is still

flowing from these half million acres of trees and a Dutch representative from Java has come to suggest that we make rubber carpets and rubber roofs out of the juice in order to utilize it. The tropical jungles of the Amazon were filled with that para rubber tree, but plantations of it in the Orient have made jungle rubber unprofitable.

It is in these little beginnings that the government can and is helping you pioneers of tropical horticulture.

The Office of Foreign Seed and Plant Introduction with which I have had the pleasure of being connected for twenty-three years is that branch of the Department of Agriculture, which concerns itself with these little beginnings. It hunts for plants in various parts of the world, sending out trained agricultural explorers and through its hundreds of correspondents getting in living material at the rate of about 2,000 things a year. I would like to present to you on the screen some of these agricultural explorers. They are not accustomed to appearing in public. The public does not yet accord them the honor which it gives to more spectacular explorers. A man who can dance a prettier dance or throw a swifter ball or kick a higher kick or punch harder will figure large in the newspapers; whereas the man who makes a new plant grow where none grew before or who even creates through hybridization an entirely new fruit is "just another plant crank" in the eyes of the so called public. I suppose the world will always be lured by the spectacular at least for many generations to come. It is its way.

But let me select a few of those little beginnings of tropical horticulture which would develop fast if the public were as quick to take up new things as those of us who are interested in the new things themselves could wish it were. And here is where the great mission of Florida comes in. If the people of Florida could only see that by the cultivation of a spirit of progressiveness and open-mindedness they might have here more new and novel foods with which to interest those coming from the North than any other State in the Union. In my imagination I can hear this kind of a conversation between a Florida business man and a stranger. "What, didn't you taste a Papaya while you were in Florida? Don't you know the Sapodilla? Or that new hybrid fruit the Tangelo? Or the delicious drink made of the Rangpur Lime and the Persian Lime combined? Or have Dasheen crisps for breakfast? Or make your lunch of an Avocado? Or taste frosted cake with fresh shredded coconut on it? Or wait long enough to eat a White Sapote? You never even heard of pigeon peas and Hopping John and bonavist pea soup and fresh cassava pudding? Well, what is the use of going to a place where all sorts of new things to eat can be had and not tasting them? You must have lived in one of the hotels which cater to the provincial northern taste with a French chef and a characterless menu." The northerner might reply that he didn't like new things anyhow but he would have a guilty feeling nevertheless.

No, the thing to do, it seems to me, is to look at every new plant which will

grow here from the standpoint of its possible utilization by the millions of people north of us. If it has a beautiful flower can it be grown here, shipped north and forced there, can its flowers be sent north and sold, has it a new perfume which might become popular? If a new vine, could young plants be sent north and used as porch vines during the summer or would it grow outdoors and form a window decoration? If it is a fruit what season would it be possible to get it into the hands of your friends in the north? Will it carry well? Has its juice new possibilities of utilization? Is it a better keeper than those with which it will compete? If it is a new vegetable what are its advantages? Some of its preparations may prove better than those of its competitors.

It may have a pleasant flavor after being thrice cooked and be just the vegetable that diabetics are looking for and which will prolong the lives of thousands by its introduction. Think how many men and women are now eating under doctors' prescriptions a sea weed—agar agar. Supposing that it should be possible to create a fashion for it which would make it supplant spinach and that it were a safer crop than spinach to grow here. The inhabitants of northern Celebes eat the leaves of the Papaya and throw the fruits to the hogs. Dr. Powers investigated these leaves and finds they contain carpaian in large amounts but I have after cooking the leaves until all bitterness is gone eaten them without injury. In Yucatan there is a tree which grows here luxuriantly and which there supplies delicate greens throughout the summer.

But I know men here in the audience who are saying, "Yes, but it's such a slow business." One real estate man said to me "Let's try something easier." A friend of mine who made 8,000 limousines, after hearing my enthusiastic account how after ten years we had gotten a new vegetable started, scornfully remarked, "Yes, but ten years is an awfully long time." I admit all this. I see the difficulties which present themselves to the minds of those who would hurry through life, but I also have in mind the small amounts of money which are going into this exploitation of new food plants. The government has not spent on all of the work of this introduction of plants that has been carried on for nearly a quarter of a century as much as \$2,000,000 for the whole period and yet last year those growing these introduced plants made \$89,000,000 out of their culture. At the present time there are thousands of individual incomes which are greater than the \$125,000 which is going into this work next year and of this sum only a small fraction can be used in the exploitation of new foods. The main expenditure must still go into the securing of new plants and their distribution to those who will bring them to a point where individual initiative will exploit them.

There is another side to this big problem. It is intimately connected with creating a demand, a taste for a new tropical food. Supposing Captain Baker had taken a liking to the West Indian Mangos which are all seedlings and instead of the banana had brought that in. Is it imaginable that he could have created a liking

for it and built up a big business with it? I cannot imagine it. The introduction of the delicious Mulgoba and other fiberless sorts and their further improvement in the Hayden is what is acquainting the great American public with the excellencies of that incomparably delicious fruit. And when Americans once really go after the mango and it becomes a million-dollar industry, its beginnings will trace right back to the shores of Lake Worth and Biscayne Bay, just as the first days of the grapefruit, which is today as much talked about in France as the banana was a generation ago, were spent here in the south tip of Florida.

Why, I once had the pleasure on a railway Pullman of presenting a Florida-grown mango of a variety which the great Parsee Tatta had given me, to the millionaire of Cleveland who had escorted Tatta through this country when he visited America. He had volunteered the remark that he had been through India and he considered the mango a much over-rated fruit. He opened and ate the Florida-grown Amini mango and declared, as any honest man would, "I must never have eaten a good one."

Most of the objection in the minds of the public to what they call tropical fruit is to poor seedling varieties of it. Over half of those who don't like them have never eaten the selected superior types of those fruits which you pioneers are bringing into existence through your art. We cannot blame the public so long as we give them only rank flavored seedlings, and when we once give them the best of their kinds they will come after them with the money fast enough.

It is in a very real sense then that you are the pioneers of tropical horticulture, for it is to you that a public of a hundred millions is looking for the perfection of these bewilderingly fascinating new forms of plants which inhabit the great forests and savannahs of the tropical zone.

So those who have come here to live should let nobody belittle the mission of Florida. To look upon what you do here as affecting only a narrow sand spit—a sand bar as it were out into the Gulf of Mexico—is to forget that what you do here to improve the plants and popularize them affects the whole American consuming public by creating a demand which, as our population increases, will draw first on Florida soils and later on the whole available tropics.

Is it not worth while to teach a hundred million people to like a fruit which can be grown cheaply over millions of acres of inexhaustible volcanic lands where the sunlight and moisture make the fruiting of it a perpetual performance?

Is it nothing to so improve a fruit or nut or vegetable that its use by a great people is made possible and its culture stimulated in regions which never could have been devoted to the cultivation of the wild form of it?

Is it nothing to build up a body of trained and enthusiastic men and women from which will be recruited those who, as opportunity comes, will go out into the wider strictly tropical field prepared to accomplish something worth while before the malaria and other diseases pull them down to that dead level of existence which almost every white resident

complains of as the drawback of the tropics?

The machinery is working which will bring in the plants for the horticulturists. It is woefully inadequate, I know better than you do, but at least it is functioning. But where are the plant breeders and plant breeding gardens and institutions where the arts of tropical horticulture are taught to the young men and women who are growing up here?

A great opportunity is here for the establishment of an Institute of Tropical Horticulture which shall become a real center of learning with respect to the problems of the tropics.

Florida's isolation with a zone of cold land on the north and the sea on the south should make it possible to keep her free from the swarm of tropical diseases and insect pests which has already overwhelmed Hawaii and is rapidly sweeping Cuba and Porto Rico and the other West Indian Islands. I was shown the other day a photographic calendar from Hawaii of one of those coconut-planted beaches and to my dismay I realized that the beauty of those Hawaiian palms had departed. A leaf moth has converted them into a lot of worn out feather dusters. Here is one spot where with intelligence and money we can have cultures of tropical plants free from disease or at least where the diseases will be under control.

And here I come to one of the most amazing performances, one of the gigantic gifts to the world which you pioneers of Florida have given.

I know some of you will not agree with me. I fear some of you have been back-

ward in recognizing the value of the contribution. Some of you may still be antagonistic towards those who brought the conditions into existence because they abridge your individual rights and hamper you in your individual ambitions.

But if I had only the command of language I would love to put this accomplishment before you so that you could not fail to appreciate it.

To one who as an orchid hunter wanders through the jungles of Java with its hundred and eighty inches of rainfall, every leaf seems clean and every tree free from disease; but a closer inspection will teach you that where the trees and plants grow there grow their fungus diseases and the insect pests. As long ago as 1895, when I was first there the Dutch had been so aroused by the complete destruction of the Java coffee plantations by the leaf disease that Treub, the great director of the Botanic Gardens, was building an Experiment Station after the pattern of our American ones in order to study the diseases of the tropical crops of the archipelago.

Here in Florida where you have such a large body of intelligent plant growers you have done with the aid of funds which a public living far away from you has in part supplied, an amazing thing. You have stamped out one of the deadliest and most easily communicated of plant diseases by your combined efforts. You have shown that the thing is possible. Can you imagine such a thing being done anywhere else—anywhere where there was not an intelligent public and easy means of communication?

Have you forgotten that it was the entomologists and their knowledge which made the building of the Panama Canal possible? Cannot you see that the discoveries which led up to the control of the mosquito, like the discoveries which led up to the building of the first dynamo will be talked of long after the greatest engineering feat which was made possible by it have been forgotten?

To have controlled a virulent plant disease! Look at it from the angle of the future. Go to Hawaii and see what the uncontrolled gathering of plants from all over the tropical world led to and how impossible it has been found to eradicate such pests as the fruit fly.

You, pioneers of tropical horticulture, have shown the vision. Men like your own neighbors here have seen the handwriting on the wall of your gardens. They have seen how easily your wonderful gardens would fade; how the unequal fight with the invisible, but none the less destructive monsters from the tropical jungles, are swarming over your garden walls and will overrun your plantations.

You may complain that they see dangers where they do not exist and undoubtedly they sometimes do, but does not any doctor see his patient from the pathological side? Are they more inclined to exaggerate than any group of enthusiasts? Will all these things not gradually regulate themselves?

You see, and I quite agree with you, that the cold water has been thrown on the individual initiative which once prompted amateurs to send all over the world for plants because of the thrills which the introduction of a new plant

brings with it. This work is now centered in a small branch of the Federal Department of Agriculture in Washington in so far at least as it relates to the out of the way parts of the world. I regret this, although perhaps I am as responsible for its coming about as anyone; but it has been for years a dream—a dream which I shall have to leave to younger hands and brains to work out—that there should be in every great section of this country trained men whose business it is to study not only the plants which are grown there, but, through extensive travel and repeated comparison, those which exist in all other parts of this planet which have similar conditions of soil and climate. The organization of a central office and the sending out of agricultural explorers from that office has been a good beginning but only a beginning.

The issues are too vast and the number of new plants too many and their study too complicated to make it possible in the brief span of a single human life to do more than touch such a field in the most superficial way. Why should it seem an extravagance for a great commonwealth to spend money on this form of research when it cannot fail to unearth forms of plants which when brought under the searching eyes and within the range of the inventive brains of thousands of amateurs like yourselves will yield new foods, produce through breeding immensely valuable immune and hardier varieties and form the basis of new and lucrative plant industries?

Let me sum up as I see them your great opportunities.

A wonderful climate for horticultural operations. An isolation which can be made a protection against the plant diseases of the tropics, and permit a degree of control of those diseases which is hardly to be hoped for anywhere else in the world. A public coming right to your groves with more money to spend than had the kings and courtiers of a few generations ago. A public, furthermore, which has not fixed its tastes on certain things to the exclusion of all others. A commonwealth filled with those restless spirits—those American pioneers—without whom this country would not be today what it is, the most rapidly evolving country in the whole world. And a mission which reaches far beyond the confines of your State—the mission of educating a hundred millions of people regarding that wealth of tropical foods and other useful plant material which lies as yet almost untouched in the tropical forests and savannahs of the world.

The opportunities are here, but you must build higher your centers of learning. Increase with all the speed you can your laboratories of research. Gather together great collections of the plants which will grow here and furnish materials for the breeders. Open the doors of opportunity for those bright eyed, curious minded, little boys and girls who today are catching butterflies and gathering snails and fishing on the keys when they are not picking fruit in your groves. It is those boys and girls who are to be the great pioneers of the tropics and if they know what they can learn of them in this State before they set sail they will be able to accomplish what they set out to do before the enervating tropical climate shall have sapped their energies and ambitions.

Ladies and gentlemen, a great future is before you.

The Institute for Research in Tropical America

Wilmon Newell, Gainesville

Some of you may assume, from the title of this paper, that the subject is a dry one. I can assure you that it is not, but, on the contrary, there is before us an opportunity to secure for Florida an institution which not only promises to greatly surpass any existing institution in the southern states but one which will presently attain a world-wide distinction in the field of science, including agriculture and horticulture. I will confess, at this time, that I requested your President and Secretary to afford me the opportunity of talking to you on this subject, because I honestly believe that we have something of vital interest to this Society, and that, furthermore, this Society is the logical agency to take the initial step towards getting this institution located in Florida.

Without further preliminaries, permit me to say that within recent months—practically since the close of the World War—there has developed among scientific investigators, particularly plant pathologists, a definite movement for investigations in the tropics, pertaining not only to plant diseases, but to various lines of agricultural and horticultural work. The beginning of this movement is right here in the United States. It is not merely the expression of a desire on the part of scientists to explore the tropics along

their respective lines of research, but is the crystallization of the plans and needs of many individuals and large business interests whose financial investments in tropical countries are such as to make certain lines of scientific research a vital necessity. There are many business firms in this country that have extensive holdings in the tropics and the future success of many of their ventures is dependent upon the solution of agricultural, horticultural or biological problems. It is only natural, therefore, that such a movement, virtually international in scope, should develop at this time.

There is also great need for a more complete knowledge of the trees, plants and crops of the tropical regions than is now available, to say nothing of the fact that medical men need a knowledge of many factors which concern the origin and dissemination of tropical diseases. There is also a crying need for an institution in which students may specialize in the study of tropical problems, in order to qualify themselves for employment by business interests having investments in the tropics. And it is equally desirable that there be provided, in or by the United States, in some form, an advanced educational institution wherein students from the Latin-American countries may take advantage of the large amount of bi-

ological knowledge which has been acquired by American investigators. All of which things would be directly contributory to a closer relationship between the United States and the other American countries.

The step which led up to the organization of the Institute for Research in Tropical America was the appointment, on November 5, 1920, by the National Research Council, through its Division of Biology and Agriculture, of a "Committee on Scientific Research in The Philippines and Other Tropical Countries." On November 19, 1920, this committee reported to the National Research Council that, as a result of its investigations, it had found a number of Philippine problems demanding prompt solution, most of which vitally concern and are closely identified with important commercial ventures, the headquarters of which are in the United States. One step followed another in rapid succession and "The Institute for Research in Tropical America" was formally organized on January 15, 1921. The President of the institute is Dr. A. S. Hitchcock, personally known to many of you, and the Secretary-Treasurer is Dr. G. R. Lyman of the Bureau of Plant Industry, United States Department of Agriculture.

Now, what is this Institute? It is an institution for research in tropical America and its field embraces biology in its broadest sense, including agriculture, horticulture, plant breeding, bacteriology, entomology, plant pathology, etc. It is being sponsored by and organized under the auspices of the National Research Council, a sufficient guarantee of its

earnestness of purpose and efficiency of operation.

By the way, some of you may not clearly recall what the National Research Council is. The Council was organized in 1916 to co-ordinate the research facilities of this country for work on war problems and in 1918, by executive order of the President of the United States, it was reorganized as a permanent body. Its essential purpose is the promotion of scientific research and of the application and dissemination of scientific knowledge for the benefit of the national strength and well-being. It is virtually a Congress of the leading scientists and scientific institutions of the United States — a co-ordinating clearing house for scientific knowledge. Its administrative work is provided for by a gift of five million dollars made by the Carnegie Corporation and it has secured various gifts for the support of projects which it has sponsored, including a gift, for Research Fellowships, of five hundred thousand dollars from the Rockefeller Foundation.

The membership of the Institute for Research in Tropical America is open to all Universities, Colleges, Museums, Scientific societies and even governments that are concerned with investigations in tropical countries. How will it be financed? Partially with the funds of the institutions, both educational and research, that constitute its membership; partially by the federal support of projects which the institute undertakes and in which the government is interested; and by endowments, for, be it noted, the responsible character of the institute and

its ability will justify the utmost confidence in it by those inclined to donate funds for scientific investigation. The heaviest financial backers of the institute will undoubtedly be the big American business interests having investments in Latin America. In short, the institution will be, in a sense, a super-university and a super-experiment station and its field of operations will embrace all of tropical and sub-tropical America. Have I been able to sufficiently express the big idea?

The institute will doubtless have field stations, particularly in the countries south of us, but one thing is sure, there will be a parent station bigger than all the rest which will, also, presumably be the first one established. Where is this main station—the virtual headquarters of The Institute for Tropical Research—going to be located? Nobody knows, as yet, and right here is where Florida is mightily interested. In the southern portion of this State we have conditions sufficiently tropical to permit of successfully carrying on many, very many, of the lines of investigation projected by the Institute—and there are certain self-evident advantages in having this main station under the flag of the good old U. S. A. I am satisfied that if we go at it vigorously we can convince the officials of the institute that their headquarters should be right here in Florida. This much will, I think, be comparatively easy, but we must go further. In order to get this institution we must make a definite offer in the form of land for experimental purposes and perhaps money for the erection and equipment of a building. Once these things are provided, the United

States Department of Agriculture will be free to send its various specialists to this field station to pursue their respective lines of investigation and professors and investigators from various Universities will be quick to take advantage of the laboratory facilities provided. It has been suggested that this first or main field station should be even more than a laboratory or experimental station and that it should, in fact, be also a postgraduate school of tropical agriculture and horticulture, perhaps under the auspices of the University of Florida. I need not tell you what a prestige such an arrangement would give to our own University.

I am well aware that I have said just enough so that I should say more, but this I cannot do, for the institute, while not exactly in a formative stage, is still in its infancy and detailed plans for its operations have not yet been worked out. But the institute is a reality—some sixteen or seventeen big Universities have already associated themselves with it—and it is going to be located either in some of the countries south of us, or in Florida. The question is, what are we going to do about it? Are we going to let this opportunity slip by or are we going after this lusty infant and capture it before it gets so big that it will spurn any advances we may make? It is up to the people of Florida and I know of no more appropriate agency to handle this matter than the State Horticultural Society, for there is no other organization in the State the aims and purposes of which are so closely akin of those of the Institute for Research in Tropical America. If the idea of getting this institution located in Florida appeals

to you my suggestion would be that a live committee be appointed from this Society to investigate and, with the Society's approval, take whatever steps may

be necessary to induce the officials of the institute to locate their main institution in Florida.

Grass Culture as Applied to Golf Course Construction in Florida

Jos. R. Brooks, Palm Beach

It is difficult to realize the great popularity of the game of golf. It is now played nearly all over the world. For several centuries it has been a favorite in Scotland and England and its popularity is fast growing on the Continent. Belgium possesses several fine courses, the game having received impetus and royal patronage from Leopold II, of whom the following story is told.

His Majesty was one day receiving a newly arrived American Ambassador, and in the course of the conversation happened to ask him what he thought of the country. The representative of the United States confessed that so far, he had not been very favorably impressed, as it had rained ever since his arrival, and worse still he found himself deprived of his favorite form of amusement, as there were no golf links. Leopold II replied that he regretted his inability to influence the weather, but that he could and would supply the remedy to the second objection. The king was as good as his word, and gave his beautiful shooting-box of Ravenstien in the Sognie Forest, for the purpose, whereupon it was transformed into the Royal Belgian Golf Club, which now has a summer course at Le Cog, a few miles from Ostend.

Nearly every large city in this country now has many golf courses, Chicago alone having more than fifty in the city and its suburbs.

The great importance of golf in this State lies in the fact that it is the most popular pastime of tourists. One of our best known hotel men recently said that if golf did not constitute the backbone of the resort hotel business, it formed at least a large portion of the vertebrae. Some of the oldest resort hotels in this State have within the last few years found it advisable to make very large investments in golf courses in order to retain their patronage. The total investment in golf in Florida already runs well into the millions and is very rapidly increasing.

Enough has been said to indicate that the construction of good golf courses has been and will continue to be, an important aid to the development of this State. Every member of this Society has therefore, an interest in this game whether he be a player or not.

The cost of production and maintenance of a fine turf on any course may depend very largely on the selection of the site. It is always essential to have an abundance of good water, and when a site can be obtained which also contains

a variety of good soils, such as sandy loam, clay and muck, the cost of construction and maintenance is much lowered.

The methods pursued in construction have a most important bearing on the quality of the turf produced, the cost of producing it, and on the cost of the future maintenance of the course. In the construction of greens, tees, bunkers, mounds, traps, in the cutting or filling of fairways, and in any other work in which the natural lay of the soil is disturbed, it is most important that the top soil be replaced on the top, and not buried with the soil from below the surface; for most of our Florida soils are light and the top strata only is capable of supporting a vigorous growth of turf. Scattering or burying of top soil in construction work will result in poor turf, which condition can be remedied only in two ways; either by heavy fertilization, which is expensive, and affords only temporary relief, or by bringing in top soil from elsewhere to supply the deficiency, which is a very expensive process.

The building of a fairway consists briefly in four operations; first clearing and grubbing the land; second, draining where necessary; third, plowing and harrowing; and fourth, planting the grass.

The first operation needs no further mention except that the grubbing should be so thorough that palmetto, compe and similar growth will not be liable to spring up in the fairways after the grass is planted.

In some places a considerable drainage system may be required. On flat ground, slight depressions may be excavated with just sufficient grade to carry

the excess water away rapidly. These may have side slopes sufficiently gentle to cause no inconvenience to the player, after they have been covered with turf. The use of these grassy hollows in connection with lines of drain tile will solve most drainage problems in a satisfactory manner.

After the drainage has been provided for, the soil should be prepared for grass planting by thoroughly pulverizing it to a depth of about five inches. I have built fairways where this latter work had to be done mostly with a road roller and a scarifier, but it is certainly much preferable to build them where the land may be properly prepared with a tractor, a plow, a harrow, a pulverizer and a drag. Too deep plowing should be guarded against, especially where the soil is very light and practically all of the plant food is very near the surface. It is well to emphasize that all soils should be thoroughly cleaned of trash before planting and that heavy soils cannot be too finely pulverized.

Very little of what has been written in books on golf construction relative to turf culture, will apply to conditions in this State. For instance, we are almost invariably directed to use fertilizer or humus or both on newly cleared land before planting grass. On the heavier newly cleared soils Bermuda grass will produce a good turf without fertilizer for the first two or three years, after which some fertilization will be required to maintain a healthy growth and a good color. The lighter soils are seldom too light or too poor to produce a good growth of Bermuda for at least the first season after clear-

ing. These lighter soils do not afford what golfers term "a good stance" or foothold, no matter how heavily fertilized. Moreover, if heavily fertilized, a large proportion of the fertilizer leaches away in these lighter soils, before the grass can get the benefit of it. In order to meet these two difficulties, a layer of stiff, heavy soil, one to two inches in thickness, preferably clay, should be spread over the ground, after a good stand of Bermuda has been obtained. It is essential that this layer of clay or heavy soil, be kept en masse and not mixed with the lighter natural soil of the fairway. It will thus form a sort of mat which will give the player an excellent footing, hold down the lighter soil, and retain any fertilizer which may in the future be applied. The Bermuda grass will rapidly penetrate this mat and will form a heavy turf.

Bermuda grass forms the turf on at least three quarters of the area of most of our links. Its greatest advantages are ease of propagation and rapid turf-forming properties. The grass is most successfully planted vegetatively, the common process being to scalp off the tops of mature grass slightly below the surface of the ground; run these through a feed cutter, or chop them up with machetes, and drop the cuttings in furrows, and cover. If a thick turf is desired in a minimum time, the furrows may be so closely spaced that each one will cover the one before it. A fairway so planted in clay soil on the Miami Country Club links was covered with a good playable turf in ninety days. On heavy soil, good results may be obtained more cheaply by broadcasting the chopped grass on the

prepared land and disk it in. A period of hot, dry weather following the planting by this latter method, however, is liable to result in a very poor stand of grass.

On the newer portion of the Miami Country Club course, about half the area is marl prairie and the remainder sandy pine land. Practically all of this portion of the links was carefully prepared for planting before any planting was started. By this procedure work was very economically accomplished, as a planting gang once organized and started, never ceased operations until the whole area was planted. The heavy marl lands were worked on in the dry weather, and wherever frequent showers made the sandy pine lands sufficiently moist, the planting gang was transferred to them. In this way a fine turf was produced over the whole area with no watering whatever.

On most of our soils, Bermuda grass will require considerable weeding and at least two good applications of fertilizer per year. It can probably be best maintained if completely plowed under every second or third year and a new growth allowed to come back from the root stocks in the soil. This process prevents the grass from becoming rootbound, cultivates the soil and destroys many of the weeds.

St. Lucie Grass is similar to Bermuda in appearance except that it is a little coarser and of a lighter color. It is much more easily destroyed than Bermuda, will often die if allowed to grow high and burned off; or sometimes, after a rank growth is obtained, it will not spring again from the roots after having been

cut close to the ground. St. Lucie runs more to tops and less to root system than Bermuda. The latter is much preferable for fairways.

St. Augustine Grass is coarser than St. Lucie and still lighter in color. It makes an excellent turf for fairways if kept closely cut. It is a more vigorous and thrifty grower, once started, than either the Bermuda or St. Lucie. Under favorable conditions, it will crowd out all other grasses and weeds. This grass has produced an excellent turf on very poor soils, absolutely without fertilizer, where the ground water level was approximately three feet below the surface.

It is, however, more difficult to propagate than Bermuda and is seldom planted in the original construction of a course. After a turf of Bermuda grass has been obtained over the entire course, one of the surest ways of cutting maintenance costs is to plant small individual sods of St. Augustine grass from ten to twenty feet apart in each direction on all portions of the links favorable to its growth. Within two to four years, the St. Augustine will have taken possession of all those areas where the ground water is sufficiently near the surface. Such areas once covered with St. Augustine grass present no further maintenance problems save cutting and the use of tobacco dust when necessary to kill the cinch bugs which attack it at times.

The putting greens are of prime importance on a golf course, for though they usually comprise less than five per cent of the total area, approximately fifty per cent of all the strokes are played on the greens and it is here that the in-

terest of each hole should reach its climax. It is, therefore, advisable that the greens be made as perfect as possible, cutting expenditures elsewhere if necessary to accomplish this result.

Clay Greens are sometimes used, surrounded by a very carefully kept area of grass which might be said to serve as a part of the green, but the grass greens are so much preferred by the great majority of golfers that clay greens should be considered only where, as in some localities, adverse climatic conditions, or exceedingly heavy play, or both, make grass greens inadvisable.

From the golfing point of view, there are two important objections to the use of Bermuda grass for turf on putting greens. It is a little too coarse and the runners which it continuously puts out, divert the ball, making accurate putting impossible.

The first objection results in what golfers call a "slow green," which is perhaps comparable to what race track fans call a "heavy track," and makes it necessary to hit the ball a much harder blow to make a putt of a given length than would be required on a finer turf. The very finest bladed turf which can be obtained is the most desirable.

The second objection may be at least partly overcome by continually cutting off and pulling up the runners, or by constantly mulching up the green to cover the runners. Both of these processes are of course expensive, and in my experience, not altogether satisfactory.

So far as I know, it was at Belleair that the first attempt was made in this State to get away from the use of straight

Bermuda grass greens. The green building process as used there some years ago was as follows: The greens were covered with a growth of Bermuda grass, and during the summer when the course was not in use, the Bermuda was as carefully maintained as if being played on, as it was desired to keep the Bermuda grass turf as a foundation for the green.

About the first of October the knives of the mowing machines were set low and the grass cut very short. Each green was then fertilized with 500 pounds of tankage and the fertilizer watered well into the soil. The greens were then sowed with about seventy-five pounds of Italian Rye grass seed and top dressed with sufficient good compost to thoroughly cover all of the seed. The ground was kept moist during the period of germination, was rolled slightly before the first cutting of the grass, and the grass was cut just as soon as tall enough for the mower to catch it.

This general process with variations, has been since followed on the links of the St. Augustine Country Club and on those of the Ormond Beach course. At present a mixture of Red Top, Red Fescue, and Italian Rye is used instead of Rye only on these two courses.

During seasons of average temperature this practice produces excellent greens at these localities, for it is usually cold enough to retard the growth of the Bermuda sufficiently so that it scarcely appears on the surface of the green at all until late in the season, when it begins to crowd out or smother the other grasses, making the green slower and coarser. The warmer the winter season, the more

quickly the Bermuda takes possession of the green, and the colder it is the more its appearance is retarded.

At the Palm Beach Country Club course, on the other hand, the same process resulted about February first in greens entirely of Bermuda grass with its objectionable features. This, of course, was due to the fact that the average temperature at Palm Beach is several degrees higher than that at Ormond Beach or St. Augustine. It was therefore necessary to retard somewhat further the appearance of the Bermuda grass.

This was attempted by scalping the whole green with a weeding hoe, removing the grass tops entirely and leaving only the masses of roots undisturbed in the ground as the foundation for the green. The mulching was then spread on, and the green seeded as before. This treatment did cause a somewhat later appearance of the Bermuda grass, but not sufficiently so; as the fertilizer and water which were necessary to force the growth of the seed, together with the mild winter climate at Palm Beach, resulted in a Bermuda grass green before the season was half over.

The next step was to do away with the Bermuda grass foundation entirely and depend altogether upon producing a turf of northern grasses, strong enough to stand the wear and tear of a putting green. This had not previously been thought possible as it was impracticable to sow the grass seed until October, the sun being so hot before that time that it would kill the grass soon after germination. The results of this latter method were so successful at the Palm Beach

Country Club course that it has been followed there ever since first tried about three years ago. The greens at the Everglades Club at Palm Beach and those at the Miami Country Club are produced in the same manner.

In order to keep a golf green in a high state of perfection, constant watching is required and the greens keeper has many difficult problems to solve. For instance, on the Miami Country Club links the greens were at times affected by what has been termed "damp off" or "die back." Fertilizers and fungicides of many kinds were tried to correct this but with very indifferent success. The appearance of this disease was peculiar and interesting. It was liable to be found particularly on a damp, foggy morning, of which variety we do have one or two occasionally in Miami, boosters to the contrary. Very early in the morning a few small spots of thick white watery looking material would be found on the grass. These would more or less dry up and disappear as the sun mounted higher, but around them the grass in a circle as true as if drawn with a compass, would lie down like dead. I have seen a dozen or more such circles on a single green, varying in size from a few inches to a

couple of feet in diameter. A solution of sulphate of ammonia or nitrate of soda would sometimes partially revive this apparently dead grass. Finally an expert from one of the best known New York seed houses came down, examined the greens, pronounced them too highly ammoniated, and advised the application of acid phosphate. This was applied as greens were not treated. In a week the directed except that two of the afflicted greens had all recovered, treated and untreated alike, so the dieback still has us guessing.

An interesting attempt is now being made here by the Miami Golf Club to keep nine of the greens of the Miami Country Club playable during the next few months. Heretofore, as far as I know, there has been no attempt to keep greens of the northern grasses playable during the summer months in Florida. It may be possible to keep them in fair shape for a couple of months if the weather is not too hot, provided night watering only is done and the grass be cut high enough to give the roots good shade.

I wish to acknowledge my indebtedness to Mr. Wm. Fremd for some of the facts used in preparation of this paper.

The Golf Course at Mountain Lake

R. H. Linderman, Lake Wales

Mr. Floyd has requested me, in preparing this paper, to try and give such information as would apply to lawns, generally, and I have tried to do so, mentioning our golf course at Mountain Lake only at such times as the methods practised there, might be of use to private lawn owners.

The first nine holes of our course were constructed during the season of 1916, with fairly good results. The second nine, making a complete eighteen-hole course, was built in 1920, with splendid results, owing, largely, to good seasonal conditions and our previous experiences. The entire course was laid out by Mr. Seth J. Raynor, a noted golf architect of New York City. All that we had to do, was the construction work. That is enough history I believe, for this paper, but a great deal more could be said if a true biography of the course were demanded.

In preparing land for grass, the methods used, and the thoroughness of preparation differs in no way to the preparing of ground for potatoes, a citrus grove, or any other commercial planting. I believe that I am correct in saying, that the great trouble with the average person in planting a lawn, or large acreage, to grass, is that he does not take into consideration the very important fact that his

crop will need caring for, in the way of fertilizer, water, etc., exactly the same as his commercial crop. One fertilizes orange trees, gardens, etc., at certain periods during their development, so why not do the same with a lawn and get the most from one's work in like proportion that you endeavor to get from the commercial crop.

I believe that it might be interesting to know of the methods used at Mountain Lake, if only for their criticism, so, with your permission, I will outline each step, hurriedly, starting with the preparation of the ground. This same routine can, and is, used to advantage by the man who only plants a small area.

After thoroughly clearing, our ground is plowed with a tractor and three-disc plow, as deeply as six or seven inches, which will get most of that under-ground growth, called gopher-root. The roots that are thus exposed, are then picked up by hand, burned, and the soil thoroughly pulverized with the disc and the Acme harrow. Whether the land will need the second plowing depends on the condition after this final harrowing. One plowing is usually sufficient in our local sandy soil.

The next step is, to get the Bermuda, St. Augustine or other grass roots, that we have decided to use for our lawn. We

have found that the most economical way of digging these roots, is to have a one or two horse plow precede a crew of men armed with ordinary potato hooks, with which to turn the furrows and shake the loose soil from the plants, so that, with an additional shaking with a fork when loading on the wagon or truck, the grass roots are practically free from soil. The plants are then brought where they are to be planted and thoroughly watered, or, if water is available where the grass is dug, it is always advisable to wet them at once, although this adds considerably to the weight, in carting.

Whether the fertilizer to be used is commercial or barn-yard, can only be determined by each one, after considering the cost of each, availability and the needs of the soil. The soil which shows a good native cover crop, requires less of the organic matter than one that is barren and lifeless. If we should decide on the stable manure, and there is nothing better, it is a very good time to apply this, immediately preceding the planting of the grass roots, so that it can be plowed in with them.

There are several methods of planting that can be followed, greatly depending on the acreage to be covered. For the small area, a forked orange tree stake, a lath, both sharpened at one end, or a small hand plow, can be used, but for the large area, the old reliable mule and plow will give the best results.

The thickness in planting the grass roots, can only be determined by the results desired. One can skip a furrow or plant in every furrow, depending on how long he wants to wait for his lawn, or

how soon he wants to get through with his work. We plant in every furrow, tearing the roots apart so that they will cover as much ground as possible, laying them, practically, continuously in the furrow. The grass needs only to be covered, thoroughly, and I do not believe that there is any specific depth that could be recommended, although we try to cover the roots at least, two or three inches, running the plow only deep enough to hold the furrow.

After the grass is planted, the fertilizer, if commercial, is applied, the ground smoothed and rolled, this smoothing and rolling serving to mix the fertilizer with the soil. This last year, we applied a formula analyzing 4-7-1, derived from nitrate of soda and sulphate of ammonia, cotton seed meal, goat manure, Peruvian guano, super-phosphate and ground tobacco stems, at the rate of 1,200 pounds per acre, making a second application in sixty days of a smaller quantity per acre. On grass that was planted on August 15, we had a perfect stand by the first of December. There are, of course, different formulas, and one need only ask any reputable fertilizer concern, or their representative, for advice, to determine what to use.

In watering lawns, it is always advisable, as far as possible, to do this either in the early morning or late in the evening, when the heat of the sun is not nearly as liable to burn the wet tender grasses, as would be the case if the watering were done during the heat of the day. Then, too, the evaporation is less at these stated periods, than at mid-day.

If one wants the effect of a deep rich lawn, in winter, similar to some of the best lawns in the north in summer, Italian Rye seed, broadcasted on the Bermuda turf and covered lightly with a top-dressing of soil, will, in about two or three weeks, if kept moist, give you the results desired.

It has been stated in bulletins, and papers, previously, that a periodical renovating of Bermuda sod, is very beneficial, and in our experience, this statement has been proven. We try, about every two or three years, to plow or disc our Bermuda sod, judging by the condition of the grass to determine when this is necessary. This renovating is particularly necessary in our high pine land, where the grass is noticed, at the end of the period mentioned, to lose strength of growth. By turning this sod, a new and vigorous growth is invariably the result. A light application of fertilizer is very beneficial at this time.

In preparing our putting greens for the winter season, we mow them as closely as possible, to the ground, letting the cut-

tings drop. This is usually done by the first of November. We then fertilize them thoroughly and get them reasonably moist, following immediately with Italian Rye Seed and Red Top, the latter giving a much finer texture to the green than the Rye, alone.

Our hard work is then over, and all one has to do, is to mow, water and feed them regularly, and get them in such shape that no matter how badly a golf ball is putted, it will, ultimately, fall in the cup, which, believe me, is no small undertaking, golf players, as a rule criticizing everything about a green before recognizing their own errors.

It would seem to me, that the secret, if it is such, of getting a good lawn in Florida, is the same as in the north. One would not think of planting a lawn, there, without first applying, liberally, an application of stable manure if nothing else; and here, in God's country, we surely need to give the same care and attention to one of the finest and most beautiful landscape features, possible—a well kept lawn.

Moisture Retaining Properties of Different Soils and Its Relation to the Growth of Grasses

John R. Van Kleek, Kenilworth Inn, Sebring

I deem it quite an honor to be asked to deliver a paper before the State Horticultural Society of Florida on this subject of the growth of grasses. However, I feel as I felt some six or seven years ago when I was employed at the State University of Illinois. I was an instructor with the Landscape Extension Department out there and was sent into various towns in the State to lecture on the beautification of schools, lawns, etc., where it was the custom in the rural districts to call any man who came from the University, "Professor." I was sent into a small town in the southern part of Illinois and got off the train loaded down with about 300 lantern slides, a traveling lantern and a suitcase. I found several people waiting at the station, including a reporter, and a fellow came up and said, "Have you seen Professor Van Kleek?" I said, "No, but my name is Van Kleek and if I can fill the bill I will be glad to do so." I feel tonight, with my short experience in Florida, the same way. I know that most of you, in fact all of you, have had more experience with Florida conditions than I have and no doubt you will want to hear the experiences of a professor and I can only give you the experiences of an instructor.

A little more than a year ago I began the construction of an eighteen-hole golf course at Sebring, Florida. You can imagine my consternation after leaving northern conditions of rock, clay and loam to be cast down upon the sands of Florida. I will tell you frankly that it had me scared and some of it still has me scared, but it has been one of the most interesting problems of my life to try to cultivate grasses on these sandy soils. Perhaps some of you do not know the section around Sebring. Sebring is in the central part of the State and is quite rolling. The majority of the soil is of a yellow texture which has been or which is now used for the most successful growing of citrus fruits. On the particular piece of land which I had to work (about 400 acres), we had five separate and distinct types of soil. The problem then was the growth of grass on these five soils.

Contrary to the common belief the construction of a golf course is purely a horticultural problem. There are some engineering features, such as the design and construction of locations for greens and the proper outlining of the fairways and traps, etc. Those are purely technical features and can be constructed from plans, and have really little to do with the

construction of a golf course. The real problem is the growing and the cultivation of young grasses for the playing surfaces of the golf course. There are two playing surfaces on the golf course, fairways and greens, that constitute two different and distinct problems; but nevertheless, the main problem is the growth and the cultivation of the grasses.

In the cultivation of the grasses the one thing that has come under my observation and the one thing that I think spells success or failure is the moisture retaining properties of the soil in the course. As I have said, we had five distinct types of soil at Sebring. One was the yellow sand common in the high pine land. Another was what a lot of us know as Rosemary scrub, and those of you who don't know Rosemary scrub I don't want to introduce you to it; it has no food value that I have been able to discover. The third soil that I had to deal with is from the bottom lands and it was a muck. The fourth type was a sand soaked type that, again, I don't want to introduce to anybody; and the fifth type was the salt and pepper sand which resembles the yellow sand in composition.

Well, for the first few weeks and months, I asked questions of everybody that I could talk to in Florida, and discovered that Bermuda grass was the type of grass best suited to cultivate for the fairways and greens. Hence, I started to plant everything in Bermuda grass. In the yellow sandy soil not previously under cultivation, and which had not been disturbed in the clearing, the Bermuda grass roots planted four to six inches apart with an ordinary amount of rolling,

fertilizer and natural rains, developed a very good and substantial stand of grass. On the other hand, in the same type of soil but formerly under cultivation in orange groves, the grass planted in the same way, with the same amount of fertilizer and water gave very little growth. That was due, I believe, to the stirring of the soil to a depth of six or eight inches giving a very loose condition which held no moisture. Also the water applied by hose would quickly disappear and hence the grass would not grow. The soil here was made to grow grass only under intense applications of water and with much rolling. It is my belief that the application of water and rolling brought the soil back to a firm condition and when that was attained we got the same results as in the soil that was undisturbed.

The second type was Rosemary scrub or white sand. For a long time I could not grow a sprig of grass although I used every kind of fertilizer anybody could sell me; used all kinds of manures. I made only a slight application of water. Finally I commenced pouring the water on during the latter part of the afternoon and evening and then I began to get a growth of grass. Now, here again was a case where without an intensive and extremely steady application of water we could get but little grass. The natural condition of this type is very loose and that in a way accounts for lack of plant food in the soil. At a later date I covered the entire fairway with a stiff muck. Even though the expense of the operation prevented a complete job, still this muck added to the loose sand helped to retain the moisture in the soil and produce a

good stand of grass. That soil today still needs lots of water and will never produce a good fairway until the Bermuda grass has so permeated the soil that the water will be held there in sufficient quantities to supply the natural needs of the grass.

Now, when we came to the bottom lands we had a good type of soil. It was a black sandy muck high in plant food. I planted the grass before the rainy season and to my utter consternation after the rain was over I had no grass. The water had completely killed out the Bermuda grass roots. I constructed ditches and lowered the water table and replanted, and still the capillary action was so great in this soil that it drew the water to the surface and killed the roots again. Afterwards I began making another tour of the State and found that the old residents whom I met had discovered the facts long ago and they depended on the native grasses. Hence, I am now depending on the native grasses under these conditions. Here too much moisture in the soil spelled failure for the type of grass needed.

In the fourth type of soil or sand soak, as many call it, there was no food left in it. At least I could discover none. On stirring this sand base the grass would grow up for a time but soon the soil would pack and the grass would die out. The only solution I found for that problem was over-laying with a loose sand. Here again too much water retained in the soil had spelled defeat for Bermuda grass. In the fifth type—a black and white or salt and pepper type—the same treatment as with yellow sand produced a very good growth of grass.

The foregoing discussion dealt with the fairways alone. When it comes to the greens the conditions are changed. Most of the greens are elevated and the grass desired must be of the finest possible texture. The soil is practically all brought to the greens and we can control absolutely the type of soils for them. We cannot, however, control the water table and have to water constantly. In my first construction of greens I followed the northern procedure putting on clay and muck and then top dressed with Moore Haven muck or a light woody muck that some of you know. I used some of the Moore Haven muck with some of the yellow sand and fertilized with about 150 pounds blood and bone to each green. The grass grew in great quantities and in magnificent quality but before long I discovered that my soil was too light. It took immense quantities of water to keep the grass in good condition.

I then changed my method of procedure, cutting out the clay because I discovered that it was too sandy for the needed use, and picked out a type of stiff muck that contained a sufficient quantity of vegetable matter in a sweet condition. I used about four to six inches of this muck on my greens with no clay and after that I had no trouble. It takes a very small amount of water during the golf season and during the season when we don't have so much playing it takes water two or three times a week to keep the course in perfect condition. In some cases commercial fertilizer alone was used in dressing the top. I had a peculiar case in front of the hotel. Between the hotel and the road, a space probably 60 by 200

feet, I gave a slight application of stiff muck, probably two inches in depth. Across the road in an area about 50x400 I did not put on the muck but I gave it the same application of commercial fertilizer as I did at the hotel. Now the Bermuda grass where I had applied the muck stayed green all winter, whereas the place across the road turned brown very quickly. (Some of you who know the situation no doubt discovered Italian Rye growing directly in front of the hotel in the area where muck had been applied. In my observation the presence of the rye grass was disregarded and the Bermuda grass alone was watched. The muck no doubt held the moisture in the soil, prevented leaching and produced a wonderful stand of grass.)

Now all this has to do with golf courses but the same principles apply to every lawn in the State. One of the big problems that I see in the State of Florida is that of lawns and the main problem with lawns is that of maintenance. If I should be asked to give my opinion of the landscape features of the State of Florida, not from the standpoint of the value of plants, but from the view point of a landscape architect, I would say that the maintenance item is the thing that has been absolutely forgotten. The man in his little home who has a lawn of 20x30 feet perhaps set out in St. Augustine, St.

Lucie or Bermuda grass, as the case might be, sprinkles on a little fertilizer once a year and then proceeds to forget it. Now I think the State Horticultural Society, from the viewpoint of a landscape gardener or architect, can do more for the State in its beautification by advocating good lawns than in any other way. The soil is the main problem. If one can get good stiff muck that retains moisture, 90 per cent of your problem is solved; then with a little common sense and personal supervision of the water supply and fertilizer we can have as fine lawns as exist anywhere in the United States. The putting greens at Mountain Lake, under the supervision of Mr. Linderman, who follows me, are the best I have ever seen in the South and I believe but few of the Northern courses have the equal. You would not believe this to be a fact, but Bermuda grass with plain muck, with proper top dressing, produces finer lawn grass than any grass produced in the North. This cultivation of grasses, of course, is a great thing. We all know that England has the best lawns in the world. There is only one thing that gives them this success—moisture in the air. We have a fair amount of moisture in the air and I believe the lawns of Florida can be made as fine as anything in this country by the proper preparation of the soil and application of water and fertilizer.

Little Known Plant Materials and Their Uses in Securing Tropical Effects

N. A. Reasoner, Oneco

Such a subject as "Little Known Plant Materials and Their Uses in Securing Tropical Effects" naturally needs some clarification. To my mind it falls naturally into three divisions.

First. General remarks on Florida Climatology—for without this we would be at a loss for a definition of the "Tropical" part of the title.

Second. Just what is meant by "Little Known Plant Materials"? To define this unknown I must first give the known, and I have therefore prepared a table of the commoner materials, with appropriate information thereon, which I will submit with this article but not burden you with just now. Following this I have prepared some information on the more neglected materials which seem to me to offer promise but have not as yet come into general favor.

And *Thirdly*, just what is meant by "Tropical Effects"? As we are considering this from the standpoint of the layman rather than the artist it will be sufficient to mention only the more important motifs such as the Palm Motif, the Color Motif, the value of fragrance, etc.

Having therefore defined and confined my subject let us pass to the true meat of the discussion. First, Florida Climatology.

Perhaps you have already heard the joke about the East Coast and West Coast Floridians who were arguing the respective merits of their own particular sides of the peninsula—but it happens to illustrate my point so I will tell it again.

The subject under discussion was mosquitoes.

"Why, they're so thick down in Dade County," the East-Coaster said, "that you can swing a pint cup around your head and catch a quart of them."

"That's nothing," replied the West-Coaster, "over where I come from they're so thick, and grow so big, you can't find room to swing the cup."

And just so it is with our climate. No section of the State wants to be out-done by any other in this respect.

"Why yes, just over the line in the other county they had a terrible freeze last winter; but it didn't hurt anything here. No, siree, this is the warmest spot in the State of Florida! Oh, yes, you'll see some dead ends on some of the trees where they were nipped a little but it didn't hurt them any. No, sir, *our* climate just can't be beat!"

Just such tales as this can be heard in any locality over the State; and the matter of accurate determination of damage resolves itself into a matter of one's own

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personal knowledge. It was this reason alone, combined with a desire to observe the damage to supposedly hardy species that led my father to tour the whole southern end of the State immediately following the freeze of '17.

From our thirty-eight years of experience with Florida conditions we have evolved the philosophy that there is *no* section of the State, at least on the main land, that is *absolutely* free from occasional frost. Of course there are some sections more free than others; some where, even when it does turn cold, it is only of short duration and seems to lack that stinging power it possesses farther north. So after all we are only *relatively* tropical, not *absolutely*.

How important this consideration must be to the landscape architect, can be readily illustrated. Suppose in his effort to secure a definite effect he has recourse to very tropical plants to sound the key note of his garden—either as to color or foliage. Supposing, then, one of our occasional freezes is so inconsiderate as to interfere and kill these tropical plants down to the ground. After all, he's worse off than he was in the beginning; for he has lost not only his plants but a year or more of valuable time. In considering plant materials it is well to remember then the only *relative* immunity from frost of most sections of the State, and make the backbone of the development at least relatively hardy. Nature has aided considerably in this regard by providing a large class of shrubs which while they may be killed to the ground by a hard frost, will yet sprout again from the roots, and thus may for practical purposes be said to be hardy. Hi-

biscus, oleanders, acalyphas, lantana, poinsettias, stenolobium, and phyllanthus will be recognized among this class.

Having given the matter considerable study, and finding it an asset as a ready reference, we prepared a rough map of the State a number of years ago showing the relative temperatures to be expected in various sections of the State and their comparative immunity from frost. Having found it helpful ourselves we are glad to pass it on, and a copy is being submitted with this report but it does not merit further attention here.

Having then finished our general remarks on Florida Climatology, the next consideration would be the relatively well known and comparatively little known plant materials.

In order to consider the little known materials it was first necessary to separate the well known, and to this end I have prepared a table covering seventy-five of the better known subjects with notes as to their common names, native habitat, color of flowers, blooming period, height, hardiness, and soil preference, and other remarks. This is submitted with this report but needs now no further attention. Conifers have not been included in this list, except for Casuarina, not because we are unaware of their many fine qualities, but because of the feeling that in a comparative tropical State like this with our wealth of broad-leaved evergreens it would be better to use distinctive subjects which can not be grown in other states. We realize the value, of course, of the conifer in the proper position, especially trees. It is the use of conifers in foundation plantings to which we wish to particularly take exception.

FLORIDA CLIMATOLOGY IN RELATION TO PLANTING

Area 1. This includes all western and peninsular Florida as far south, roughly speaking, as Hernando, Marion and northern Volusia counties as shown in accompanying map. The few southern counties of this area—those just mentioned—practically mark the northern limit of the citrus industry. There are scattered groves north and west, of the hardier types on hardier stocks, but they do not figure conspicuously in the industry. This region is especially adapted to the deciduous fruits that are suited to Florida planting as the Persimmon, Fig, Pecan, Peach, Plum, Pear, etc. It is true that most of the varieties commonly grown in Florida do splendidly even in south Florida, but generally speaking they reach their perfection in the northern sections of the State. You will note on going over the remarks on hardiness at the head of each department, to which we call your especial attention, that the * is used to indicate this relative hardness.

Area 2.—This is really more than "central Florida," as it covers all of the southern half of the State with the exception of a narrow strip of better protected territory on both coasts from Pinellas County around to Brevard, which widens out at the southern extreme to include Dade and Monroe counties, and a large portion of Lee and Palm Beach counties, all of which constitute Area 3. We leave the larger portion of the Everglade country in the second area as comparatively little is known as to just what

its climatic conditions may be and at some points there it has been colder on occasion than at many points farther north. Area 2 includes the bulk of the citrus territory as now understood, and also the most celebrated trucking centers of the State. Because of its unusual location, most of the plants we list can be grown successfully with the exception of some of the more tender tropical sorts, though even of these many shrubs may be grown, for even if the tops are killed down, they come right up and flower and fruit again.

Area 3.—Includes the more strictly sub-tropical area in which all plants are as near hardy as at any point in the United States. At the points farthest north, along bays and rivers where water modifies the temperature in cold weather very perceptibly, this area of comparatively safe planting of tropical material extends back from the water one or two miles, the strip widening as it extends southward.

On the information contained in this table, and on considerably less in some instances, most of the landscape work of the State has been done. It was in the effort to broaden this information, that this article was conceived, and the following paragraphs given.

Taking up the subjects in the same order as given in the table, first of all come the Palms. As will be shown in a later paragraph, the palm is one of the primary motifs in the tropical landscape, and certainly the one on which our northern friends lay the most emphasis. It behooves us therefore to pay particular at-

tention to the palms and to use them as often and to the best advantage possible.

First of all there is the *Acrocomia totai*, one of the handsomest of all palms, attaining a height of thirty to forty feet, and crowned with a magnificent head of graceful pinnate leaves. Its only drawback—and it is seldom indeed that we meet perfection in plants as we do in persons—is the fact that it is protected throughout, both trunk and leaves, with exceedingly sharp, long thorns, making it unsuitable for parkways and similar public uses. For the private estate, especially for creating backgrounds, it is, however, without a peer. But best of all it is comparatively hardy, being about as resistant as the *Cocos plumosa* and doing well up into the center of the State.

Another interesting item is with regard to *Archontophoenix alexandrae*, which I am told does well here in Miami. From our experience in growing decorative palms, it would seem that for large tub specimens it is much superior to the commoner *seaforthia*, although it is a trifle less hardy. It is a wonderful palm in the open ground too and deserves more attention than has been given it.

Arenga saccharifera, the Java Sugar Palm; *Dictyosperma rubra*; *Elaeis guineensis*, the African Oil Palm; and *Hypocephalum verschaffeltii*, a stubby-leaved orange-colored palm from Mauritius, are all magnificent tall-growing palms which should be planted extensively in the lower end of the State.

To come back to harder materials it would be well to call attention to the Giant Sabals, *blackburniana* and *havenensis*, hardy practically throughout the

whole State. Then, too, there is the *Phoenix sylvestris*, resembling the well known *Ph. Canariensis*, but lacking the extreme drooping habit of its leaves. It is of interest, too, for its picturesque trunk, slender with the boots remaining on the entire length. It is also interesting to note that it is a much faster grower on poor soils.

In the hardy dwarf palms it would be well to remember the Hardy Cocos of the *Australis* type, comprising several closely connected species, and the *Livistona Chinensis* or *australis*, formerly known as *Latania*. These are wonderfully decorative subjects and hardy throughout the State. The *Trachycarpus excelsa*, sometimes still called *Chamaerops*, has almost disappeared, and is now seldom encountered in nursery stock as it is such an extremely slow grower. An excellent substitute, and even preferred by some, is found in the native porcupine palmetto, *Raphidophyllum hystrix*, unfortunately quite rare too.

Passing from the Palms to the shade trees we are struck at once by the lack of variety in comparatively hardy evergreen subjects. In this southern section of the State you have a wealth of suitable materials, and it is peculiar indeed to note how badly this has been neglected in a section so richly endowed by nature and which has advanced so rapidly in other ways. Having as you do so many truly wonderful trees that can be grown no where else in the United States, it will be to your eternal discredit if you do not realize on some of these opportunities. And whatever you do, in all conscience give the Australian Pines a rest! Truly

it is a wonderful subject in its place, but the good Lord never meant it for every use under the canopy, which is about what you seem to expect of it. For sea-shore use where salt and poor soil must be combated it is without a peer—but that is about enough to expect of it!

What a pity three or four miles of the Dixie Highway from Palm Beach south could not have been planted with Bauhinias, world-famed for their orchid-like beauty, instead of the somber Australian Pines. Another section planted with Jacarandas; still another with the justly famous Silk-Cotton from Jamaica; another with the blood red Sterculia; or *Stenocarpus sinuatus*, the wheel of fire; or a number of other truly wonderful subjects. Had this been done you would have had a leafy tunnel, constantly changing, both from mile to mile and from day to day. Indeed it could have been so arranged that not a day would have passed without finding some section in full bloom, making it a true "Pathway of Flowers."

In the central and northern sections of the State much work must yet be done in searching for really distinctive subjects at the same time practically hardy. It is well to note the increasing use of the Silk Oak, *Grevillea robusta*, in the central portion of the State, especially the high, dry sand hills of Polk County, which is just the type of soil they appreciate. It is good to know, too, that these trees can now be obtained in large sizes, suitable for street planting, and doing away with a large portion of the delay in securing immediate effects. The Jacaranda is also coming into its own. About as hardy as the *Cocos plumosa*, it is being extensively

used in the central section of the State, and it will not be long until its wonderful sky-blue mass of flowers will be a common sight throughout the State during April and early May. It prefers a rather damper soil than the Grevillea but it must be well drained. The *Melaleuca leucadendron* should be mentioned also. It is commonly called Cajuput or punk tree, but really it isn't a "punk" tree but a very fine one, especially on low, wet situations not too cold. It is also salt resistant. We are doing quite a bit of experimental work in the effort to extend this list of harder shade trees and hope to be able to report additions, but we'll have to wait until we have a real freeze before we can report definitely.

In passing from the shade trees I should like to mention the *Callitris verrucosa*, or cypress pine of Australia, a truly wonderful conifer and hardy throughout the State, and growing well even in the poorest white sand ridges. Ordinarily it makes a broadly columnar tree up to sixty feet in height and branched all the way up from the ground. By a little trimming, however, it can be forced up as slender as an Italian cypress or it can be kept down into a low spreading, round headed tree, this adaptability making it very useful in landscape artistry.

Having spent so much time on the palms and shade trees, we will have time only for a hasty survey of the shrubs and vines before passing on to the consideration of the methods of obtaining tropical effects.

In the tropical shrubs we have again a wealth of materials, comparatively little known, and surely worthy of planting

TABLE OF COMMON PLANT MATERIALS

SCIENTIFIC NAMES	COMMON NAME	NATIVE HABITAT	COLOR OF FLOWERS	BLOOMING PERIOD	HARDINESS	SOILS	HEIGHT	REMARKS	
PALMS									
Cocos Plumosa	Plumy Cocoanut	Brazil	Yellow, Insignificant	Spring and Summer	Down to 26 degrees	Well drained	50 ft. or more	A very fine palm for street parking. Substitute for Royal Palm.	
Cocos nucifera	Cocoanut	Tropics	Yellow, Insignificant	Spring and Summer	Slight frost only	Light soils	40 to 70 ft.	Salt resistant. The common seashore palm of the tropics.	
Oreodoxa regia	Royal Palm	Cuba	Yellow, Insignificant	Spring and Summer	Slight frost only	Heavy, damp, muck	50 to 125 ft.	The finest of the palms.	
Phoenix canariensis	Canary Island Date	Canary Islands	Yellow, Insignificant	Spring and Summer	Down to 15 degrees	Medium	30 ft. or more	Has a leaf spread of 40 ft. or more, and hence demands space.	
Phoenix reclinata	Natal Date Palm	So. Africa	Yellow, Insignificant	Spring and Summer	Not much below frost	Good, well drained	Up to 30 ft.	Forms ornamental clumps by suckering from bottom.	
Sabal Palmetto	Cabbage Palmetto	Florida	White, Insignificant	Spring and Summer	Down to 15 degrees	Not too dry	25 to 40 ft.	Palmette. Good for street parkings.	
Washingtonia robusta	Cal. Fan Palm	Cal. Fan, Ariz. and Mexico	White, Insignificant	Spring and Summer	Down to 15 degrees	Not too dry	Up to 40 ft.	Palmette. Good for street parkings. "Thread Palm."	
TREES									
Cinnamomum camphora	Camphor Tree	China and Japan	Greenish yellow, Insignificant	Spring	Hardy all over Florida	Well drained	30 to 50 ft.		
Delonix regia	Royal Poinciana	Madagascar	Bright scarlet, showy	Late Spring ?	Slight frost only	Good soil	About 30 ft.	Handsome, rounded tree, low branching.	
Eucalyptus robusta	Swamp Mahogany	Australia	White	May	Down to 26 degrees	High and dry	Up to 125 ft.	Usually low branched, and very spreading.	
Eucalyptus rostrata	Red Gum	Australia	White	May	Hardier than above	High and dry	Up to 125 ft.	Tall and slender, very objectionable in neighborhood of sewer lines. Subject to blight.	
Grevillea robusta	Australian Silk Oak	Australia	Orange, brown and yellow	April	About like orange	High and dry	50 to 100 ft.	Very good for street planting, but drops some litter.	
Magnolia grandiflora	Southern Magnolia	So. United States	Large, white and fragrant		Absolutely hardy	Heavy, damp	50 to 75 ft.	Very ornamental, but slow growing.	
Quercus laurifolia	Laurel Oak	So. United States	Insignificant		Absolutely hardy	Practically any	50 to 75 ft.	Our commonest street tree. Miscalled "Water Oak."	
Casuarina equisetifolia	Australian Pine	Australia			Slight frost only	Practically any	50 to 75 ft.	Salt resistant, graceful tree, but overworked in South Florida.	
BAMBOOS AND GRASSES									
Bambusa argentea	Bamboo	Japan			Down to 26 degrees	{ Practically any, but must be well drained	35 or 40 ft.	The common small-clumped clump bamboo.	
Bambusa disticha	Dwarf Bamboo	Japan			Down to 26 degrees	{ Slight frost only	10 to 12 ft.	Dwarfer form used for screening.	
Bambusa vulgaris	Giant Golden Bamboo	Japan			Summer	Hardy	Up to 75 ft.	The common giant bamboo.	
Cortaderia selloana	Pampas Grass	?	Silvery white			Medium	4 to 6 ft.	Much used for its fountain-like effect.	
TROPICAL SHRUBS									
Acalypha mosaica	Acalypha		Green, yellow and red foliage		Slight frost only	Good, well drained	4 to 6 ft.		
Caesalpinia pulcherrima	Dwarf Poinciana		Red and yellow	Summer and Fall	Slight frost only	Good, well drained	6 to 10 ft.	Colors stronger in cold weather, stands trimming well.	
Duranta repens	Golden Dewdrop	Am. Tropics	Golden, golden fruit	Practically continuous	About 28 degrees	Good, well drained	6 to 10 ft.	Also known as "Barbadoes Flower Fence." Spiny.	
Euphorbia pulcherrima	Poinsettia		Fiery red bracts	Winter	Slight frost only	Must be rich	6 to 10 ft.	Somewhat subject to root knot.	
Hibiscus rosa-sinensis	Double Pink	China	American Beauty shade	Perpetual	About 28 degrees	Any good soil	4 to 8 ft.	Sheds its leaves in cool weather and must have other lower foliage.	
Hibiscus rosa-sinensis	Peachblow	China	Double light pink	Perpetual	About 28 degrees	Any good soil	4 to 6 ft.	{ The commonly used shrub for quick effects.	
Hibiscus rosa-sinensis	Double Red	China	Deep scarlet	Perpetual	About 28 degrees	Any good soil	3 to 5 ft.	Useful as hedge, mass planting, or single specimens. If frozen down, comes up again from roots. Must have good drainage.	
Hibiscus rosa-sinensis	Single Pink	China	Medium clear pink	Perpetual	About 28 degrees	Any good soil	6 to 8 ft.		
Hibiscus rosa-sinensis	Euterpe	China	Orange salmon	Perpetual	About 28 degrees	Any good soil	6 to 10 ft.		
Hibiscus rosa-sinensis	Single Scarlet	China	Rich glowing scarlet	Perpetual	About 28 degrees	Various	8 to 12 ft.	See other hibiscus.	
Lantana	Shrubby Verbena	Tropical America	Variety, except blue	Perpetual	Some frost	Light, well drained	4 to 6 ft.	Strong odor to leaves. Coarse shrubbery.	
Pbyllanthus niv. r. p.	Snow Bush		Pink and white var. foliage	Perpetual	Some frost	Good soil	4 to 6 ft.	Useful for low hedge.	
Plumbago capensis	Blue Leadwort	So. Africa	Sky blue	Perpetual	Slight frost	Good soil	4 to 6 ft.	Border and foundation planting.	
Phyllaurea	Croton		Red and yellow var. leaves		Slight frost	Good soil	3 to 8 ft.	Require sun for coloration.	
Tabernaemontana coronaria	Cape Jessamine	India	White	Except Winter	Slight frost	Good soil	5 to 8 ft.	Very dormant in winter.	
Thunbergia erecta		W. Africa	Dark blue, orange throat	Practically perpetual	Slight frost	Almost any	4 to 6 ft.	Border and foundation planting.	
Thunbergia erecta alba		W. Africa	White, yellow	Practically perpetual	Slight frost	Almost any	4 to 6 ft.	{ Stands full sun exposure well.	
Vinca	Periwinkle	?	White and magenta	Perpetual	Slight frost	Almost any	1 to 3 ft.	Profuse bloomer, good border.	
HARDY SHRUBS									
Abelia grandiflora	"Abelia"	?	White with pink base	April to November	Hardy throughout	State	Heaver		
Azalea indica	Indian Azalea	?	All shades except blue	Winter and Spring	Hardy throughout	State	Loose humus	4 to 6 ft.	Foliage metallic bronze color in winter.
Camellia japonica	"Japonica"	China and Japan	Pinks, reds and whites	Winter and Spring	Hardy throughout	State	Heavy loam	3 to 6 ft.	Absolutely no lime, acid soil.
Eleagnus reflexa	Silverthorn	Japan	Yellowish, insignificant	Late Summer	Hardy throughout	State	Various	6 to 15 ft.	Wonderful glossy foliage.
Hydrangea hortensis	French Hydrangea	?	Many shades	Summer	Hardy throughout	State	Heavy, rich	6 to 10 ft.	Gray green foliage.
Lagerstroemia indica	Crepe Myrtle	China and Japan	Carmine, pink, purple and white	Summer	Hardy throughout	State	Various	2 to 5 ft.	Unfortunately partly deciduous in winter.
Laurocerasus caroliniana	Carolina Laurel Cherry	Carolinias	Creamy	Spring	Hardy throughout	State	Lighter soils	6 to 20 ft.	Deciduous.
Ligustrum amurense	Amoor River Privet	Japan	White	Spring	Hardy throughout	State	Various	10 to 40 ft.	Wonderful glossy foliage.
Ligustrum nepalense var.	Var. Nepal Privet	Nepal	White	Spring	Hardy throughout	State	Various	6 to 15 ft.	Common hedge material
Ligustrum lucidum	Wax Privet	?	White	Spring	Hardy throughout	State	Various	6 to 15 ft.	Fine hedge, also good for individual specimens.
Michelia fuscata	Banana Shrub	China	Cream colored, fragrant	Spring	Hardy throughout	State	Various	6 to 12 ft.	Fine hedge, also good for individual specimens.
Myrica cerifera	Wax Myrtle	So. United States	Foliage only		Hardy throughout	State	Good soil	10 to 15 ft.	Can be kept lower by pruning. Slow grower.
Nerium oleander	Oleander	Asia Minor	Pinks, reds and whites	Spring and Summer	Hardy throughout	State	Almost anywhere	10 to 30 ft.	Salt resistant. Requires moisture.
Pittosporum tobira	Tobira Shrub	China and Japan	Creamy white	March	Stands some frost	Almost anywhere	6 to 15 ft.	Salt resistant.	
Rhapiolepis indica	Indian Hawthorn	India	Pinkish white	Spring	Hardy throughout	State	Good rich soil	6 to 10 ft.	Salt resistant. Good hedge, also specimen plants.
Viburnum tinus	Snowball	China	Creamy white, fragrant	Winter	Hardy throughout	State	Good rich soil	4 to 6 ft.	Extraordinarily slow grower.
Viburnum odoratissimum	Snowball	China	Creamy white, fragrant	Late Spring	Hardy throughout	State	Good rich soil	6 to 10 ft.	Very fine in North Florida, not so much in South. Well drained.
Warneria augusta	Cape Jessamine or Garkenia	China	White, fragrant	Late Spring	Hardy throughout	State	Good rich soil	6 to 20 ft.	Does well throughout the State.
VINES									
Allamanda Hendersonii	Allamanda	Guiana	Clear yellow	Throughout year	Some frost	No lime		Very subject to white fly.	
Antigonon leptopus	Pink Vine	Mexico	Rose pink	Spring and Summer	Slight frost	Various, damp			
Bougainvillea gl. sand.	Paper Flower	Brazil	Peculiar dull purple	Winter and Spring	Some frost	Well drained		Makes a fair shrub, too.	
Ficus pumila	Creeping Fig	Orient	Foliage only		Some frost	Various		"The Rosa de Montana."	
Gelsemium sempervirens	Yellow Jessamine	So. United States	Yellow, fragrant	Early Spring	Hardy	Various, damp		Clashes with most colors.	
Jasminum pubescens	Hairy Jessamine	?	White	Throughout year	Fairly hardy	Various		Fine for brick work.	
Lonicera sempervirens	Coral Honeysuckle	So. United States	Waxy scarlet	Summer	Hardy	Various		Choice, native.	
Nintooa japonica	Yellow Honeysuckle	So. United States	White to creamy yellow	Spring and Summer	Hardy	Various, damp		Also as a shrub. Profuse bloomer.	
Pyrostegia venusta	Flame Vine	Brazil	Orange red	Winter and Spring	Some frost	Various		Choice native.	
Tecoma radicans	Trumpet Creeper	So. United States	Orange red	Spring and Summer	Hardy	Various		Wonderful for roofs, pergolas and fences.	
Trachelospermum jasmin	Star or Confed. Jessamine	China	White, fragrant	March and April	Hardy	Various		Native, rather shy bloomer.	
MISCELLANEOUS									
Nephrolepis cordata compacta	Sword Fern	?	Foliage only		March and April	Hardy	Various	Fine glossy, thick foliage.	
Cannas	Indian Shot	?	Reds, pinks and yellows	Spring and Summer	Some frost	Heavy, rich, damp	1 to 2 ft.	The common border fern.	
Hemerocallis	Day Lilies	So. United States	Yellow and orange	Summer	Slight frost	Heavy, rich, damp	3 to 6 ft.	Useful for ornamental beds; bronze and green foliage.	
Hippeastrum	Amaryllis	Tropical America	Red	March and April	Hardy	Heavy, rich, damp	2 to 3 ft.	Very showy.	
Eugenia	Surinam Cherry	?	White	Spring	Heavy	1 to 2 ft.	Very showy.		
					Some frost	Good soil	6 to 12 ft.	Makes a wonderful dwarf hedge.	

throughout the whole southern end of the State. To mention only a few in passing, we have, of course, the Acalyphas in variety; the fragrant Artobotrys and Cestrum, not to forget the wonderful rose-pink Cestrum elegans and the orange Cestrum aurantiacum, which are not fragrant; the Assonias with their large composite heads of soft pink flowers, a single head making a nice corsage; then the Dendralanthus, with its intense blue flowers coming at the height of the tourist season; the Ixoras in both red and yellow; the charming Turk's cap, or Malvaviscus; the intense yellow Stenolobium or yellow elder, a true gamboge shade; and so on down the list. A truly wonderful variety, also sadly neglected for the better known Allamandas, Hibiscus, and oleanders.

In the hardy shrubbery, the havoc caused by the Federal Quarantine 37 will of course be noted, cutting off as it did the importation of azaleas and camellias from abroad and forcing the American nurseryman back on his resources. That he accepted this challenge, and won out with his usual ingenuity and enterprise, goes, of course, without saying, and it is interesting to note that there are two firms at least, possibly more, in Florida, that will shortly offer their own stock of these materials. Pittosporum, Laurel Cherry, Oleanders, Privets, etc., have of course been affected by this shortage in other lines but are now getting back to normal again. Just at present the only well known hardy materials which are hard to obtain are the sweet olive, Osmanthus fragrans, and the anise shrub, Illicium anisatum, and it is to be hoped

that some way of augmenting the visible supply of these two excellent subjects will be found.

As to notes on new subjects we would call attention to Eugenia hookeriana, Ligustrum massalongeanum, and Viburnum suspensum (also known as sandankwa), all truly magnificent subjects which we have obtained from California, and while they have not been tested as yet by a real freeze we believe they will be found hardy throughout most of the State. We have also discovered a Raphiolepis japonica, which is the equal or superior of the well known indica, and which grows five times as fast. There is considerable confusion, however, in the nomenclature, the ordinary indica being listed as japonica by some nurserymen, the obtaining of a stock of true japonica is, therefore, beset with difficulties. The Ilex paraguayensis, or the "yerba mate" of the Argentine, also shows promise and is being propagated for use as a hedge or the taller shrubbery. It will of course be entirely hardy. The native Myrtle, Myrica cerifera, and salt bush, Baccharis halimifolia, are being field grown too, as for some situations they simply "can't be beat."

In the vines it will be enough to pause a moment to bewail the comparative lack of interest in the wonderful newer species of Bougainvilleas. We do not, of course, under-rate the common glabra sandiana, as we are well acquainted with it from years of experience; but to mention it in the same breath with some of the newer species seems almost like sacrilege. By a great deal of work and experimentation we have worked up five of the new

species to a commercial scale, the colors ranging from a deep purple, through light purple, red, and pink, to the most intense and glowing crimson. There are two more forms on which we are working but have not as yet sufficiently tested out. It is interesting to note here the entirely different colors of the flowers in plants grown under glass—it would seem there is some slight variation also in individual specimens out-of doors. In general, however, the assortment of vines is more complete than any other class of materials. We must not forget, however, to mention the Brazilian Glory, with its scientific name of thirty-three letters, in spite of which it is a wonderful subject covered twice a year with a multitude of carmine-crimson flowers. Unfortunately it is comparatively tender, but if frozen down it will come up again from the roots.

Passing then from the notes on new plant materials, we come to the last and shortest division of my subject, the creation of tropical effects.

Tropical atmosphere is a difficult thing to define, for after all it is not based on things as they *are* in the tropics, but on what some people *think* about the tropics. In other words, a dense forest of trees with their branches so thickly interlaced as to make broad noonday only twilight beneath, would never be tropical atmosphere; even though it happened to be in the Amazon valley, broiling on the equator, and the trees were Bread-fruit or other tropical trees! What is called tropical atmosphere, at least to the northern mind, is best described in the works of

Jack London, Robert W. Chambers, or some other of our popular novelists.

"What then is tropical atmosphere," you will ask in despair? "You say it is not necessarily the natural growth of the tropics, and you illustrate it with pictures that never existed except in the mind of the author—in other words were only dreams!"

That's it exactly—"Only dreams!" Only such pictures as you dream of * * * the myriad leaves of waving palms * * * the great raw masses of color, not refined, not cultured, but primitive as man's inmost emotions * * * the teasing scent of strange perfumes borne on the tranquil breezes of the night * * * the glistening crescent beaches, bathed by a slowly surging sea, bluer than turquoise, more baffling than the sphinx * * * quiet * * * rest * * * ineffable ease * * * the far-off strains of distant music. * * *" This indeed is the tropic atmosphere, not real, perhaps, but then who cares for reality? The fantastic tissue of dreams, in that lies our tropic charm!

If, then, we are to create the tropic atmosphere we must emphasize the infinite variety of our dream subjects; must fill in our background with waving palms; must paint largely and with strong colors; provide if possible, a water view or the sound of a gurgling stream; must provide new and strange perfumes; and above all we must provide ease and accessibility, so that our tropical grounds shall indeed be dream places, filled with fairies, and far-removed from the rush and harshness of a busy world.

"How to create this atmosphere?"

More than I have given, I cannot tell you! Can the artist give directions for painting again his masterpiece, or can the glowing cardinal tell why he loves his mate? No more can I tell you. It is only something which we love and to which some of us have dedicated our lives. If we have some

small measure of success, it is not to us to whom credit should be given, but to Him who created these materials, the living pigments with which we work, and gave us the power and imagination, and even opportunity, to work with them.

Ornamentals Growing on the Lower East Coast of Florida

J. B. Donnelly, Palm Beach

The subject of my paper is Ornamentals growing on the lower East Coast of Florida. As I live at Palm Beach a description of the plants growing here will probably do for the territory between Fort Pierce and Cape Sable.

To mention all the ornamentals growing in that stretch of coast would make my paper rather lengthy so I will confine myself to such plants, vines, and trees as are growing in my immediate vicinity, and which can be grown, and probably are growing in several places along the coast.

Catesbia Spinosa, a very handsome evergreen shrub, with small, dark green shiny leaves, flowers pale yellow, drooping, lily shaped, branches full of small spines. The plant is very ornamental when in bloom and I think equally so, when covered with the seed berries which are pale yellow and resemble the fruit of the Kumquat. Grown from seed or cuttings. Common name, Thorn Lily.

Thunbergia erecta is a very satisfactory shrub, almost continuous bloomer, flowers tubular, dark blue with a rich orange and yellow throat, does best with me in partial shade; easily propagated from cuttings. There is a white flowering variety of this, *T. erecta alba*.

Eranthemum pulchellum, this is a soft wooded plant, particularly useful because it is a winter bloomer, from November to May. The flowers are a rich bright blue, very freely produced, easy of propagating from cuttings of young wood.

Plumbago Capensis, a splendid shrub, suitable for planting singly, making hedges, or for training on a trellis. The flowers which are borne in great profusion are of a pale blue color, propagated by off shoots from the base of the plant. There is a white flowering variety, but I find it a weak grower.

Murraya exotica, is a fine clean shrub suitable for hedges as it stands close shearing, it has small glossy green leaves and white, sweet scented flowers in clusters, followed by red berries which hang on for a long time. Planted out as a specimen it can be pruned into any desired shape. There is another variety, *M. paniculata* differing only in its fewer flowers and larger growth. These shrubs are now named Chalcas.

Hibiscus, of which we have about a dozen varieties are too well known to require any description. They are useful for planting as single specimens or for hedges, windbreaks, etc. They have to be cut back well every year to be kept in

bounds. They are easily propagated by cuttings and grow freely in almost any kind of soil or sand.

Jacobinia coccinea, a quick growing, soft wooded plant, easily propagated, fine foliage and tall terminal spikes of scarlet flowers. Good winter bloomer.

Tabernamontana Coronaria fl. pl. This is a very fine shrub with dark green leaves and large white sweet scented double flowers resembling *Gardenia florida*.

Stenolobium Stans (*Tecoma Stans*). This well known shrub I find if cut back in the fall will bloom freely during the winter, large clusters of yellow, tubular flowers; blooms profusely in the fall.

Bauhinias in variety. These well known shrubs are of easy growth and should be planted more than they are. They will grow in the poorest soil and some of the varieties can be had in bloom at almost any time of the year. *B. purpurata* is a winter blooming variety and its large, orchid-like flowers are much admired by visitors. Propagated by seeds.

Alpinia Nutans—Shell Flower. This plant is related to the Ginger, a very handsome plant requiring rich soil and plenty of water and a sheltered situation to grow it well. The flowers are in terminal drooping spikes, pink, and sweet scented. The plant resembles the "Ginger lily." Common name, Shell Flower.

Carissa arduina. This plant is a small leaved evergreen with double spines; flowers white, star shaped, sweet scented; berries dark red when ripe; they make a fine jelly. The bush is almost constantly in bloom.

Clerodendron pendulaflorum, a very ornamental plant or shrub when in bloom, the flowers are in pendulous racemes from the ends of the branches. Many flowered shrubs about six feet high and bushy. There are several other varieties of *Clerodendron*, all desirable plants.

Strelitzia—*Augusta* and *Reginae*. This is a magnificent plant resembling in growth the Travelers Tree (*Ravanelia*). The flowers of *S. Augusta* also resemble the flower of *Ravanelia*. The flowers of *S. Reginae* are orange and purple. They are called "Bird of Paradise flower," are hard to describe but are well worth seeing. Both varieties bloom at Palm Beach. They require rich soil and plenty of water. The plant belongs to the same family as the Banana. Propagated by seeds and sprouts.

Ravanelia, the Traveler's Tree. This fine plant resembles *Strelitzia Augusta*; its flowers are white, clustered in alternate boat shaped spathes. The plant grows fifteen or twenty feet high with a trunk resembling a palm. The seeds are covered with a blue woolly substance and are edible. A very striking and ornamental plant in all stages of its growth. There is considerable water stored in the large cup-like sheaths of the leaf stalks from which travelers are supposed to quench their thirst, hence the common name. Propagated by seeds and suckers growing from the base of the tree.

Pandanus, commonly called Screw Pine is a very ornamental plant. *P. utilis* grows to a height of twenty feet or more. The male and female flowers are on separate plants. The seeds grow in a large cluster resembling a pineapple of large

size and hangs on the tree for a year. *P. Veitchii* is an ornamental plant when young and is largely used as a pot plant. When planted out it makes a large specimen fifteen feet high with numerous aerial roots. When planted as a hedge or windbreak it is impenetrable in a few years. The leaves of all but one variety have spines along the edges and mid-rib. *P. Baptistii* is a smooth leaved variety with long finely variegated leaves.

Monstera deliciosa, an ornamental evergreen climbing plant, with curious perforated leaves attaches itself to a tree, house, or other support by its numerous aerial roots. The fruit resembles an ear of corn, with a delicious pineapple flavor and odor, propagated by cuttings of the stem. Another fine *Aeroid* is *Pothos Aurea* with large dark green leaves, striped and blotched with golden yellow, attaches itself to walls, trees, etc.

I don't know of any finer ornamental than a well grown specimen of the *Kumquat* (*Citrus Japonica*), with its bright green leaves and hundreds of golden fruit.

In colored foliage plants the *Croton*, I think, takes first place with its varied colors and forms. Some of the newer varieties are very fine planted out as single specimens, borders to walks, beds, or planted to cover unsightly places they are always attractive. They are also very effective when grown in pots or tubs, easily propagated from cuttings.

The variegated forms of *Aralia* and *Panax* are equally effective in groups, borders or pots.

Aphelandras and *Sanchezia* are also fine variegated plants.

Acalyphas in four or five varieties are largely used for borders, hedges or groups, etc.

Among the many vines growing here, *Thunbergia grandiflora* and *T. laurifolin* are I think the most satisfactory and beautiful. There is very little difference in these two varieties. They are continually in bloom. The flowers are light blue, about three inches across, and the whole vine is literally covered with them. It is a rampant grower and will cover a large space in one season. Propagated by cuttings.

Petraea-Volubilis is a very fine, hard wood twiner, with numerous spikes of blue flowers, blooms a couple of times during the year and is very attractive; a quick grower but rather difficult to propagate. The well known *Bougainvillea* is another fine hard wood climber. It is now covered with its purple bracts which makes it a very showy plant for covering arbors, porches, etc. The newer varieties are being planted largely. Their bracts are very attractive in color, brick red, crimson lake, etc.

Bignonia Venusta, "Flame Vine," is a very satisfactory vine of rapid growth, will cover houses and trees in a couple of years. It begins to bloom in December and continues for about three months. During that time it is covered with its large bunches of orange-red tubular flowers. There are several other varieties of *Bignonia* vines that are very showy and ornamental when in bloom.

Ipomaea Horsfallea Briggsii is a fine winter blooming vine of the Convolvulus family, with large racemes of crimson flowers and palmated leaves of shining

green. It has a large tuberous root and perennial—a very desirable vine.

Solandra is another desirable vine with large chalice like flowers of pale cream color changing to white. It is a strong grower, easily propagated. There are several other varieties.

There are many other desirable vines, winter and spring bloomers, such as *Solanums*, *Cryptostegia*, *Abrus*, *Rhynchospermum*, *Porania*, several varieties of *Aristolochia*, etc., that are easily grown and very beautiful when in flower.

Of palms we have the following varieties growing in the open ground without any protection and all doing well. *Cocos Nucifera*, the well known Coconut palm, bearing great quantities of nuts every year. *Cocos Plumosa*, and several others of this class. *Phoenix*, the Date palm; several varieties *Caryotas*; three varieties, *Arecas*; *Oredoxia regia*, the Royal palm; *Washingtonia robusta*, the California palm; *Latania borbonica*, *Thrinax Argentia*, *Pritchardea pacifica*, *Attalea cohune*, *Accrocomia totai*, *Hypophorbia Verschaffeltii*, *Seaforthia elegans*, *Martinezia Caryotaefolia*, *Sabal*, the palmetto; and several others.

We have two Cycads that do well here, *Cycas revoluta* and *C. circinalis*, that are very ornamental and make fine large specimens. Another Cycad, *Dioon edulis*, is a very fine plant, resembling *Cycas revoluta* but not having as many leaves.

In ornamental and shade trees there are a great variety, all making fine specimens in a very few years and nearly all of them suitable for planting in the territory mentioned. They seem to thrive in the poorest sand or rich jungle land

and on the rock ridges bordering Lake Worth.

Tamarindus Indica, Tamarind Tree, makes a wonderful growth, some specimens here being over thirty feet high, with a spread of fully thirty feet. A delicious drink is made from the pulp which surrounds the seeds.

Albizia Lebbec. "Whistling Bean," is another fine tree either for shade or street planting. When in bloom it fills the air with its delicate perfume.

Bombax Cebia is another fine tree, with buttressed roots and growing over forty feet high. It is commonly called "Silk Cotton Tree," and is very tropical in appearance.

Grevillea robusta, Australian Silk Oak, grows freely here and stands the salt air. Small plants set out fifteen years ago are now fully fifty feet high, with a trunk diameter of eighteen inches, two feet from the ground. In the spring the branches are covered with orange yellow flowers in large bunches. A fine tree for street planting.

Many varieties of *Eucalyptus* grow well here. Some fine specimens planted about fifteen years ago can be seen on several of the streets of West Palm Beach.

Poinciana regia, is so well known on the lower East Coast that it needs no description. When well grown it makes a tree forty feet high and wide spreading, covering over fifty feet with a dense shade. When in bloom it is a magnificent sight, covered with large bunches of scarlet flowers. Have known tourists remaining here to see the tree in bloom and take photographs of it.

There are about a dozen varieties of *Ficus*, Rubber Tree, growing here, nearly all, fine shade trees and suitable for street and road side planting. *Ficus altissima* makes a magnificent tree in a few years and is, I think, the finest of the species. *Ficus eburnea* is also a fine variety and a quick grower. *Ficus pandurata*, "The Majestic Rubber" has very large leaves, but is of slower growth. As a single specimen on a lawn it is very effective. *Ficus Nitida* is the best variety for street or roadside planting; it is a quick grower, gives a dense shade, has dark green, small leaves and is in every way a fine tree for the purpose named; it would also make a splendid wind break. A cutting of this variety about the size of a lead pencil was sent to me by mail some fifteen years ago and is now a tree thirty feet high, of compact growth, with a spread of the same dimension.

Achras sapota, the Sapodilla, is also a clean evergreen tree of slower growth than the Ficus but makes a very handsome shade tree.

Jacaranda Mimosafolia is a lovely shade tree; the leaves are finely pinnated like the Poinciana. The numerous flowers come in long erect panicles of a lovely shade of blue. It should be largely planted in South Florida. It is the most ornamental tree I know of and admired by everyone who sees it in bloom.

Casaurina equisetifolia, Australian Pine, so called, but it is not a pine. This tree is largely grown as a shade tree or windbreak along the lower East Coast; it seems to thrive under any conditions and stands the salt air well. It is largely used in making hedges. It grows very

fast. I have known them to grow ten feet high from the seed in one year. The wood is hard and takes a fine polish. It makes splendid fire wood and should be largely grown in waste places for this purpose alone. I find that this wood lasts longer than pine, it is not what would be called an ornamental tree, but for the uses mentioned it is the best. If cut back it branches better and makes a fine street tree.

Parmentiera cerifera, the Candle Tree. This is a curious tree bearing large white flowers and long waxy yellow fruit resembling candles. The fruit is said to be edible, but I have not tried it although I had a crop of "Candles" last year.

Kigelia pinnata is another curious tree. It bears large trusses of tulip-shaped flowers followed by a crop of sausage-shaped fruit. It is commonly called "Sausage tree."

Spathodea palmata, *Parkis africana*, *Heritiera littoralis*, are all fine, tall growing trees raised from seeds sent me from the Philippines.

Aberia Kaffra, a dense growing thorny tree bearing golden yellow fruits resembling a miniature apple.

There are many other available plants, vines and trees suitable for planting along the lower East Coast, but I am afraid my paper is already too long to enumerate any others. I see no reason why there are not more ornamentals planted. They grow with very little care and are easily procured from nursery men at reasonable prices, and one can always get cuttings from a friend or neighbor who have plants growing. The poor man can grow a tree, shrub or vine as

well as the rich man if he is only inclined. Besides planting his grounds with desirable trees, etc., it makes his place more attractive and valuable. In conclusion I may add that all of the trees, shrubs and vines mentioned in this paper, and many others, have been planted by me and are growing on the property at Palm Beach which I have had charge of for the past eighteen years.

I would like to call the attention of real estate owners, promoters of sub-divisions, Rotarians, Good Roads Associations, and Women's Clubs to the dreary stretches of roads along the East Coast

and other parts of the State. What a vast change could be made in their present appearance if there were trees and shrubs planted along the road sides, and there are trees and shrubs to be found suitable for the different soils. What a pleasing change it would be to the home-seeker or tourist in a few years, compared to the present uninviting conditions.

I would like to see some concerted action taken by these organizations to have these dreary road sides improved by planting suitable trees and shrubs and caring for them until they were established.

Recent Development in Sub-Tropical Horticulture

W. J. Krome, Homestead

The Committee on Avocados and Sub-tropical Fruits, in arranging its portion of the program for this session, has endeavored to present to you information showing the development which has been made in the culture of sub-tropical fruits in various sections of our State in a commercial way, as well as the most recent technical data relative to the propagation of such fruits and the control of the diseases and pests which may infest them.

Our program deals largely with the Avocado because its culture in Florida has become more general than that of any other sub-tropical fruit and information of both a commercial and technical nature regarding it is more sought after.

During the past year there have been developments which are of great interest to the Avocado grower. A number of new and very promising varieties have been fruited and some of the older varieties have shown faults which were not fully anticipated. Seedling Avocados, grown from the seed of fruit of the Guatemalan type produced in Florida, have begun to bear, and the fruit produced by these trees has given an entirely new trend to varietal propagation.

Henceforth three distinct races of Avocados have been recognized. The Mex-

ican, which is hardy and produces fruit of fine flavor but so small in size and of such poor shipping qualities as to be hardly worth consideration as a commercial proposition; the Guatemalan, a race which provides varieties fairly cold resistant, prolific and bearing fruit of fine eating and shipping qualities but in many cases of too small size to meet the requirements of our Eastern markets; and the West Indian race, upon which the commercial culture of the Avocado in Florida has been founded and which still furnishes practically all of the fruit which is shipped out of this State. Occasional natural hybrid varieties have been brought to the attention of propagators, but heretofore these have been crosses between the Mexican and Guatemalan types. In their natural environment there has not been much opportunity for crosses of the Guatemalan and West Indian Avocados to occur, as the two races are seldom found in the same locality. But in Florida we now have West Indian and Guatemalan Avocados growing in close proximity, often blooming during the same period and, from the natural crosses which seem sure to result, we are quite likely to obtain, by selection, varieties combining the good qualities of both par-

ents and better adapted to Florida conditions than either. Several Guatemalan seedlings of Florida origin have borne fruit during the past season and in each case this fruit has been neither straight Guatemalan nor West Indian but has shown unmistakable evidence of being a cross of the two types, having some qualities superior to that of either parent.

This winter and spring, for the first time, Guatemalan Avocados have been placed on the northern markets in quantities sufficient to permit some idea being formed as to the reception which the consumer is going to give this fruit. At any rate enough have been shipped to make it evident that all markets do not value the Avocado alike. When Avocados sell in one city for \$42.00 per crate and in another only a few hundred miles away at \$10.00 per crate, for practically the same grade of fruit, as has been the case this season, it is apparent that neither market is giving the product its proper rating. However, while prices varied greatly, the fact that all offerings met with a ready sale, has been very encouraging to the producers.

Ranking next to the Avocado in importance, at the present time, we may safely place the Mango. That this delicious fruit has not been more heavily planted and has not reached a position commercially more prominent, has been due almost wholly to the indifferent bearing qualities of the finer varieties. Such fruit as is produced by trees of the Mullgoba, Haden, Amini, Paheri and several other of the East Indian type of Mangos, would have brought about the planting of thousands of acres and would have firm-

ly established the fruit as one of the most sought-after of all of our Florida products, were it not for the unreliable fruiting character of these trees, which so far has kept commercial Mango culture on about the same basis as lottery playing. The Bureau of Plant Industry of the United States Department of Agriculture has been working on this problem for a number of years and some of the results most recently obtained have been very encouraging. One of the papers to be presented at this session will give some interesting information along this line.

It has been heretofore accepted as a fact that Date culture on a commercial basis was limited in the United States to a few comparatively small, arid sections of California, Arizona and possibly Texas. That Dates could be successfully grown in Florida was not considered a possibility on account of climatic conditions, yet there now seems to be a fair chance that these conclusions have been in error and that this very profitable industry may be established on a commercial footing in at least one section of our State.

Dates have been produced on Key West Island and some of the adjacent keys for many years, but during the past decade the number of bearing palms has greatly increased and at the proper season ripe Dates are to be found on most of the fruit stands in the Island City. These facts have been brought to the attention of the officials of the Bureau of Plant Industry and some preliminary investigations have been made which, while not at all conclusive, are very interesting and encouraging.

The greatest obstacle in the way of Date culture in Florida has been the heavy rainfall and frequent dews during the maturing season of the fruit. The annual rainfall at Key West is hardly more than half of that at points on the southern mainland and there is said to be an almost total absence of dew throughout the period when the date is ripening. This opens possibilities for the fruit which may lead to the founding of an important industry.

A great many thousands of dollars have been spent in exploring the Date-growing countries of the Orient and in importing into the United States the offshoots of the finest varieties which are grown in those regions. These varieties are now grown commercially in the Coachella Valley and a few other sections of the West and the extension of the plantings is said to be limited almost wholly by the supply of offshoots available. These offshoots which provide the only certain means of growing the palms true to name, sell readily at from \$10.00 to \$20.00 each. During the past season the California Date growers have been able to market their first-grade fruit, after proper preparation, at from \$1.00 to \$1.50 per pound. When one considers that a full bearing Date Palm will carry an average of 100 pounds of fruit and that the processes of preparing this fruit for market are not more expensive than those required for most other similar products, some of the possibilities of this industry become apparent. Among the keys adjacent to Key West, there are thousands of acres of land which is too low in elevation above tide water to per-

mit the growing of any other fruit trees but upon which the Date Palm will thrive, for the Date does not object to somewhat salty soil conditions. The growers of Dates in California, to realize the best prices for their product must get it to our Eastern markets in advance of the best Dates from the Orient and this fact is apparently going to bar the commercial growing of some of the best varieties in that State. One fact brought out by the recent investigations by the Bureau of Plant Industry has been that the time of blooming of the Date Palms on Key West Island is nearly two months earlier than in California, with probably about the same difference applying to the season of maturity. The advantage of this would be very great to the Florida Date grower.

Unfortunately when the Date offshoots were brought into this country from Asia and Africa a serious scale was introduced, which has never been eradicated. If the industry is ever to amount to anything in Florida it would be a great mistake to burden it with this pest to begin with and it is therefore not advisable to bring into the State, even for experimental purposes, offshoots of the fine varieties which might otherwise be obtained from California. This will make any possible development in this State, slower of realization than would otherwise be the case, but the initial steps have already been taken and future results will be awaited with great interest.

Here, there and anywhere within our boundaries may be found men and women working with such fruits as the Litchee, the Papaya, the Anonas, the Guavas, the Carissa, the Jujube and a host of other

more or less exotic food plants. Little by little we are learning of what can or cannot be grown in sub-tropical Florida, and each one of these enthusiastic individual experimenters is doing a work of value for our State which should receive the utmost encouragement from the members of this Society.

Those of us who have lived here long enough have learned to use that phrase "waste land" very carefully when we apply it to areas within our own State, for we have seen many sections, which could be briefly described in that way with ap-

parent safety, become bountifully productive through the introduction of some new product or the application of new methods to the production of some old staple. It must be either a very learned or a very ignorant man who will make the unqualified assertion that any section of our State is hopelessly "waste land," for at any time some hopeless crank is likely to make his dream come true and bring into profitable production some plant which will turn that particular piece of wilderness into a garden.

The Avocado From the Investor's Standpoint

L. F. Flipse

The Avocado, peer of salad fruits, during its short history in this country has stirred the enthusiasm of its grower, has been favorably received in all the largest markets of this country, and has gained for itself an enviable position from the investor's standpoint.

This fruit was first discovered by the earliest Spanish explorers in Central and South America, and it has since been distributed around the tropical world. Never before its introduction to Southern California and Florida has it been grown under modern grove methods, and never before has it been marketed on a scale to have reached the proportions of an industry.

It is not unusual in the development of new sections of our country to find new and favorable locations for the growing of fruits well known and established in our markets, but it is very rare, indeed, to find a new fruit with all the qualities to create an unlimited demand that has never before been exploited on a commercial scale.

The topic assigned to me, "The Avocado from the Investor's Standpoint," in its discussion calls for a record of the past performance of the Avocado in South Florida, and of its fruits in the markets of our country. Will it pay the prospective grower to grow Avocados as

we grow other fruits in this State? Will he be rewarded financially for capital invested and labor expended in growing this fruit?

Fortunately, the Avocado has made some very conclusive performance records right here in South Florida upon which to base expectations as to the future success of Avocado growing. We have passed the experimental stage and have established some very vital and fundamental facts upon which to base our predictions as to the financial success a grower of Avocados may expect. Fortunately also, the fruits shipped to our markets have not only made records but have broken all records for returns on fruit shipments.

In all horticultural pursuits there are two main factors essential to the success of the undertaking, viz.: Production of the fruit under practical conditions; and market distribution of the product at a profit.

It would be ruinous to attempt to grow any fruit on a commercial scale in a locality where soil and climate or any other condition prevented the fullest development or interfered with the natural functioning of the tree; nor would it be practical to grow any fruit commercially where cost of land or cost of bringing the grove into bearing and maintaining it in

a healthy and prolific state were so great that even the best of returns could not show a profit on the investment.

The best and most conclusive evidence that we can produce the fruit under practical conditions in favored sections of South Florida; that our soil and climate and seasons of drought and rainfall are all congenial to the fullest development of the tree and its fruit, lies in the trees now growing in this section and the fruits they have produced in past seasons.

We have in Southern Dade County seedling trees twenty to twenty-five years old and budded trees nearly as old. Trees that have weathered our storms, overcame frost injuries, or suffered none; rested in our periods of drought, and rejoiced in our tropic rains and sunshine. For twenty-five years some of them have accepted our climate and weather in all its moods and just as nature makes it and they stand today beautiful and thrifty specimens with all the vigor of youth.

I doubt whether the Avocado trees of the same age growing in their native lands in South and Central America would much surpass our trees in size and vigor or in productivity. Some of these old trees have a spread of fifty feet or more and tower no less in height. Some of them are so large in girth that my two arms would barely encircle their trunks. Many of them in one grove about fifteen miles south of Miami, were broken almost to the ground during the severe storm of 1910, but undaunted and with renewed vigor have put on new tops and quickly regained their place with their more fortunate neighbors. These old seedlings have not only made a favor-

able showing in size and vigor, but have also been generous in the production of crops. It is not uncommon for some of these trees to yield fifty or sixty dozen fruits. From a group of almost a dozen trees, 4,200 fruits have been sold and perhaps many more were produced by the same trees in other seasons.

These facts as to trees now growing are brought to the investor's attention to show that the Avocado is at home in parts of South Florida; that our soil and our climate are congenial to the productivity and longevity of the Avocado; that we have passed the experimental stage of Avocado growing here; and that we have here the first factor essential to the success of Avocado growing—the right conditions for the practical production of the fruit.

The growth and vigor of the trees show that our soil and climate, our seasons of rain and drought are congenial to the fullest development of the tree and its fruit. Our past experience in growing Avocados demonstrates most convincingly that these sections of South Florida are natural Avocado sections; that we have a natural Avocado belt here just as truly as they have a peach belt about Fort Valley, Georgia; just as certain as there is a natural cherry section about Sturgeon Bay, Wisconsin. And just as has the Hood River Valley become famous for its apples, so will South Florida become famous for its Avocados.

The second factor essential to the success of Avocado growing is the profitable distribution or sale of the fruit. The returns on Avocados sold in all past seasons have been most gratifying. Prices re-

ceived by the grower from the time first shipments were made to this date are evidence of its popularity, and the demand for this fruit has made it the highest priced fruit on the American market to-day. Our budded varieties of Avocados have made records of sales, in individual cases, which, used as a basis for computing grove returns would run into figures to stagger the imagination.

The fruit from a grove in Southern Dade County consisting of 200 budded trees returned over \$800.00 to the grower three and one-half years after trees were planted. The next season the fruit was sold for \$1,200.00 on the trees. Then followed two lean years on account of frost injury to the tips and bloom buds. Last season the fruit from this same grove netted the grower over \$4,000.00.

It is not uncommon to sell budded varieties of Avocados at from \$10.00 to \$20.00 per crate of about three dozen fruits, and the usual range of prices of the later budded varieties, on the tree, is from \$2.00 to \$3.00 per dozen. The question that arises in the mind of the investor is, "Will the markets continue to pay the prices paid in past years?"

The prices of Avocados or of any other fruit are governed by the law of supply and demand, and the answer to the question of future prices resolves itself necessarily into a prediction. If demand keeps pace with supply or vice versa, if supply falls short of demand, if the present ratio of supply to demand is maintained, then we may expect no reduction in prices of Avocados.

We have in this country a very limited area in which this fruit may be grown

under practical conditions. We have, so to speak, a monopoly on the growing of this fruit commercially south of the line passing somewhere through the peninsula of Florida, a limited area at best, and an important factor in limiting the supply and maintaining the past ratio of supply to demand.

True! The fruit may be grown commercially in the nearby tropical islands, but it is also true that the fruits of these islands will not carry satisfactorily beyond our seaport cities, and even there does not generally arrive in satisfactory condition. Furthermore, this fruit is from seedling trees and does not come into season with our best varieties. The grower of Avocados here does not recognize competition of foreign Avocados.

But a few years ago the Avocado was practically unknown in the markets of our large cities. Its sterling qualities won for it immediate recognition of the public, and by a flavor all its own and its characteristic as a salad fruit, it has held its popularity. To some the first taste may be insipid, but a taste usually invites another, which grows into a desire for more. The Avocado with a favorite dressing is pronounced the most delicious of all salads. Once the taste for the fruit is acquired, the desire to satisfy the palate becomes almost a craving, accompanied by a readiness to pay almost any price for the fruit.

In the tropics where the Avocado is well known it is eaten and relished by all; there is no substitute for the Avocado. It is and will be in competition only with itself. It is unique in character and fla-

vor, a salad fruit, and as such is not effected by other or competing fruits.

Its popularity is assured whenever and wherever it makes its appearance, and regardless of other fruits competing for popularity.

A desire for an orange or an apple may be satisfied by a grapefruit or a peach; but a desire for an Avocado will be satisfied only by an Avocado or an Avocado salad. Is it not safe to assume that the palates of the masses of Americans will respond likewise as we grow more of the fruit and make it possible for more to enjoy it?

The sterling qualities of the Avocado have hardly been touched upon. Its food

value is comparable pound for pound with that of milk and eggs and meat.

It is unfortunate, indeed, that this wonderful fruit cannot be produced from coast to coast in quantities to supply the demand for food for the masses; for young and old; to nourish the feeble, and give energy to the worker.

The future of the Avocado and the probabilities as to financial success of its growers are so promising as to halt expression of candid opinion and it seems evident from analysis of conditions that from the investor's standpoint the Avocado offers possibilities never before equalled by any horticultural venture.

The Control of Insect Pests on the Avocado

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The Avocado is not attacked by as many enemies as cause damage to citrus fruits which have been longer established within our borders, nevertheless there are a number of destructive enemies which cause concern to the Avocado grower, and which must be reckoned with in order to successfully produce healthy trees so that they may produce a satisfactory crop of fruit. It is generally admitted that practically every fruit which is propagated commercially has one or more enemies bent on its destruction. At times growers fail to think about these enemies until their trees and fruit are attacked by them, and then it is generally too late to repair the damage done. It is very important for the grower who wishes to produce healthy trees in order that they may bear a satisfactory crop of fruit, to be ever on the lookout to detect insect infestation; to know something about the various destructive pests which may attack his trees and the measures which he may employ in order to effectively control them.

The purpose of this paper is to bring together briefly some information concerning some of the more destructive Avocado insects present in Florida, so that the grower may have some knowledge concerning them, and become better

acquainted with some of the insect troubles he may at times be confronted with.

For the most part the insect pests causing damage to the Avocado in Florida resemble greatly in habit and general appearance those which attack citrus fruits. Practically all of them are insects provided with mouth parts fitted for sucking the juices from the plant tissues. Such pests as scale insects, white flies and mealy bugs found on citrus trees are also to be found on the Avocado. It is quite possible that some of the insect pests at present found attacking the Avocado in Florida have been brought in. Others may be insects which have always existed here on some native vegetation and have adapted themselves to the Avocado. Hence as groves are being established in different widely separated sections, we may possibly find at times different insect pests appearing which gradually establish themselves on the Avocado. This condition is quite true of most newly introduced trees and plants. Then again, we may find sections in the State where the weather conditions prove more favorable for the multiplication of certain pests which do not thrive where the weather conditions are more adverse. This condition is evidenced by certain pests which thrive in groves situated on

the keys with the close proximity of water which greatly regulates the temperatures. Many insect pests are sensitive to abrupt changes in temperature. Hence we may expect to find insect infestations severe in certain localities where others prove less favorable to insect activity.

During the dry winter months in Florida, the Avocado is generally considered in a dormant condition. At this time of year various enemies are to be found attacking the Avocado which thrive under conditions of little rainfall and low humidity.

THE AVOCADO RED SPIDER.

One of the enemies which attacks the Avocado during the winter is the Avocado Red Spider, *Tetranychus yothersi* McG. In appearance it is not unlike most other red spiders which attack citrus trees. By examining the foliage carefully the red spiders will appear as mere red specks moving in every direction over the foliage when disturbed. It is very desirable for the grower to be provided with a suitable hand lens in order to be better able to detect and distinguish between the various pests he may come in contact with as many of the enemies are rather minute.

Trees heavily infested with red spiders appear in a comparatively short length of time under favorable conditions as if scorched by fire, the leaves turning brown and ultimately dropping. The over winter foliage should remain on the trees until there is sufficient new growth produced in the spring to take its place when normal shedding of the foliage will occur. Where the winter foliage is lost prema-

turely the result may be an abnormal development of the bloom, and a set back to the trees in their activity to sustain the proper set of fruit. The grower should watch his trees carefully and examine them frequently especially on the approach of dry weather in the fall, and when the red spiders are detected in numbers while the foliage is still green he should prepare to spray and not wait until the foliage has become browned and scorched.

Control.

The Avocado red spider may be controlled by spraying with the regular lime sulphur solution at the rate of one gallon to seventy-five gallons of water.

THE AVOCADO LEAF THrips.

Another enemy which may at times be seen infesting Avocado foliage is the so-called greenhouse thrips of the northern states, *Heliothrips hemorrhoidalis* Bouche, which attacks the Avocado in the open in Florida. This thrips resembles most other thrips in appearance, is black in color and about a millimeter in length.

The first indication of injury caused by this thrips is the production of pale colored areas to the foliage due to the extraction of the plant juices. These pale areas gradually run together as the work of the thrips becomes more in evidence over the leaf surface. Later the foliage assumes a brown color and appears scorched. Eventually the foliage drops prematurely as in the case of the red spider.

Control.

It may be controlled by using a spray of nicotine sulphate 40% at the rate of one gallon to nine hundred gallons of water. To this should be added four or five pounds of fish oil soap to each one hundred fifty gallons of the diluted spray mixture. The soap will cause the spray to spread more evenly over the foliage. If both the red spiders and thrips are present on the foliage, the two sprays of lime sulphur and nicotine sulphate may be combined, eliminating the soap. As both the red spiders and thrips carry on their depredations on the upper surface of the foliage, the spray should be primarily directed to that part of the foliage.

THE AVOCADO BLOSSOM THRIPS.

With the approach of spring various other insect activities present themselves. Before the bearing Avocado tree produces new growth, the blossom clusters arise from the terminal twigs or from the base of the year's growth. The bloom as it appears is attacked by a blossom thrips, *Frankliniella cephalicus* Craw. This blossom thrips is not the same which attacks citrus in Florida, however, it does not differ materially in general appearance. It averages less than a milimeter in length and in general color is a pale yellow. It was first recorded as taken from the native acacia-like plants in the mountains of Mexico and it is quite probable that it has found its way into Florida from that country.

The injury by the thrips to the bloom is caused by the feeding of the young and adults on the individual flower parts destroying many of them in the course of their depredations. As succeeding generations appear the adults deposit their eggs in great numbers in the stems and pedicles which bear the floral panicles and which hold the fruits as they set to the terminal twigs. These punctures which later become emergence holes for the young reduce somewhat the strength of the stems which bear the fruit. This condition is evident in such varieties as the Trapp, which naturally bear weak stems. The thrips do not attack the fruit.

Control.

It may be controlled by spraying with nicotine sulphate 40% at the rate of one gallon to nine hundred gallons of water with the addition of four or five pounds of fish oil soap to the diluted spray, which serves as a spreader.

THE AVOCADO WHITE FLY.

With the maturing of the bloom and the setting of the fruit new growth commences to arise from the floral racemes. As the new growth appears it is attacked by the Avocado white fly, *Trialeurodes floridensis* Q. This white fly is not unlike the species of white flies which attack citrus, it bears white wings and possesses a yellow body. It is however, somewhat smaller than most citrus white flies, and may be distinguished on the foliage in the pupal stage by the characteristic fringe which this stage possesses.

This white fly is usually more abundant in groves situated on the keys and stretches of land between the ocean and bay inlets along the lower east coast of Florida. This probably is due to the fact that the temperature registers more evenly in these localities. It is found, however, in varying numbers on the mainland and especially in nurseries on young trees in lath houses, where its activities are more or less protected and not greatly interrupted by the weather conditions.

The adults which appear in the spring of year emerge from the over wintering pupal stage clustered in great numbers on the lower surface of the older foliage. The adults deposit their eggs in great numbers on the new growth, the larvae which hatch from the eggs pass their existence on the lower surface of the leaves.

This species also produces an abundance of honey dew which accumulates upon the upper surface of the foliage and fruit. The common sooty mold fungus later develops in this honey dew deposit eventually giving the Avocado foliage and fruit a decided blackened appearance.

Control.

Where this pest is present in a bearing grove it may be controlled by spraying with the regular oil emulsion spray. Two sprayings will generally control the white fly, one during the spring after the fruit has set and the first general flush of new growth is sufficiently hardened, using a strength of one gallon to eighty of water. Another application should be made in the fall when the adult flies are for the most part off the wing and the foliage

is turning dormant using a strength of one gallon to seventy of water.

THE DICTYOSPERMUM SCALE.

At times various scale insects give the Avocado grower considerable trouble. One in particular is the Dictyospermum Scale, *Chrysomphalus dictyospermi* Morgan. In appearance it does not differ materially from a great many scales and resembles quite closely our common Florida red scale in shape and is a light amber in color.

Where this scale is present in a grove or nursery it attacks the twigs and branches, and where very numerous may often be found on the foliage. The branches attacked are gradually weakened and ultimately become of little use to the tree. The twigs and branches soon become roughened and crack considerably, thereby affording entrance places for various injurious plant diseases. As time goes on an infested tree shows a decided lack of lateral twigs and branches resulting in a badly formed tree.

Control.

The best time to control this pest on the Avocado is when the trees are dormant, usually from the middle of December until the first of February. The scale is readily killed by using an oil emulsion spray at a strength of one gallon to seventy gallons of water. Two applications of an oil emulsion spray at a three or four-week interval will control this pest.

PYRIFORM SCALE.

A scale which seriously attacks the Avocado in a number of localities is the Pyriform Scale, *Protopulvinaria pyriformis* Ckll. In appearance this scale is somewhat convex, pyriform in shape and of a reddish brown color. In the adult stage it possesses a cottony matter which projects about the margins of the scale.

The scale attacks the foliage. The immature scales migrate in the spring to the new growth as they hatch from the mature scales on the older growth of foliage. In the process of development on the foliage honey dew is produced in practically the same manner as when white flies are present and eventually sooty mold covers the foliage and fruit.

Control.

It is controlled by using an oil emulsion spray as recommended for the *Dictyospermum* scale. However, in this case the spray should be directed toward the lower surface of the foliage where the scales are found.

This in a general way gives briefly some information concerning some of the more important Avocado pests. There are, however, still others of importance about which little is as yet known, while there are still others of less importance. As our investigations along this line continue, information concerning these will be available.

Lastly, I wish to mention, that it behooves us in this early stage of the Avocado industry, to take full account of all Avocado pests and strive in every way to do our part toward controlling and eradicating such pests as we now have and to prevent the importation of those that exist in other places. Stop and consider what saving would have been accomplished in our various fruit industries, if the various destructive pests had not been introduced or had been eradicated when first introduced. In Hawaii the Avocados are badly infested with a fruit fly, and the commercial growing of Avocados, which otherwise would have become important, has been ruined. Such pests as the Mediterranean fruit fly, the West Indian fruit fly and others, as well as a number of very dangerous Avocado weevils, occur in a number of places where Avocados grow and we do not want in Florida. Every traveler coming from some foreign land is tempted at times to bring along some of the rare tropical fruits attacked by these various dangerous pests. Our laws are stringent on this point, but people are ignorant and we are constantly threatened with the possibility of the importation of dangerous pests. We should all be alert and watchful to aid so far as we can in preventing any such pests that threaten our various fruit industries from becoming established.

Spraying for Avocado Diseases

H. E. Stevens, Ft. Myers, Florida

Last year, in a paper read before this Society, I mentioned some spraying experiments for the control of Avocado diseases which the Experiment Station then had in progress. At that time it was too early to anticipate what the results would be. Today I wish to again refer to those experiments and give you the results that were obtained since this work was done in the Redland section of Dade County. I believe this information will be of interest to the Avocado growers of this section of the State or other sections where diseases of the Avocado fruit are troublesome.

If you will pardon a little digression, I would like to touch on the future possibilities of the Avocado in Florida, for a few moments. I believe that a substantial and profitable industry can be developed in this line, not only with the Avocado but with the Mango and other sub-tropical fruits that seem to be well adapted to culture in South Florida. This view is becoming more prevalent among our home folks and even the newcomer expecting to make Florida his home. This industry is yet new and few have gone into it in a strictly commercial way, but at the present time I find many people who are interested in developing plantings of this nature and I be-

lieve that the Horticultural Society can aid materially in fostering such a spirit and at the same time help to establish such an industry on a sound basis. There is a demand for information concerning these crops which can hardly be supplied from our present general store of knowledge. In any new horticultural enterprise the development usually moves slowly, but the time has now arrived when greater impetus should be given to finding out just what can be done with the Avocado and Mango in a commercial way, how these crops can best be handled and what prospects do they offer for the future. Is it a safe and sane policy to invest one's money in commercial plantings of this nature for the future? These are some of the questions that come to the beginner.

Personally, I am optimistic in regard to the future of the Avocado and Mango, and believe that the time is not far distant when these fruits will be as much in evidence on our leading markets of the country as the grapefruit is today. We do not have to go very far back into history to find the grapefruit regarded as a novelty, yet today there are thousands of acres in grapefruit groves and more acres are being planted each year. Why should this not apply to the Avocado and Mango,

within the next few years, especially in those localities where it has been demonstrated that they can be grown. We can not hope to grow Avocados on a commercial scale and sell them for fifty cents to one dollar apiece, and any one going into the industry with this in view, is apt to be disappointed. I do not think I am wrong in the supposition, however, that Avocados can be grown and put on the leading markets at a price that would tempt the average consumer and at a price that would give a fair return to the producer.

There are a number of things we must yet learn concerning the production of the Avocado and Mango before many persons will attempt plantings on a large scale. The soils and locations best suited for their culture; the best varieties to plant; methods of caring for the trees; kinds and amounts of fertilizers suitable for best results; disease and insect pest; available market and methods of marketing the output; are some of the questions that come to those interested in developing Avocado or Mango plantings for the future. We have a scattering knowledge in all of these subjects, but in some cases it does not extend beyond certain local limits. The beginner needs some more or less definite plan or set of instructions that he may follow with some degree of certainty.

The lower east coast has been the first to recognize the commercial possibilities of the Avocado here in Florida. Dade County has the largest commercial plantings in the State and probably the oldest bearing trees. There are two men in this

locality who have done pioneer work with the Avocado and Mango and they are largely responsible for what we know today in regard to the culture and varieties of these fruits best suited to Florida conditions. Mr. W. J. Krome and Mr. Geo. B. Cellon have contributed much to our knowledge of what can be done with these fruits in a practical way. It is here that the industry as such has started and other sections of the State naturally turn to Dade County for information. While this section is first in the production of Avocados and has demonstrated the feasibility of commercial plantings, there are other sections in South Florida where the Avocado and Mango can be grown equally as well. I believe there is just as great a future for these fruits along the lower west coast as there is here on the east coast. On the higher lands and the soils that can be well drained, I can see no reason why the Avocado and Mango can not be as generally grown in Lee County as they are in Dade. Lee County has a climate just as favorable, and a soil in many localities which I believe is better adapted to their growth, if the trees that I have seen thus far can be taken as a criterion.

At present our commercial plantings are few and of small acreages. The door yard plantings are limited to a few seedling trees and but little thought has been given to the Avocado and Mango as a commercial proposition in the past.

Now, however, the people are beginning to consider planting Avocados for the future and they are seeking all the available information on this subject.

We will have our problems to work out as we go along and in many cases can profit by the experiences of the Avocado growers in this section. If the industry develops in Lee County as I anticipate it will, this section should contribute something of interest to the Avocado industry in the future. I believe that by close co-operation and through a free exchange of ideas on the subject, much can be done to rapidly build up a permanent and healthy industry in the growing of subtropical fruits. We have a section of country peculiarly suited for such development, so why not take advantage of the opportunity.

But to return to the subject I am to discuss, "Spraying for Avocado Diseases."

There are three diseases of the Avocado fruit that might prove to be troublesome factors in the production of Avocados for commercial purposes. These are, Black Spot, Avocado Blotch and Avocado Scab. They are all fungus diseases and they were described and treated in the Annual Report of this Society for last year.

Black Spot and Blotch affect the fruit as it approaches maturity, making a worthless fruit for shipping purposes, and both of these diseases may be fore-runners of rapid decay. These two diseases are more common on the seedling varieties at the present time, however, Black Spot has been observed to occur on some of the budded varieties to some extent. Avocado Scab occurs on both seedling and budded varieties and this disease attacks the fruit during the early stages of its development. Scab does not affect the interior of the fruit but it mars the

outward appearance of mature fruits and severe attacks may cause a heavy shedding of young fruits or a stunted and misshapen growth.

As plant pathologist of the Florida Agricultural Experiment Station, I had made some investigation of these diseases for two or three seasons past to determine their causes and find some means of control. The preliminary experiments that we previously tried had shown little effect in controlling Black Spot or Blotch. In the spring of 1920 a definite plan of spraying was outlined and carried through the season, which took into consideration the control of each of these diseases. Our plan was to begin about the middle of the bloom period and to spray at monthly intervals over a period in which the fruits appeared to be more susceptible to these diseases. Bordeaux Mixture 3-3-50 or its equivalent was used in the first applications and the 4-4-50 formula in the last applications. The spraying was done with a power sprayer and spray guns. The object of this experiment was to determine the number of applications of Bordeaux Mixture necessary to control these diseases and the time they should be applied to be effective. The results obtained were very encouraging and I think demonstrate that each of these diseases can be controlled by proper spraying.

In the sprayings for Black Spot and Blotch thirty-six seedling Avocado trees were selected in a grove where the fruit had spotted badly during the past few seasons from these two diseases. The trees were large and from fifteen to eighteen years old. The trees were di-

vided into groups of four trees each and each group was treated as a separate unit.

Group 1 was sprayed four times during the season. The first application was made on March 23, spraying directly into the bloom. A second spraying was made April 21. The 3-3-50 Bordeaux Mixture was used in the first two sprayings. A third spraying was made on May 21, and a fourth on June 22, using the 4-4-50 Bordeaux formula, in the last two applications. The first part of August the fruits on these trees were examined and checked over for Black Spot and Blotch. Only 1.6% of the fruit from trees in this group showed slight attacks of these diseases. The infected fruits were found mainly in the tops of the trees and probably were not thoroughly covered with the spray material. A striking illustration of the effectiveness of Bordeaux Mixture in controlling these diseases was brought out by a single tree in this group. This tree had been observed for two or three seasons past and the fruit at maturity was always badly affected by Blotch and Black Spot. This season at the end of the experiment the tree was carefully examined and the fruits checked over, but not a single fruit was found that showed any indications of Black Spot or Blotch. The previous year fully 90% of the fruits on this tree were more or less spotted.

Group 2 received three applications of Bordeaux Mixture during the season. The first two applications were made with 3-3-50 Bordeaux, and in the third the 4-4-50 formula was used. These trees were sprayed first in the bloom,

March 23, again on April 21 and the last application was made on May 21. On the first of August when the fruits were examined 5% were found to be slightly affected with Black Spot and Blotch. The slight increase in the percentage of infected fruits in this case over those in groups 1 and 3 is probably due to failure to thoroughly cover the fruits with the spray solution.

Group 3 was sprayed only twice during the season with the 3-3-50 Bordeaux Mixture. The first application was made March 23 into the bloom, and the second on April 21; 1.2% of infected fruits were found on the trees in this group when the fruits were checked over the first of August.

In the following three groups the bloom spray was omitted and the first application was made after the fruit had set and the bloom had all disappeared.

Group 4 was sprayed three times during the season. The first application was made April 21, using 3-3-50 Bordeaux Mixture. A second application was made May 21 and a third on June 22. The 4-4-50 Bordeaux Mixture was used in the last two applications; 2.6% of the fruit on these trees showed slight infections of Black Spot and Blotch on August 1st.

Group 5 was sprayed twice during the season. First on April 21 with 3-3-50 Bordeaux and again on May 21 with 4-4-50 Bordeaux Mixture; 2.6% of the fruit of these trees showed slight infections of Black Spot and Blotch.

Group 6 was sprayed only once during the season. An application of 3-3-50 Bordeaux Mixture was made on April

21; 18.8% of the fruit on these trees were found to be affected with Black Spot and Blotch on August 1st.

Group 7 was sprayed twice during the season with 4-4-50 Bordeaux Mixture. The first application was made May 21 and the second on June 22. Sixty per cent of the fruit on these trees were found to be badly affected with Black Spot and Blotch on August 1st.

Group 8 was sprayed only once during the season with 4-4-50 Bordeaux. This application was made on May 21. On August 1st when the fruits were examined, 97% were found to be affected with Black Spot and Blotch.

Group 9 was not sprayed during the season and served as a check. The fruits were examined on August 1st and 84% were found to be affected with Black Spot and Blotch. Why the unsprayed trees should show less spotting than the trees in group 8, which was sprayed once, can probably be explained by the fact that two trees in this group showed a marked degree of resistance to these diseases.

In summarizing the results it will be noted that sprayings made in April and May were more effective in reducing the amount of Black Spot and Blotch. Where the April spraying was omitted the disease showed an increase following two applications of Bordeaux Mixture.

For the control of Black Spot and Blotch the bloom spray hardly seems necessary. It appears to me that these diseases can be controlled by two timely applications of Bordeaux Mixture, or three at most. The first spraying need not be made until the fruit is well set, probably

two or three weeks after the bloom has disappeared. A second spraying should follow three weeks to one month later and possibly a third spraying three weeks to one month after the second. I would advise the use of 4-4-50 Bordeaux Mixture which should be made of fresh stone lime rather than hydrated lime.

The above experiment will bear repeating and should be carried through a few more seasons before final conclusions might be drawn, but from the results obtained it seems to me that spotting of the Avocado fruit can be easily taken care of by timely and efficient sprayings. The lime sulphur solutions might work equally as well as the Bordeaux Mixture and they should be tried out along the same lines. I can see no serious objection at the present time, however, to the use of Bordeaux on the Avocado tree.

A similar spraying experiment for the control of Avocado Scab was carried along with the sprayings for Black Spot and Blotch. In each case the sprayings were made on the same dates and the same solutions were used. The scab spraying experiment, however, was conducted in a different grove. The trees were of the Trapp variety and were in their second or third year of bearing. Eight blocks of trees were set apart for this experiment.

Block 1 of ten trees was sprayed once during the season. An application of 3-3-50 Bordeaux was sprayed directly into the bloom on March 23. The fruits were examined on August 1st and 25% of the fruit on these trees showed slight scab infections.

Block 2 of ten trees was sprayed twice during the season with 3-3-50 Bordeaux. The first application was made on March 23 into the bloom and the second application on April 21. Six per cent of scab infected fruits were found on the trees in this block when the fruits were examined in August.

Block 3 of ten trees was sprayed three times. The first application was made on March 23 into the bloom and a second application on April 21. 3-3-50 Bordeaux was used in these two applications. A third application of 4-4-50 Bordeaux was made on May 21. The fruits on this block showed 9% of scab infection.

Block 4 of 15 trees received four sprayings during the season. The first two applications were made with 3-3-50 Bordeaux Mixture and the 4-4-50 formula was applied in the last two applications. The trees were sprayed first into the bloom March 23. A second spraying was made April 21, a third on May 21 and the fourth on June 22. Four per cent of scab infected fruits were noted on the trees in this block.

Block 5 of five trees was sprayed three times. The first application was made on April 21, after the bloom had disappeared and the fruit had set. The second application was made May 21 and the third on June 22. 3-3-50 Bordeaux was applied in the first spraying and the 4-4-50 formula in the last two. Nine per cent of scab infected fruits were found on this block. Through a mistake four of the five trees in this block were sprayed into the bloom during the March spraying and this prob-

ably accounts for the low percentage of scab noted.

Block 6 of five trees was sprayed twice. An application of 3-3-50 Bordeaux was made on April 21, after the fruit had set. A second spraying was made on May 21 with 4-4-50 Bordeaux. Twenty per cent of the fruit on the trees in this block showed scab infections.

Block 7 of five trees was sprayed once. An application of 3-3-50 Bordeaux was made on April 21. Sixty-three per cent of the fruit on the trees in this block showed scab infections.

Block 8 of 12 trees was reserved as a check and received no spraying during the season. Ninety-two per cent of the fruit on these trees were affected with scab and in a majority of cases the fruit was badly affected.

With the exception of block 7 all of the sprayings made in this experiment materially reduced the percentage of scab. I believe, however, that a convenient and effective spray schedule can be made up for the control of Avocado scab which need not include more than three applications of Bordeaux. The bloom spray seems to be essential and should not be omitted. In making such a schedule I would suggest that the first application be made into the bloom during the latter part of the bloom period. A second application should follow in three weeks to one month later and a third application in three weeks after the second. The 3-3-50 Bordeaux will be of sufficient strength to control attacks of scab on the fruit.

Behavior of the Guatemalan Avocado and the Chinese Mango in South Florida

Edward Simmonds, Plant Introduction Garden, U. S. D. A., Miami

In 1906 the Department of Agriculture introduced into Florida several Avocado seedlings of the Guatemalan type. Some of these were planted at the Miami garden amongst South American and Mexican types. In 1911 some of these fruited. Fortunately some of the seed were saved and planted; however, at that time there was very little interest taken in this type. The Trapp Avocado was planted extensively until the freeze of February, 1917, when it became apparent hardier types were necessary.

Attention was then directed to these Guatemalan seedlings, some of which had fruited and were thought to be hybrids probably crossed with the South American and Mexican types. The seedlings originating here will probably prove to be well adapted and represent a new type well suited to this section. Observations so far show their foliage, pollen and fruit suited to the climatic conditions here. One plant grown from a seed of the Winslow Avocado and fruited out by Prof. P. H. Rolfs, is already being planted. This is a free grower and so far fruits well.

The collection recently secured in Guatemala through the Department of Agriculture represent the best types to be

found there. These are established and some seem well adapted as to growth. Some of them grow well on South American stock and very poor on Guatemala; some do well on both, and some will not grow on either.

The Guatemalan race on its own stock appears so far to be ten days or two weeks later than the South American type in coming into growth in the Spring. It is generally observed at this time, the Guatemala will go very dormant in the winter. Trouble has been experienced in trying to run buds in the winter time.

A large number of Guatemalan varieties have been worked on their own type of stock at the U. S. Plant Introduction Field Station, near Buena Vista. Some are now in fruit and the next cold wave should prove if this is the proper stock for this race. Of course it must be remembered that these stocks coming from fruits raised in the old garden on Brickell avenue are probably hybrids. Some of these hybrids with their unusual vigor may prove better stocks even than pure Guatemalan or West Indian. With the interest the U. S. Department of Agriculture and the several responsible nurseries are taking in the Avocado culture, this fruit has a bright future.

With the resistance of the Chinese Mango blossom to the fungus trouble which sometimes occurs when these trees are in bloom and with the splendid growth being made on its own type of stock, it would seem that this type has a wonderful future for Florida. The early introduction in 1902 of S. P. I. 8701 under the name of Cambodiana, does not seem to have been planted extensively on its own type of stock, attention being directed at that time to the Mulgoba.

Later introductions in 1904 of S. P. I. 11645, which has been named the Saigon and of which several seedlings have been planted at the Plant Introduction Field Station on Brickell avenue, Miami, have shown promise of being worthy of propagation. Seedlings of this strain planted at the U. S. Plant Introduction Field Station, Buena Vista, Fla., in 1918, have made splendid growth on high pine sand.

It is interesting to note this type of Mango is well established in the Philippines under the name of Carabao, and in Mexico being called Manila. It seems to have become a favorite in all countries where it has been introduced; however, it has been learned that this type is not planted on its own stock on heavy clay soil in Cuba, but is generally budded on the East Indian stock. This would seem to indicate by its behavior here that this Mango prefers light well drained soil.

The fact that Florida climate suits the Mango from China should interest many in trying to get seedlings of this type established with a view of getting improved strains of this fruit. It is interesting that one of our leading growers have made a start with 400 seedlings of this Mango. It seems desirable at this time to develop this type, which may make Florida famous for this wonderful fruit.

Avocados in Polk County

L. D. Niles, Lucerne Park

The Avocado is undoubtedly the most promising fruit among those bidding for popular favor at the present time; it has overcome much skepticism and now appears in varieties that can be grown throughout most of the citrus section.

It is difficult at present to define the exact climatic and soil conditions most favorable to the Avocado tree, as the different races vary in their adaptability under local conditions.

Taking Polk County for our illustration, it has been demonstrated that as a commercial proposition, the West Indian race which comes from the moist lowlands and sea coasts of tropical America is much more susceptible to frosts than either the Guatemalan, which comes from the highlands of southern Mexico and Guatemala, or the quite hardy Mexican from the table lands of central and northern Mexico.

It is true, however, that there are quite a number of old, large West Indian seedling trees in Polk County, some of which were injured only in 1895. There are two at Frostproof, and others near Winter Haven. One seedling in Polk County measures 12 feet in circumference at 12 inches from the ground and is well over 40 feet in height. All must admit that this is quite a sizeable tree. I estimate the tree to be 40 feet in height.

On March 26, 1921, the tree was nearly through blooming and the indications were for a very light crop; in fact it has always been a shy bearer. While this undoubtedly proves that the West Indian will grow in this section we are satisfied the race is too tender for a commercial planting. However, when one takes into consideration the rapidity with which they renew their fruiting wood, it shows that if one takes the precaution to bank above the bud, even the tender varieties are practical for home orchard planting as they can renew their top and fruit again in two or three years.

Pollock and Trapp trees in our planting at Lucerne Park are fully as large today as before the cold of 1917, and some of them matured fruit last year; proving that they recuperate very quickly from cold injury. As the fruit is excellent and budded trees bear at an early age, a few of this race should by all means be planted near the house for home use.

To illustrate the precocity of the Trapp variety, the following is a summary of tree performance records of some trees at Lucerne Park. This block of Trapps was planted in April, 1912, and this summary shows the average yield per tree per year. In the year 1914 the average number of fruits per tree was 1.30; in 1915, 6.70; in 1916, 34.33. These trees

while injured in February, 1917, fruited again in 1920.

Concerning varieties, would say that after our experience with the West Indian race in 1917, as stated, we secured bud-wood of the best available varieties of the Guatemalan and Mexican races (including the Guatemalans introduced by Mr. Wilson Popenoe), with which we worked over most of our older Trapp and Pollock trees. We later planted a new test plat budded on three different stocks, giving us a total of over forty different varieties in our groves. Of these some ten varieties fruited in 1920 and thirty-six are holding fruit at present. Some of the results noticed in this test planting which as stated includes trees budded on three different stocks—West Indian, Guatemalan and Mexican, are very interesting; and in the course of a few years should be of value in determining the variety and stock best suited for this section.

I wish to emphasize the fact that some of the Mexican race, including seedlings, while not of commercial value, are most excellent for home use, ripening in summer and early fall, and being quite hardy, they are of great economic value.

This reminds me, everyone thinks of the Avocado as a salad fruit, but really, have you ever eaten an Avocado pie? Take a good Mexican fruit or fruits, according to the size pie you like, and tell the cook to make it like pumpkin or sweet potato pie. The combination is guaranteed to make an Avocado enthusiast.

Speaking of some of the odd results noticed with these varieties, I would like

to tell you the history of one of our trees. During March, 1917, a Pollock tree (injured in February) sent up two sprouts from the root stock. During April I budded one sprout with Taft and the other with Fuerte buds. They both lived and looked so promising that the Pollock wood was removed. Both buds made good growth and are now some sixteen feet in height. While both buds are on the same root system, each year the Fuerte has bloomed during January, while the Taft, on same root, has never started new growth until in March. Another point of interest is that the Fuerte bud matured fruit in 1919 and in 1920 and has a fair crop set this spring, while the Taft bud has not bloomed to date.

Regarding the hardiness of the different races and varieties, would say that we have both Mexican and Guatemalan varieties which withstood the cool spell of 1917, and are fruiting and growing very well today. Consequently exact data as to hardiness had best be left for a future report. At present there appears to be a marked difference in the first start of new growth and in blooming periods. This may be an important point to be taken into consideration later in connection with quality, quantity and favorable ripening season. The hardiness and vigor of the tree will be the important factors in choosing our most valuable varieties.

As previously stated, there are several stock experiments being conducted in this section which are showing some interesting phases. Personally, I believe the West Indian is one of the best and most vigorous growers on land which is suited

to rough lemon stock. By banking above the bud it is undoubtedly sufficiently hardy. We have found a few instances where Guatemalan buds on this stock seem to make an imperfect union; proving a point long suspected, namely, that we have still many things to learn concerning stock behavior.

So far the Mexican stock does not appear suited to this section, because as a rule the bud makes slow growth. Some may think there is contradiction in this statement as many Mexican seedlings here are very vigorous growers and bear heavily. It is, however, a well known horticultural fact that seedling trees, under favorable conditions, will usually make a strong growth. But this is by no means proof that buds from an apparently vigorous seedling will make satisfactory trees when propagated.

In connection with the question of stock there is one point which I deem of the utmost importance. Do not allow the tap root of the stock tree to become injured by being kept in a box or pot which will prevent the tap root from going where nature intended, namely, straight down towards a water supply. I consider this the greatest cause of failures with Avocados. Germinate the seed in a 5x5x12-inch box; and then transplant when the tree is some eight inches high. The tap root will be longer if you plant it where you want your future tree to grow and bud later. Handled in this manner your tree will prove more vigorous, withstand drought and winds and grow better than any root-bound tree can possibly do.

I realize this statement is treading very near some nurserymen's toes, but I wish to modify somewhat by saying that I refer to grove planting more particularly than to trees in small numbers for home grounds, unless one is able to bud them himself. Comparatively few have the tree knowledge to successfully bud Avocados, but for large plantings where best results are wanted the above method is entirely practical.

Would say in this connection that I have an Avocado planting where this method has been tried out and the trees show for themselves. When planted this way the tree will put down a deep tap root, the result being that it will withstand climatic changes much better than if shallow rooted. At first thought this method of developing groves seems more expensive than if handled in nursery rows, but it is more than offset by avoiding the shipping and handling of nursery trees later. Therefore I am confident groves could be developed by this method at less cost and ultimately have better and more uniform trees, for the *tree* is the thing we want. If you don't like its fruit, the tree, being vigorous can be top-worked to any desired variety and will be quite sure to fruit in two or three years.

In addition to the plantings referred to there are a number of commercial size in this section, perhaps the largest acreages being owned by Mr. M. E. Gillett at Eloise, Mr. Mackay at Lake Alfred, Mr. W. D. Carrier at Crooked Lake, and others, totaling perhaps 100 acres.

In cultivation, one of two methods should be followed. Either keep a dust

mulch from the day the tree is planted which will force a deeper root system; or use a mulch of organic matter such as leaves, compost, etc. This will bring feeding roots to the surface, and the danger is that, in a dry spell, unless mulch is very heavy, trees will soon show bad effects from lack of moisture. However, in well drained land, for the first two years after planting, an Avocado tree should have water in anticipation of its wants.

In propagating it would perhaps show wisdom to engage some one who has demonstrated his ability along this line (but perhaps you desire to do this part yourself), very well. Make sure your stock is in thrifty, vigorous condition; do not allow the stock to become too large and the bark to harden before budding, as under such conditions failure is almost certain. With the stock in proper shape, select budwood from the last growth (varieties differ, but usually best results are obtained from fairly mature wood), just before it is ready to start a new growth.

The actual manual performance of budding should be similar to shield budding of the citrus, either in form of a T or an inverted T. Personally I use the T, believing it will form a union nearer the ground. The bud being carefully placed in position, should be at once tightly wrapped with a strip of waxed cloth, covering the entire bud except the eye. Be sure and fasten the end of the cloth, as it is necessary to keep the bud wrapped for a longer length of time than with cit-

rus. After wrapping, judgment must be used to determine whether the stock plant needs the growth slightly checked by cutting away, say two or three leaves near the top of plant. This depends somewhat on whether propagation is in the open or under half shade.

Two weeks after the buds are inserted, depending somewhat on weather conditions, look them over carefully and if the bud is alive, cut off three or four inches of the tip of stock. In another ten days if found alive, judgment must be used in removing axillary buds from the stock, or perhaps taking out a half inch section of bark from the stock about one inch directly above the bud. This will usually force the bud into growth, at which time the waxed cloth must be loosened above the eye of bud; but do not fully remove budding cloth until growth is well started. A point to remember is, if stock growth is checked too heavily, the eye is almost sure to fall from the bud and all your labor is lost. After the bud has made its first growth and the wood is maturing, the stock should be cut back further, tying bud to stem of seedling and removing sprouts, thus forcing all growth to the bud. While dormant during the following winter, stake the bud and remove the seedling stub, covering the cut surface with grafting wax.

In conclusion would suggest that everyone in the citrus section should plant Avocado trees of each of the three races for home use at least; someone sometime will thank you for doing so.

Avocado Culture in South Dade County

E. R. Goldberg, Redlands

A great deal has been said about the Avocado and its culture in different parts of the State, as to climatic and soil conditions, and as to type and variety of this fruit.

Avocado culture has been growing in leaps and bounds for the past four years in Dade County, and has been retarded only through the shortage of nursery stock available for planting. Hundreds of acres of Avocados would have been planted if trees had been obtainable. I know of cases where trees were ordered one year in advance in order to get the desired variety. The reason for this, I believe, is a shortage of bud-wood for nursery work. Fruiting of different types and varieties of the Avocado has been carried on by the nurseryman only, so that when a certain variety was found worthy of propagation, the source of bud-wood was very much limited. I hope the time is not far distant when the individual grower will take it upon himself to be of some help along this line, and plant a few seeds of the different races and varieties. In this way he is not only helping the industry in which he is actually engaged, but will be helping himself financially.

Avocado growing in Dade County, from the growers point of view, is indeed a promising one. In making this state-

ment, I do not wish to infer, that we do not have our troubles in propagating this fruit. This, however, is only a natural condition and is one that confronts the grower of all fruits and vegetables.

I am going to give you a few facts taken from experience and observation during the past six years as a grower of this fruit. In doing this I shall confine myself to the district with which I am familiar—South Dade County.

The first question for the Avocado grower to solve is the land on which to make his planting. I would consider any land that is not subject to overflow, or land upon which water does not stand for more than two or three days at a time, as good Avocado ground. The Avocado is a gross consumer of this liquid, but also appreciates a happy medium. I have seen many Avocados destroyed in a very short time from stagnant water around the crown roots of the tree, and I would therefore regard land of this type with suspicion.

The type of land with which we have to deal in South Dade County, is of coralline origin, the rock coming to the surface and intermingling with a red clay soil. This soil is very shallow, which necessitates a preparation of the land prior to planting, for good results. This can best be done by scarifying to a depth

of not less than six inches. Where this method has been tried out it has given excellent results. The majority of the older plantings of Avocados in this section did not have any preparation of the land prior to planting. In a good many cases the tree stumps were not removed, and has proven to be a sad mistake and should not be repeated. Where no preparation of the land was made as stated above, the grower worked out a system of breaking the coraline rock from two to six feet around each individual tree during each year until the entire tract has been broken up. If this work is done in time, or in other words, if the root system has not been retarded to any great extent, the results obtained are very satisfactory.

The distance of planting the Avocado in grove form, should be given considerable thought, as in after years one may wonder just why he left so little room around his trees, in which to do the spraying, fertilizing and the harvesting of his crops. I would not think of planting any trees less than twenty-five feet in the row, and the rows the same distance apart, unless it was the kumquat. As the trees increase in size from year to year, one will find it very convenient to be able to drive down the middle of the rows without coming in contact with the branches of the trees.

Selection of the race and variety of trees that are to be planted is a question that is somewhat trying and often proves to be very expensive to the grower. A profitable planting will consist of trees that will fruit during different months of the year. The reason for this is plain when you consider that about 90% of the

Avocados grown in this section today are fruiting during the months of August, September, October and November.

We have two distinct races—West Indian and Guatemalan—from which to make selections as to variety. The West Indian race has been extensively planted in this county, and has been used as stock in the propagation of the Guatemalan varieties. The Guatemalan race of Avocados has proven to be more hardy than the West Indian, and no doubt will be used as stock in nursery work, if the supply ever exceeds the demand. But with Guatemalan Avocados selling from five to ten dollars per dozen, I see no relief in sight for some time to come, in order to use this race for nursery stock.

In making your selection of the varieties you intend planting it would be well to know if they are climatically suited to your location. This is particularly true of the Guatemalan race, as they come to us from their native home, from far above sea level. Mr. Wilson Popenoe, of the Department of Agriculture, tells us that he had found Avocados growing at an altitude of 8,500 feet. With this information I am not at all surprised at the behavior of some of these varieties when planted a few feet above sea level.

I hope that sometime in the near future the Avocado growers will get together and select a standard as to variety and to season of fruiting. This should be done for the benefit of the present grower, and more so for those who expect to embark in this enterprise.

The following varieties of Avocados have done exceptionally well in this sec-

tion, and I will class them as to season of maturity and race:

Pollock.—This is our summer fruit, maturing during the months of August and September, and is of very good quality. It is a large fruit weighing from two to three pounds, and is as a rule a shy bearer. This characteristic seems to apply pretty much to all varieties bearing large fruits. The tree is a vigorous grower, and of West Indian race. It has netted the grower some very good returns during the last two years.

Trapp.—This variety has been grown extensively in Dade County, for a good many years, and has been a profitable investment for the grower. Trapp is of West Indian race and is a fair grower and fruiter. We have found that this variety is not an even fruiter, being inclined to put on more fruit than it is able to take care of, and at the same time put on new wood for the next season's crop. This is indeed an objectionable feature, as the tree is very often completely defoliated, leaving no protection to the branches from the direct rays of the sun, and the result is a stunted tree, which takes as a rule a year or more to overcome, and of course the loss of the crop on such trees for that year. I have seen Trapps bear themselves to death during the first two or three years after planting. This can be overcome by thinning out the fruit each season until the tree is strong enough to carry its crop. But you will find that the average grower will not carry this out, as it is like pulling teeth to throw good Avocados on the ground. This variety is also very much affected by Avocado scab. I will not take up time

on this subject, as I think this will be brought out by other members on the program, but would like to say that if you insist on planting Trapps in South Dade County, I would advise that you place your order for a power sprayer at the same time, as you will find it impossible to produce marketable fruit without a system of spraying. I have also found that this variety has a small per cent of loose seeded fruit, the extent of which varies from year to year. This feature is not a desirable one, because the constant shifting of the seed in its cavity is no doubt responsible for the large percentage of decay which occurs while enroute to extreme northern markets.

Waldin.—The Waldin is a variety of the West Indian race, which was originated in Homestead, Fla., by Mr. B. A. Waldin and has a very promising future. This is a holiday fruit coming to maturity in November to January. It is a very good grower, and of good quality. The shape is oval, and is of good marketable size, having a tight seed and a tough skin. The tree seems to be more hardy than most of the West Indian race. During the cold winter of 1917 and 1918 this variety did not show any bad effects from the cold, while other trees of the same race (West Indian) adjoining the Waldin were badly frosted. Waldin is a good fruiter, coming into bearing at an early age. I consider this variety as one of our future leaders.

Taft.—The Taft belongs to the Guatemalan race, and it has been very much of a surprise to the growers of this section. It is a vigorous grower, making a very symmetrical tree. It is inclined to bush

rather than grow tall, as do most varieties of this type. Taft is a good fruiter, distributing its crop well throughout the tree. It is of good flavor and size, averaging in weight about one pound. It has a tough thick skin which will stand considerable rough handling, making it an exceptionally good shipper. Season February and March.

The Taft has been regarded with suspicion for various reasons, and in some sections I believe they have been well founded. The variety is a very poor grower in the northern part of this county, while with us it is the best grower we have. Taft does not come into maturity at an early age, usually the fourth year after planting. I am satisfied that this variety will be one of our standards.

Taylor.—This variety originated in Miami, from a seed that was produced in California. It is of Guatemalan race, and one of the best fruiters we have. While the fruit is rather small in size, I think its season of maturity—January to March—will more than off-set the disadvantage. The quality is not of the best, but fruiting at a season when Avocados are scarce, this variety will bring good returns to the grower for many years to come. The tree is a strong vigorous grower, having a tendency to shoot straight up as do the seedling varieties. The fruit has a small tight seed, and a thick skin.

Taylor trees planted in this section during the past three years have done exceptionally well, and I would certainly consider this variety in making a commercial planting of the Avocado.

Wagner.—This variety comes to us from California, and was produced from the same tree that gave us Taylor, being of Guatemalan race. Wagner and Taylor are identical in growth and foliage, while the fruit of these two varieties would hardly reveal their close relationship. Wagner fruit is almost round, and is much larger, weighing from 18 to 24 ounces. It is of good quality and flavor. This variety like Taylor, is an early and exceptionally good fruiter. I have seen Wagner grafts 14 months old, that were put into an old seedling stump, set a crop of fruit that would do justice to a three-year-old tree of ordinary fruiting qualities. Season of Wagner is January to March. This variety has not been planted to any extent in this section, being a recent introduction and having been fruited by Mr. W. J. Krome of Homestead, during the last three years. The color of Wagner is green with a thick brittle skin. Wagner has a good future as a commercial variety.

The above races and varieties of the Avocado are those found in grove form, and have been fruited sufficiently to determine their commercial value. There are a great many other varieties being tested each year, and as the list grows, we find the selection of a variety more difficult.

In setting the Avocado in this section, I have found that placing one-half stick of 40% dynamite in the center of each hole, at a depth of 15 inches, is of much benefit during our dry season. In using this system I would suggest that the hole be filled with small rock and then filled in with soil. In doing this your tree will

not settle below the surface and leave a pocket in which water would stand during the rainy season. I am a great believer in drainage for the crown roots of all trees, which necessitates the setting of your tree, from three to four inches above the level of the ground.

Fertilizing the Avocado is a problem to which many growers have given but little thought, and the results obtained have been very unsatisfactory. The Avocado is a gross feeder, and to do well must be kept in good condition at all times. I know of no tree that responds to good care as does the Avocado; on the other hand, you will find a neglected tree is very much a burden.

The source of plant food best suited to the Avocado is still a question in the minds of some growers. Personally, I prefer the organic mixtures, and have used these with very good results. I have seen Avocado trees upon which plant food from chemical sources was used, destroyed during the rainy season in this section. Avocados in the same district and at practically the same elevation upon which the organic mixtures had been used

for several years, came through without the loss of a single tree. I am not prepared to say as to what caused the damage in the grove where chemical sources of plant food were applied, but I will say, that it looks somewhat suspicious.

In fertilizing the Avocado, I have found that three applications a year, of two pounds each, and two pounds added for each year to each application, will keep your trees in good fruiting condition. The mistake is very often made in fertilizing the Avocado as to size; if you expect to have a planting of even stand and size, I would advise giving the small tree just as much plant food as the larger one, providing it be of the same age.

Mulching the Avocado has been practiced here to some extent, but should not be overdone. Trees that have a heavy mulch the entire year, are inclined to send their feeder roots into this, and as the mulching decays forming humus, it settles leaving these roots exposed. A light application of mulching is very beneficial, but strike the happy medium, as near as you can, for best results.

The Avocado and Mango on the Sand Lands of Palm Beach and St. Lucie Counties

John B. Beach, West Palm Beach

Mango and Avocado trees seem to thrive well on the sandy soils along the coast in Palm Beach and St. Lucie counties, as evidenced by many old Avocado trees six to eight feet in circumference, and 40 to 50 feet in height, and by Mangos less lofty, but running larger in girth.

The soils, where almost all of these old trees are found, are classified by the U. S. Soil Survey as various grades of St. Lucie sand, Palm Beach sand, and Gainesville sand. Nine-tenths of them are on the former, owing mainly to the fact that this alone has proven suitable for pineapple growing, and this was for many years the only form of agriculture in this region; all the dooryard trees were planted in it. The Palm Beach sand embraces what is locally known as "beach hammock," and lies on the ocean side. It consists of a good percentage of calcareous material, largely organic, with humus, mingled with silicious sand. The Gainesville sand is confined in this section to the so-called "red hammock," underlaid with rock, only occurring on the eastern shores of Lake Worth and Jupiter Island.

On Palm Beach sand the Mango does not seem to thrive so well, bears poorly, and is often troubled with a fungus

blight. Avocados, however, thrive, and make huge, productive trees. Where found on the Gainesville sand, both trees seem vigorous and productive, although there is sometimes a tendency to blight among the Mangos. Of the St. Lucie sand areas, that described as the "yellow sub-soil phase," where yellow or orange sub-soil appears near the surface, is the best for both trees, as is the case with almost anything else planted, either trees, pineapples or vegetables. However, little of the famous Pineapple Ridge in St. Lucie county has this sub-soil.

The other determining factor is the humus content. St. Lucie sand is described as pure silica, with nothing else but humus. In the absence of the yellow sub-soil phase, all depends on the percentage of humus. Hundreds of acres of old pineapple fields, which have been abandoned to grow up in Natal grass and weeds, and which we all hope will some day recover their former productiveness, are at present useless as well as unsightly, and all would be glad to see them producing Avocados. Mangos are easier started, and require very little fertilizer, but not being such money-makers, few care to plant them. We know from the big, old, bearing Avocado trees of the door-

yard plantings of the past 25 to 30 years, that the land will grow them, but it is a question of getting them started. I have talked with a number of people who have been trying this, and it is apparently mainly a matter of water. After the second summer they are sufficiently established to stand any ordinary drouth without need of watering, but faithful watering is required to bring them to this condition. Planting in a basin 12 to 18 inches deep, and at the same time mulching very heavily, seems to be of much assistance; and shading with slatted lath frames, with the top covered over with burlap, seems to be well worth the cost involved. This frame may be covered with old sacks, temporarily, if a frost is threatened during the first winter.

Planting the young trees in a young pineapple field, simultaneously with the pineapples, is a splendid plan, and works out beautifully, as has been often demonstrated with citrus trees also. Carroll Dunscombe, at Stuart, has some Trapp trees which were planted seven years ago in common St. Lucie sand (which is now well supplied with humus) among a field of young pineapples. They look as well as any trees of their age that I have seen anywhere in Florida, outside of custard-apple hammock. He reports them to be very productive, and they appeared to be setting a good crop when I saw them a few weeks ago. He is so well pleased that he plans to plant 50 to 100 acres this year, provided he can get the slips and trees.

In planting out old pineapple fields, it is often an open question as to whether it will pay. If you cannot plant out pine-

apples at the same time to help pay expenses, and provide the surplus fertilizer needed, it may still be worth the trouble and cost to get something growing on the old unsightly field. Avocado trees stand more cold than pineapples, and even if we did not have the old trees to prove it, we could safely assume that fields that had produced pineapple crops successfully would serve to support an Avocado grove, without danger of loss from that factor. L. C. Harbrecht on the north bank of the St. Lucie at Rio, has some very promising Avocado trees, mainly Trapps with a few Guatemalans, which he has successfully brought to the bearing stage, upon one of the highest, sandiest old pineapple fields to be found anywhere. He prefers Solano among the Guatemalans.

Water seems the great factor on these sandy ridges. At the residence of the late John Sorensen of Jensen, there is a row of seedling Avocado trees, planted many years ago, as evidenced by their size. One stands close by the well, and rises to the full altitude of the 50-foot windmill tower, and is easily 50% bigger than the one which comes next to it, and is 20 or 30 feet farther from the well. This apparently tells its own story.

In a grove I am planting a mile west of the shores of Lake Worth on "fine St. Lucie sand, yellow sub-soil phase" (as described by the U. S. Soil Survey), I have this clearly demonstrated. It is an old abandoned orange grove, which was destroyed by fire some years ago, and has been cleared 18 or 20 years, and until I acquired it recently, had been swept pretty regularly by fire every year. One tree,

close to the negro cabin where the family washing is done, is now three times as large as any of the rest, all having had equal advantages of water and fertilizer, aside from the weekly wash water.

Avocado planting on the flatwoods west of the coastal ridge is of course in its infancy, owing to the fact that little of it has been drained even four or five years, and little of that has been drained perfectly for that length of time. However, it looks very promising, so far as we have seen, not only for Avocados, but citrus stock as well. There were 50 Avocado seedlings planted four miles west of here

(West Palm Beach) about eight years ago. They were planted on ridges to keep them out of the water, and have been subjected to frequent inundations at intervals ever since. When about three years of age we had a 15-inch rainfall in 24 hours about August 1st, and water stood within a foot of the top of the ridges for two weeks. This only killed four out of the original fifty, and the others are alive today, and as thrifty and productive as could be expected of trees that have never been properly fertilized or cared for.

Shipping and Marketing the Avocado

Hamilton Michelson, Miami

Before proceeding with my subject I wish to state my pleasure in being associated with the Florida State Horticultural Society. Last evening was my first opportunity of attending such a meeting and I wish to state that the discussions presented, represented to my mind no little food for thought. This formation of thought will produce but one result, and that is a crystalization of the thought formed, and the Horticultural Society deserves the strongest support from every community in the State. The subject which has been assigned me—The Shipping and Marketing of Avocados—is of interest to the entire State and especially to Dade county, where the fruit grows to perfection in size and flavor.

The value of the Avocado as a food is equal to that of meat or milk, as the better varieties contain about 20% of vegetable fat; and the most delicate person can partake of them with relish. However, in the North, the Avocado is eaten mostly by the well-to-do classes as its scarcity puts it in the class with luxuries.

Owing to the peculiar nutty flavor the average person does not take to it readily. The taste must be acquired. This accounts to a large degree for the difficulty in marketing large quantities of the fruit. At the present time a hundred carloads of grapefruit and oranges can be sold

where one single crate of Avocados can be disposed of.

We who know the value of the Avocado, feel that it is but a matter of time when the fruit will be as popular, and in as great demand, as the citrus fruit. Systematic advertising is all that is required. This systematic advertising has long since been acknowledged as the making of any article of value. Take the concerted advertising of the California raisins. A few years ago it was impossible to find a market for the small quantities produced; now, after a few years of advertising, all the wine grape vineyards are being converted into vineyards of raisin grapes. Hammer it home, as it were, and your task is accomplished. This same condition existed with the California walnuts. The Avocado is just as nourishing and very much easier digested than either the raisin or nut and is extremely appetizing.

Speaking of appetizing brings to mind an experience which I had some years ago when a brother visited me from California. After giving him a sample of the fruit he replied to my inquiry as to how he liked it: "Well, to be perfectly frank with you, I never tasted anything that resembled Octagon soap more than does this fruit." He further remarked, "I would not give you a dollar for all the Avocados in Dade county." Now he has

me ship them across the Continent to him. We hope the day is not far distant when the Avocados will be taken out of the luxury class and be regarded as a staple, throughout this country as it is in the tropics.

The methods of handling the Avocado are of great importance on account of the extreme delicacy and perishable nature of the fruit. In our early days, dating back to 1911 when the industry was in its infancy, we used a long bamboo pole with a hook on the end to pull the fruit from the brittle limbs which could not be reached with the hand. Some of our seedling varieties tower twenty-five to thirty-five feet in height and the use of a ladder against the brittle limbs is out of the question. So one man would pull the fruit with a long pole and hook while another would watch his chance as the one, two or three-pound Avocado gained momentum on a direct downward line towards him, allowing it, not infrequently to slip through his hands on to the ground and breaking into a dozen pieces or more, and occasionally to drop on top of his head. Now a small canvas bag is attached to the hook at the end of the bamboo pole and the greatest of care is taken in their gathering. Only the perfect fruit, free from all blemishes, is shipped to the fancy trade. All scarred and blemished fruit is shipped to a cull market.

By so watching and carefully grading our fruit, the little business of 1911 has grown to a point where it now handles about 70% of the entire production of Dade county. Shipments are selected carefully as many of the varieties do not carry well; some become soft in twenty-

four hours while others hold up six or eight days. Those varieties that soften quickly are always sorted out and shipped to nearby markets, while the firmer ones are used for the distant markets.

Three styles of packages are used by our concern in making shipments. The one which is considered the standard crate contains about forty pounds of fruit net weight. This package is used more extensively than any other style of crate as it is recognized by the express company as the standard. The next style is the flat crate carrying about half the contents of the standard crate. For some years this flat crate, carrying one layer of fruit, was used in making long distance shipments such as across the Mojave Desert to the Pacific Coast with a great deal of success. As the war came on we were forced to abandon this flat ventilated crate, and after considerable experimenting, we invented a very inexpensive pony refrigerator which could be discarded at the receiving end owing to its cheapness of construction. We found this mode of transportation very successful as the express company was then delivering shipments of ventilated crates in a worthless condition on account of arriving long over-due. This refrigerator, which has its iced compartment immediately over the fruit, saved the day. No matter whether it was on the road ten or twenty days, as long as the crate was properly re-iced, it carried the fruit in perfect condition. We are now using this style of package in all of our shipments except the immediate South.

Perhaps the greatest difficulty we have to contend with is the importation of Cu-

ban and other foreign Avocados, which are dumped on our markets. Cuba makes no attempt to grade or cull her fruit, nor do we get much protection against the poor quality of fruit which is shipped into our large consuming markets from that country. I know it to be a fact that many of the Avocados that are shipped in here from Cuba are carried in bags, thrown over a horse's back, for a distance of many miles before the already bruised fruit is crated for shipment into the States. When we get protective tariff against this foreign fruit our markets will handle all the fruit that is now being grown, if properly distributed.

In addition to the foreign shipments that flood our leading markets, some of our good growers make bad conditions worse by shipping indiscriminately on consignment. To my mind the consignment of perishables is not the proper method of marketing them. Would a shoe merchant consign his products to some distant points to be sold for his account? Do the California raisin growers ship their products to be sold for what-

ever the market will bring? Or do the nut growers of California ship in this manner? No. Are the tomato growers of Dade county shipping on consignment today? Very few. Why? Because they are being properly distributed and with such equal distribution that the demand holds up.

Just so is our method of marketing the Avocados. We buy and sell upon a plain business basis and never in our ten years of Avocado business have we consigned a crate of Avocados, except culls, that we would not put into our printed wrappers, or an occasional extra crate when the pickers misjudged the amount required for the day's orders and over-picked. We always try to pick the exact amount of fruit each day needed for shipment that day, whether it be fifty crates or five hundred crates. When markets are flooded with consigned fruit the tendency always is to bring the general price down to the level of the price brought by the surplus. Our motto is, "Create your market or sell to one who has created one. Never consign!"

Some Observations on Avocados in Custard Apple Muck

H. O. Sebring, Sebring

In April, 1919, I paid my first visit to the territory lying on the south side of Lake Okeechobee, known as the Ritta section. The land is a rich custard apple hammock soil, well drained, and has on it a growth of tall custard apple trees, or where these have blown down, a thick growth of elders. We found a hotel at the mouth of the Miami Canal, and from that point visited the section along the lake for a distance of ten or twelve miles, also Ritta Island.

At every home, we found a few Avocados; seeds having been planted, and in every instance, they were growing fine, and some of the stories told us were unbelievable. The oldest tree was on the Sewell place, having been planted in 1910, and at this time was about forty feet in height and eighteen inches in diameter at the base. None of the trees had had any fertilizer, and from appearances, they had had no care. On this immediate shore, there seemed to be no effect of the cold of 1917, as Royal Palms, Avocados, guavas, Australian pines, rubber trees and other tropical growths were doing fine.

We were unable to locate on this trip, any budded stock, and were disappointed with the amount of fruit that had set on the seedling trees, but everyone told us

they had carried heavy crops the year before.

Later, we made a trip to the plantation of Mr. Ed. Forbes on the north end of Ritta Island, and to the grove of T. D. Feister on Kramer Island. We found plantings of Trapps and Pollocks at these places. At that time they were very small, but at this time have attained a wonderful size for their age. The trees on the Forbes plantation, that are two and one-half years old are eight to nine feet in height and have set a crop of fruit of about a box to the tree. And the trees in the Feister grove, which were four years old last September, are eighteen and twenty feet high, and are carrying a crop of seven or eight boxes to the tree. The trees have been given no fertilizer.

Physical development in the Glades is in a pioneer stage. Transportation is very slow and uncertain. The cost of developing and handling fruit is high, but the prospects are bright, as a railroad is being constructed from Moore Haven to Sandy Point; there is talk of a bond issue of \$350,000, for a good road from West Palm Beach to the south side of the lake and on towards Ft. Myers.

During the spring of 1920, we made some purchases at the Sewell plantation,

so that I have been back to this country almost every month since that time. All of the seedlings have produced heavy crops during the years. There is one large tree on the Sewell place that bore a crop of over seventeen hundred fruits, and the indications are that it will have a good crop this year.

I have discovered only one or two Avocado trees of the Guatemalan type in the Glades and they are only three or four years of age. These have produced the same amount of growth that the seedlings and West Indian varieties have. The Winslow variety bore a fair crop in 1920.

The custard apple soil seems to have all of the ingredients necessary for the raising of Avocados and producing good crops of fruit and all interested in the Avocado industry will watch this section closely, for as soon as transportation is improved, a heavy production of Avocados is bound to come from the south shore of Lake Okeechobee.

W. J. Krome: This concludes the program to be offered by the Committee on Avocados and Sub-tropical Fruits, and if there are any questions anyone would like to ask in regard to any of the papers that have been presented along the lines of Avocados or sub-tropical horticulture, the members of the committee will be glad to answer them before we adjourn.

Mrs. _____: I would like to ask what to do for the Avocados and Mangos dropping the small fruit.

W. J. Krome: We have had that trouble at various times in our groves and it

may result from several causes. A very heavy rain during the time that the bloom is open seems to result almost certainly in the dropping of fruit. The presence of either thrips or an infection of the anthracnose fungus will have a similar result. The thrip injury will quite frequently take place, throw off the bloom and in most cases the fruit will not actually set. The dropping from the anthracnose fungus usually takes place about the time the fruit is the size of a bird's egg and seems to be due to a weakening of the union between the stem and the branch upon which it is located. I think that there are several other reasons but those have come under my own observations. Possibly some member of the committee can more fully answer that question.

H. H. Hume: I might say in behalf of the Society that we appreciate very much the program on Avocados which these gentlemen have given us this afternoon. There is no question about the importance of this branch of horticulture in Florida. It is one of the coming things; it has been a long time coming because there have been a lot of difficulties and a lot of unknown things to be worked out but we are gradually getting around to it and I think before very many years we will have an Avocado industry in Florida that will be of first great importance in the horticulture of the State, and these men who are on this platform today are the men who are making it, are doing the work and Florida owes much to that type of pioneers in an actually new field so far as we are concerned.

The Improvement of Pineapple Soils

Alfred Warren, Ft. Pierce

In the improvement of the soil for pineapple culture two things should be kept in mind; first, the addition of humus, a very necessary part of any soil for any kind of plant production, and second, the control of the nematode.

Humus, although seemingly but scantily supplied on our ridge-land soils, even on the virgin land, still plays a greater part in the growing of the pineapple than most persons believe. It is the humus, though meager in quantity on our so-called typical pineapple lands as compared with that of the rich hammock lands, that gives stability to all productive soils and this applies equally well to our pineapple soils. It helps to retain the moisture, on the sandy pineapple lands, which is a very important feature; it absorbs and holds the fertilizer elements that are applied and releases them as the plant needs them; it furnishes food and a medium for the soil bacteria without which plants could make but little growth; and it improves the tilth allowing better aeration, bacterial action, and other processes that go on in the soil for the good of plant growth. Humus then is one of the prime factors in restoring old pineapple fields or in retaining those that are still fairly productive.

Good illustrations of what the lack of humus does may be found in perhaps any

of the pineapple plantations. Parts of a field for some reason or other may lie fallow and scorch in the sun for a year or more, or a path or an alleyway after a few years' of use may be planted to pines. Such plantings always stand out in glaring contrast to their surrounding plantings by their stunted growth, due to lack of humus and bacterial life.

Next in importance in the improvement of the soil comes the nematode control. The scientists, among whom may be mentioned Dr. C. D. Sherbakoff and Messrs. J. R. Winston and H. R. Fulton, who have given the pineapple problem a great deal of thought and attention for the past number of years and who are still carrying on experiments in St. Lucie county, are still of the opinion that the nematode is one of the chief factors, if not the chief one, in bringing about the so-called pineapple wilt.

In the summer of 1919 Dr. Sherbakoff started some very interesting experiments with the view to either prove or disprove the nematode theory. Briefly his line of attack was sterilization of the soil with steam, carbon bisulfid, and formaldehyde. In addition to these soil sterilization experiments other very interesting and important test plots were started to show the value of selecting strong healthy slips versus poor slips; also the

fumigation of slips before planting versus non-fumigation.

The above mentioned experiments were started nearly two years ago on the A. N. Hoofnagle place, one and one-half miles south of Ft. Pierce. The plants are now bearing their first crop. Three things loom up very conspicuously in these experiments, namely:

1. Cuban slips by far are giving the best results.

2. Of the local slips those chosen for their vigor and from healthy plants are far outranking those that showed weakness at the time of planting or those taken from wilted plants.

3. The plots whose slips were fumigated with hydrocyanic acid gas, at the rate of 2 ounces of sodium cyanide to 100 cu. ft., are superior to those not so treated. Just why fumigation should make such a difference in the growth of the plants has not yet been explained.

With regard to the soil sterilization plots it is yet too early to draw any definite conclusion. During all of the first year the plots, including the checks, looked uniformly well, all plots growing as vigorously as in the days when the pineapple was in its prime on the East Coast. Even during this year, until just recently, the plots appeared to be quite uniform and bore a good crop of large-sized apples. But about six weeks ago the plants of the outside row on one side of one of the check plots began to show some wilt. Just the other day it was observed that the wilting has crept in as far as the fourth row. So far no wilting appears in any plant of the other check plots nor in any of the sterilized plots. As said be-

fore, it is still too early to draw any definite conclusions with regard to the sterilization plots, but in another year some very interesting points may be cleared up.

Although these sterilization plots do not at this time give us anything definite with regard to soil sterilization, yet they bring out another interesting and most important feature in the soil improvement problem. These plots are located in a part of the experimental field that had Natal grass growing on it since 1916. The grass had been left undisturbed, having been neither cut down nor plowed in until just before the slips were planted when the ground was plowed. Each bed, whether treated or not, produced uniformly large and vigorous plants. This vigorous growth cannot be attributed alone to the sterilization of the soil, for the reason that the check plots, until only recently, produced equally vigorous plants. This uniformly fine growth of pines was undoubtedly due, first, to the humus that was restored to the soil by the three years' continuous growth of Natal grass; and second, to the partial starving out of the nematode, as the Natal grass is highly resistant to this dreaded enemy of the pineapple.

This humus theory is further substantiated as follows: Plants growing in another part of the same field, but where the grass was plowed under two or three times a year, are not doing nearly so well as those where the grass had not been disturbed. Likewise on still other parts of the field where more recent plantings have been made under these particular cultural differences, the plants show less vigor in the plots that had the grass

turned under two or three times a year for the past two years than in the plots where the grass was left undisturbed during the three years previous to planting. The explanation for this no doubt is that where the field is plowed and a long dry hot period follows the bare soil is exposed to the hot winds and to the rays of the sun which burn out both humus and bacterial life.

On our pineapple ridgeland in St. Lucie county Natal grass has up to date found no superior in the way of improving the soil by adding humus and at the same time starving out the nematode. Natal grass is drought resistant and will make a good stand even in dry weather on poor soil once it makes a start.

To summarize the salient points that have been brought out by the experiments carried on in St. Lucie county in the growing of pineapples the following may be mentioned:

1. Restoration of humus in the soil by the growing of some plant or plants resistant to the nematode. The different varieties of velvet beans, the iron and brabham cowpeas, and the various grasses are resistant. So far the forage crop that has given the best results is the Natal grass. And so far the best results with this grass have been obtained where it has been allowed to grow undisturbed for two or three years and only plowed under just before the planting of the pineapples.

It may be that equally good results could be obtained by plowing under each successive crop of Natal grass if the plowing could be done just before a heavy

rain or just before the starting out of the next grass crop, thus allowing only a very short period of time for the soil to lie fallow.

2. The control of the nematode. This is but a corollary of the first. By planting nematode resistant plants to restore the humus, the nematode will be controlled at the same time.

3. A definite rotation of crops. For a stable pineapple industry the grower should have a definite system of rotation. After the fourth or fifth crop of pines the field should be planted to some cover crop for one or two years to be plowed under. A plantation could be divided off into say five different plots, and each plot in rotation planted to a cover crop, thus maintaining a uniform acreage in pineapples year after year.

4. The selection of slips. Cuban slips have given good results wherever planted. But since it is next to impossible to obtain slips from Cuba, the grower should pay the closest attention to the selection of local slips. Only slips from strong and vigorous plants should be taken. By continuing such a practice in a few years a strain more or less resistant to the nematode could be developed. Such a scheme should have the co-operation of all the growers.

5. Since the fumigation of the slips by hydrocyanic acid gas has proven in our experiments to make a decided difference in the growth of the plants, it would be well to continue this practice, at least as long as we obtain good results from it, or until we learn why fumigation is beneficial.

6. The proper use of commercial fertilizers as set forth by experimenters along this line.

The experiments that have been carried on and are still being carried on in St. Lucie county by the Federal Department,

by the State Experimental Station, and by the growers of St. Lucie county, are of greatest importance to the pineapple industry. These experiments should by all means be continued until we know definitely just what causes pineapple wilt.

Pineapple Problems

R. L. Goodwin, Ft. Pierce

Pineapples have been successfully grown commercially on the East Coast of Florida during over 30 years.

The industry brought about a million dollars annually into St. Lucie county, until 1915, at which time many fields had become old and unprofitable, and a large percentage of the fruit small and unmarketable.

A dying off of plants appeared in many fields. This condition was recognized as "Wilt," something that had always been known on a small scale but not feared up to that time by the growers in St. Lucie county.

The industry had been wiped out gradually in the vicinity of West Palm Beach, but St. Lucie county growers felt that pineapples were exempt from pests or disease and could be grown on the same piece of land indefinitely; that when a field needed replanting all that was necessary was either to remove the old plants and plow the land or grub the old plants under and replant. In some locations fields have been planted three times in 25 years. One field was kept well fertilized and by filling in vacant places from time to time was made to yield profitable crops for 26 consecutive years.

When the war broke out with Germany the shipments of potash were cut off and potash later disappeared from the pine-

apple fertilizers. Consider for a moment that in Florida, in a sub-tropical climate, we have growing a tender tropical plant—the pineapple. We found by experiment that we could harden the pineapple plant by using a good percentage of potash in our fertilizer mixtures so that there was less liability to injury by cold waves. We had also learned that applying ammoniates without potash made the plants tender and very susceptible to injury by cold. Potash not being available except at an exorbitant price, the grower applied only ammoniates and phosphates, such as blood and bone, tankage, etc.

In February, 1917, a frost injured the plants; a year of drought followed, and in December, 1917, another cold wave did damage. 1918 was another dry year and the pineapple grower threw up the sponge when fertilizers became as valuable as gold dust.

In the meanwhile the United States Department of Agriculture at Washington and the State Agricultural Experiment Station at Gainesville were conducting experiments on various plantations to develop a method of control for red spiders, mealy bugs, and nematodes (root knot); and were seeking for parasites and other agencies that might be responsible for pineapple troubles. Plant selection, fumigation, soil sterilization,

disinfection of soil and of plants have been carried on. Natal, napier grass and rattle box have been tried as rotating crops, and healthy plants sterilized, fumigated and planted in 1919 show signs of giving a good crop this season. Plots of ground on old fields have been steamed, and others treated with formaldehyde or with carbon bisulphide. The experiments are being conducted to prove or disprove the many theories that have been advanced and the information obtained will always be of value to whoever grows pineapples in Florida.

An association for the Promotion of Pineapple Culture was formed in July, 1919, and about \$1,500 was raised to help the State carry out its experimental work. The treasury is at low ebb at the present time, but money will be forthcoming in same way. The work must not stop!

There are fields that went through the cold spells of 1917 with little injury, and were fertilized normally that fruited well last year and the fruit brought high prices. A few fields that were cleaned off and allowed to remain fallow in 1917 and 1918, were replanted in 1919 and at the present writing the plants are full of

bloom and promise a 90% crop. The plants look healthy. One field, belonging to D. T. McCarty, is located on Riverside Drive, Dixie Highway, one mile south of Ft. Pierce, and is observed by every one passing. One company has made contracts to replant a thousand or more acres of pineapples during the coming season and there is hopes of the industry being restored.

The land immediately adjoining and overlooking the Indian River is in demand as winter resident sites, and the location is beautiful with about 35 feet elevation above the river and a hard asphalted road over which all automobiles pass to and from Miami and Palm Beach.

Many acres of the old pineapple belt will never be planted to pineapples again. Other crops such as limes, guavas, avocados, pigeon peas, cassava and nursery stock have been planted and will produce an income.

Local pineapple plants are very scarce and high in price, but plants will be imported from other parts of the world, and in a few more years the pineapple industry will again be an important factor in Florida's upbuilding.

A Fertilizer Program

S. F. Poole, Lake Alfred

Any material added to the soil to produce crops and maintain the soil strength may be termed a fertilizer. This being the case any real fertilizer program for our groves and farms has a double purpose to fulfill: (1) To retain and add to the soil reserves, and (2) produce the maximum of crops.

Soil reserves. At all times during the production of the crop (and in a citrus grove this means twelve months every year), there must be sufficient plant food to properly feed the tree. This plant food should not be too readily soluble, for during periods of wet weather the absorption by the trees together with leaching, would remove too much plant food from the soil. Then would follow a period when the trees could not secure sufficient food to continue operations.

The grove man, following a system of fertilizing at stated intervals, is often at a loss to understand why his trees do not always maintain their usual healthy condition. I have in mind a number of groves that, two years ago this summer, illustrate this very condition. At that time we had all through June, July, and during the most of August a rainy season such as I have heard the old settlers tell about. By the first of September the rains shut off and two months of dry weather followed. By the middle

of July these groves were seriously affected by withertip as evidenced by a considerable dropping of fruit. By October the situation was really serious, with from 25 to 50 per cent of the fruit on the ground and the trees full of dead wood. Groves that had been fed a less readily soluble fertilizer weathered this trying period in safety. In these latter instances the soil had sufficient stocks of food in reserve to carry the trees along.

Soil reserve should be maintained; or in other words, keep food before the tree at all times. No bank can do business without capital. Add to this, for as your capital increases so grows your ability to transact business. With the citrus grower this spells bigger crops and better fruit.

The trees require certain kinds of food from the soil and these should be supplied by the fertilizer in proportion to the needs of the tree, the fruit and the deficiencies of the soil. There should be provided for the trees the food they need to produce complete growth and fruit.

A complete fertilizer is so termed when it contains ammonia, phosphoric acid, and potash. These three are named because they are the three elements of which a Florida soil is usually deficient. They are also regarded as the most active in fostering growth and production of crops. The other elements that are necessary

but are found in the soil in sufficient, though small quantities are sulphur, lime, magnesium, iron, etc.

Ammonia is the element that produces growth. The spring and early summer is the best time to apply fertilizers having relatively high percentages of ammonia. It is best to wait for the removal of the fruit before applying high percentages of this element; yet I have seen growers apply four and even six per cent of ammonia in February and then wonder why their late fruit became coarse and green before the time for shipment arrived. It would have been better to wait until after the fruit was picked before using stimulating applications of ammonia.

Potash is necessary for the formation of sugars and wood and for the transfer of these compounds from one part of the tree to another. It is held that photosynthesis cannot take place without potash. It is commonly understood that potash produces a thin, tough peel, making a fruit better fitted to withstand the shocks of transportation.

Soil Conditions. Let us turn back to the soil again. Four things are requisite for a satisfactory fertilizer program: (1) Proper type of land; (2) Water; (3) Humus; and (4) Soil bacteria.

(1) *Type of Land.* The trees should be planted on land adapted to citrus trees. The high pine lands of the Winter Haven section are a good example. These lands are high, well drained, and well aerated. The sub-soil is clay located deep enough to provide space for the tree roots and moisture is easy to retain. Groves have been set on flat woods and sand scrub lands in this section but the returns are

not commensurate with the effort expended.

(2) *Water.* The citrus tree like all plants uses its food in solutions as dilute as the fraction of one per cent. The sap of the tree is very dilute, the only approach to concentration being found in the fruit and seed. There is a constant stream of water flowing through the tree day and night. Large quantities of water are required for a tree to carry on its vital functions. When the amount of water in the soil gets low, or in other words, when the solutions of food in the soil become too concentrated, the trees wilt. They are unable to get sufficient raw materials for their requirements.

(3). *Humus* is decayed vegetable matter thoroughly incorporated into the soil. Its presence in the soil makes it easier to retain moisture and encourages the growth of living agents. There are two ten-acre groves in our section that were planted side by side on the same kind of land seven years ago last winter. One grove man has kept his land virtually clean the year round. The other man has not. His grove is clean during the dry season and full of grasses and beggar-weed during the rainy season. Today the trees in the grove where clean cultivation has been practiced the year round are fifty per cent smaller than those in the other grove. The amounts and quality of fruit bear no comparison. The grove kept clean during the dry season only has produced three times as much fruit.

(4). *Soil Bacteria.* Last but not least, are the soil bacteria. These are the agents that convert the crude materials of the soil

into forms that are soluble and beneficial. The helpful soil bacteria cannot do their work unless they have plenty of humus and an abundant supply of fresh air and water. Conversely land that has no soil bacteria is dead and will not produce satisfied grove owners.

The soil may be compared to a factory in which the: Building is the inert particles of soil; labor, the bacteria; raw materials, the water, air, solvents and humus; capital, the fertilizer; finished products, the products absorbed by the tree roots.

A good fertilizer program requires a

consideration of all these factors. Nor is the case as simple as this presentation might lead one to think. These factors are entirely dependent upon each other for the absence of any one interferes with the health of the trees.

Let us sum up briefly:

Apply fertilizers to the soil that are congenial to the tree and sufficient to build up the soil reserves, and see to it that the soil bacteria have a chance to flourish. I know this is not always an easy thing to do, that there is danger in straying from the straight road.

Humus, Fertilizers, Lime and Fertilizer Inspection

Dr. H. J. Wheeler, Boston, Mass.

HUMUS

Before entering upon a discussion of fertilizers and their use, it is of first importance to speak of humus; since, if the soil is not adequately supplied with humus, plants cannot make their best growth, neither can fertilizers exert their maximum effect.

What is needed in Florida soils is not organic matter which has reached the most advanced stage of decomposition, but rather organic matter *in the various stages of decomposition*. I have known soils exceedingly rich in organic matter, a large part of which had decomposed to such an extent and was in such a state that it could be dissolved from the soil by treatment with ammonia water; and yet these same soils were very unproductive because of the need of organic matter in the earlier stages of decomposition. In general it is probably safe to state that the richer the plants are in protein, the chief nitrogenous constituent, the more quickly they decompose. On this account many of the non-legumes decompose rather more slowly and furnish organic matter in the various stages of decomposition for a longer time than the legumes do. Young and tender legumes decay very rapidly. In fact, they act almost as quickly as sources of available ammonia for

plants as do certain of the well recognized organic materials, such as tankage and cottonseed meal.

I recall experiments made several years ago, in which I grew the perennial flat pea for two or three years on the same land and then turned the crop under and sowed barley. The barley was much better than it was on adjoining land where flat peas had not been grown previously, and the crop appeared to be abundantly supplied with nitrogen. The next year, however, there was no appreciable increase in the crop where flat peas had been turned under a year before as compared with the plot where no flat peas had been grown. This showed that the nitrogen contained in the flat peas had practically all been utilized by the crop which followed or that it had been transformed into nitrates which had leached away.

For crops or plants which may be injured by the presence of too much nitrogen, particularly toward the close of or just following the rainy season, it might be better in some cases to use non-legumes as cover crops, rather than legumes. It is generally recognized, that certain crops or plants are more affected by various diseases if the plants are over-fertilized with ammonia at certain stages

of their growth, than if they are supplied with properly balanced plant food which does not carry an excess of ammonia.

Another point in connection with legumes ought to be mentioned. Everyone recognizes the importance of getting nitrogen out of the air and of utilizing legumes wherever they can be utilized to advantage. Until quite recently some mistaken notions have existed in regard to the amount of nitrogen which they fix from the air; since, as long as there is present in the soil an abundant supply of combined nitrogen in forms which the plants can utilize, they take it up instead of assimilating atmospheric nitrogen to any considerable extent. Recent experiments in the Middle West have shown where legumes and non-legumes have been grown side by side and then removed from the land, that the soil has been made poorer in nitrogen where the legumes were grown than where the land was devoted to non-legumes. Even if the crops are left on the farm and are returned in manure, a large percentage of the ammonia is finally lost before the plant residues in the form of liquid and solid manure are returned to the land. On this account, if one wishes to add to the soil the greatest amount of nitrogen from atmospheric sources, the legumes must be grown on land which is not already rich in combined nitrogen, and they must then be plowed under.

When plant residues are applied to the soil, the complex nitrogenous compounds which are contained in them are soon broken up through the activity of bacteria and the other naturally-existing micro-organisms of the soil. While these

changes are taking place, some plants are able to assimilate directly certain of the more simple organic nitrogenous compounds, comparable to those produced from hair, wool, and other complex organic nitrogenous compounds when subjected to suitable factory preparation and treatment for fertilizer uses. The greater portion of the nitrogen, however, is transformed into ammonia by the agencies just mentioned, which in turn is transformed in the soil into nitrous acid and finally into nitric acid. This nitric acid then enters into combination with potash, soda, lime, or magnesia, from which it is taken up by plants unless lost in the drainage waters. In Indiana even aluminum nitrate has been known to be formed in soils to such an extent that it became poisonous to vegetation. In other words, this compound may act in the same way as certain of the other soluble aluminum salts.

The various changes in plant residues take place more readily in soil well supplied with moisture, and at fairly high temperatures, than in rather dry soil, especially when the temperature is low. The formation of nitrates is said to occur most actively at a temperature of about 98° F.; hence, in many cases soil near the surface in summer becomes too hot for the most rapid formation of nitrates.

It is not necessary from the standpoint of the plant that all of the nitrogen, aside from the small amount which is taken up in simple organic forms, be changed into nitrates; for at least many kinds of plants at certain stages of their growth are able to use some nitrogen while still combined

as ammonia. On the other hand, if there is too great and sudden a formation of ammonia, owing to the conditions being unfavorable to its transformation into nitrates, there is a possibility that ammonia may in some cases accumulate in the soil to such an extent as to be injurious to plants. In a word, the most important problems in connection with the feeding of plants are the selection of the proper plant foods and the compounding of the various materials in such proportions as will insure a proper and adequate supply of all necessary plant foods to meet the plant requirements from seeding time until full maturity is reached.

Even if fertilizers are supplied in adequate quantities and of the right analysis, it is also important to have the right proportions of the different materials used in the mixtures. This may best be illustrated by citing my own experiment with fertilizers in Aroostook County, Maine. I found it possible to produce 30-40 bushels more of potatoes per acre with one fertilizer than with another, even when an analysis of both would show the same percentages of ammonia, available phosphoric acid, and potash. The factors determining the difference in yields in these cases were the kinds of materials and their availability. Thus the difference in the value of the product from an acre of land produced by the two fertilizers having the same analysis was enough in most seasons to pay the entire cost of the fertilizer used. It is because of these important considerations that a careful study of soil and climatic conditions and of soil and plant requirements is necessary in or-

der to manufacture fertilizers which will give the best possible results.

FERTILIZERS

Ammonia.—I notice that the previous speaker spoke of ammonia as that ingredient of the fertilizer which "produces plant growth." I know it is a more or less common practice nowadays to speak of nitrogen, or ammonia, as that which causes growth, of phosphoric acid as that which produces the seed, and of potash as the fertilizer ingredient which causes the production of starch, sugar, and cellulose. We must not forget, however, that there are at least ten different plant foods, all of which are important to the proper functioning of the plant; and if any one of these is entirely lacking, the plant will not thrive. Therefore, iron, magnesia, and lime are as necessary to growth as nitrogen is. We are led, however, to think of nitrogen as especially necessary to growth for the reason that when it is deficient in a soil, plants generally take on a light or yellow color and present an unthrifty appearance. And yet, I have seen Indian corn which looked as light-colored and unthrifty as a plant possibly could, when supplied with everything a plant requires excepting iron, but which, as soon as iron was supplied, recovered its normal green appearance and thrived perfectly.

Another important consideration in connection with the use of fertilizers is their effect upon the soil. Nitrates, for example, are subject to ready loss by leaching on sandy soils if heavy rains occur, and nitrate of soda in particular

tends to deflocculate clay soils and seriously injure their physical condition. On acid soils nitrate of soda tends gradually to correct the acid condition; and if the soil is of such a physical character that it is not likely to be injured by the residual sodium carbonates, the after effect from the use of nitrate of soda is beneficial.

Sulphate of ammonia is not so subject to leaching as nitrate of soda; yet if it were used as the exclusive source of nitrogen on a highly calcareous soil, there is a possibility that so much ammonia would be liberated at once that some of it might escape into the air and be lost, or even, under such conditions, cause direct injury to plants, many of which are very sensitive to its presence in large quantities. Sulphate of ammonia also tends to make soils acid on account of the fact that the ammonia is largely changed to nitric acid in the soil, which further adds for a time to the marked acidity created by the residual sulphuric acid that was combined with the ammonia at the outset.

Calcium nitrate and potassium nitrate are both subject to ready loss by leaching in open sandy soils in case heavy rains occur. For crops which are greatly in need of lime, especially when they are grown on acid soils, calcium nitrate has distinct advantages; whereas for certain root crops which can use some soda, in case the supply of potash becomes deficient, nitrate of soda may be a more efficient or better source of nitrogen.

If calcium cyanamid is introduced into fertilizers in small amounts under certain chemical conditions, the nitrogen may be largely transformed into urea, a most valuable organic source of nitrogen

for plants. On the other hand, if it is introduced into fertilizers under other conditions or in large quantities or if it is applied directly to the soil under the usual conditions, large amounts of dicyanodiamid are formed from it—a compound which is highly toxic to plants. It is on this account that calcium cyanamid of itself is usually considered unsuited for use as a top dressing or direct application to growing crops or trees. It is on this account, also, that it must be applied two to three weeks before the seed is sown in order not to injure the young rootlets.

There is a possibility that in the near future ammonium chloride may be placed on the market as a source of ammonia. If this occurs, it will have to be used with even more care than sulphate of ammonia, especially on acid soils.

The important feature in connection with fertilizers is to have such quantities and such proportions of various materials used as to exert the best and most favorable influence upon plant growth, taking into account, also, the effect of the fertilizers upon the physical and chemical condition of the soil. It is possible with a clear understanding of these points to use such proportions, for example, of certain nitrates, ammonium salts or other materials, as to avoid the ill effects which may arise from their exclusive use as sources of ammonia; for when combined in the proper proportions and in a proper manner, the various drawbacks mentioned may be largely or wholly avoided, by making the effect of one substance counteract the unfavorable effect of another.

A further interesting phase of the nitrogen problem is that of denitrification,

or the destruction of nitrates within the soil. It has been proved by the most painstaking experiments that if a soil becomes water-logged up to a certain limit, nitrates instead of being formed or conserved in the soil, begin to undergo decomposition, especially if the soil contains considerable amounts of fresh manures and certain other kinds of organic matter in the early stages of decomposition. This change may go only so far that ammonia is formed; or it may even progress to such an extent that the major part of the nitrogen existing in nitrates already in the soil or applied to it in fertilizers, may be changed into gaseous form and thrown off into the air. The nitrogen would then be in the same form as the nitrogen in the air which we are breathing in this room at the present moment, and it would be of no more use to plants than the naturally-existing free nitrogen already in the air. A very small part of the nitrogen under these conditions is transformed into organic material consisting of the micro-organisms which bring about this change. Thus it is important that soils be properly drained. If they are not, organic material which has considerably decomposed or which has been well composted is far safer than organic material in a less advanced stage of decomposition, since the latter is capable of supplying a greater amount of nutrient to the denitrifying organisms.

Phosphoric Acid.—In regard to phosphoric acid, it is a well-known fact that in Europe in the early days no such thing as superphosphate, or acid phosphate, was known. Due, however, to the work of Von Liebig during the latter part of the

first half of the preceding century, it was shown that the crop-producing efficiency of ground bone was very greatly increased by treating it with sulphuric acid (oil of vitriol). Still later phosphate rock, which is a far less effective source of phosphoric acid than bone when both are untreated, was also subjected to the same treatment, whereupon it was found that the available phosphoric acid, thus produced, was as efficient a source of plant food as if it had been produced by treatment of bone with sulphuric acid.

Ordinary bone and phosphate rock consist chiefly of tricalcium phosphate, sometimes called a "three-lime" phosphate. In the manufacture of superphosphate (acid phosphate) either from phosphate rock or from bone, it is customary to add enough sulphuric acid to combine with two of the three atoms of lime, so that only one atom of lime remains in combination with phosphoric acid. This remaining compound containing only one atom of lime is soluble in water, supplying what is known as "*soluble phosphoric acid*." The other two-thirds of the lime in the bone or in the phosphate rock are changed into land plaster, or gypsum, which remains in the mixture. This, therefore, the farmer secures without cost, since the charge for the superphosphate is based merely upon the percentage of available phosphoric acid.

It has been found in some of the states on the Pacific Coast and elsewhere that sulphur, even in such combinations as land plaster, or gypsum, is very helpful to the growth of certain plants; and it is not at all impossible that the sulphur contained in the land plaster, associated with

acid phosphate, or dissolved bone, is often of some use to plants. It may not only serve as direct plant food, but, to a certain extent, the gypsum may act as a liberator of potash; and if ammonia happens to be present in the soil in the form of carbonate, it may react with the ammonia so as to change a part of it temporarily into sulphate, in which form it is non-volatile and cannot escape into the air and be lost.

Two great advantages are derived from the use of superphosphate, whether made from bone or rock, namely: (1) it is soluble in water and hence can be taken up immediately by the plants, and (2) it becomes better distributed in the soil if applied in soluble form than if applied in its untreated natural condition. To be sure, much of the soluble phosphoric acid, upon application of a superphosphate to the soil, is soon changed into less soluble forms, known as "reverted" or "back-gone" phosphoric acid. Its efficiency, after this reversion has taken place, is determined to a considerable extent by the character of the soil and the relative proportions of the various substances with which the soluble phosphoric acid can combine. For example, if the soil contains large quantities of aluminum and iron oxides, and little or no available lime, there is a tendency for much of the phosphoric acid to enter into combination with the iron and aluminum and for but little of it to enter into combination with lime. It is on this account that it is advantageous to make small or moderate applications of lime from time to time to soils where superphosphates are to be

used, provided crops are grown which are not subject to injury by liming. For citrus fruits, unfortunately, lime must for other reasons be used with exceeding care and in very small quantities if at all.

Much has been said and written in recent years about raw rock phosphate, or, in other words, regarding phosphate rock which has not been subjected to treatment with sulphuric acid; and many extravagant claims have been made concerning its efficiency as plant food. It is of some agricultural value even without treatment, on certain soils, and its greatest efficiency is observed when it is used on acid peat or muck soils. The next best soils on which to use it would be upland soils which contain large amounts of acid organic matter. However, for most crops and soils throughout the greater portion of the United States and especially in the east along the Atlantic seaboard, no other form of phosphoric acid has proved equal to superphosphate prepared from bone or rock phosphate by treatment with sulphuric acid. It has been found, for example, that if the raw rock phosphate is used on land which has been recently limed or which naturally contains a considerable amount of carbonate of lime, its efficiency is very greatly reduced or in some cases practically nullified, for the reason that the acids of the soil or those contained in the rain water or produced as a result of nitrification and fermentation are likely to attack the carbonate of lime before they can exert any material solvent action on the raw rock phosphate. It is for this reason that soft phosphate, which generally contains much carbonate

of lime, is often less efficient than it would be if it were entirely dissociated from carbonate of lime.

When soluble phosphoric acid reacts with lime, it first forms dicalcium phosphate or, in other words, a two-lime, or reverted, phosphate. This is still very available to plants; for even though it is not directly soluble in water, it is readily dissolved by the action of plant roots and by water containing carbonic acid, such, for example, as rain water and the natural soil waters, which derive their carbonic acid from the decomposition of the organic matter of the soil.

The chemist determines in the laboratory the amount of water-soluble phosphoric acid and also the amount of reverted phosphoric acid and refers to the sum of the two as "available" phosphoric acid.

Another source of phosphoric acid, which was used in this country somewhat extensively before the war, is basic slag meal, or Thomas phosphate. This was produced in the manufacture of steel from phosphate of iron by what is known as the "basic" process. The phosphoric acid in this material is largely combined with lime in a different combination from any of the other phosphates mentioned, and some iron, manganese, and free lime are also present. As concerns the availability of its phosphoric acid, it is somewhat inferior to superphosphate. It is, however, superior in this respect to untreated bone meal and is much superior to raw rock phosphate or soft phosphate. Its availability to plants depends very largely upon the conditions under which it is manufactured, and certain basic

slag meals produced in some European works before the war had a very low availability as compared with that produced in others. Thus the source of the basic slag meal, or Thomas phosphate, may be a very important consideration from the purchaser's standpoint.

Another new source of phosphoric acid is the so-called "ammo-phos," which is a combination of ammonia and phosphoric acid. This is a material which is as yet but relatively little known in agricultural circles. It must be used experimentally under varying conditions and with a large number of different kinds of plants before one can state definitely the conditions under which it can be used to the best advantage, or can be sure of its real desirability and of the efficiency of its phosphoric acid as compared with phosphoric acid in superphosphate.

During and since the war many processes have been patented for the preparation of phosphates for agricultural use from raw rock phosphate by different methods involving fusion with various substances; but as yet none of these products has apparently been able to hold its own in competition with superphosphate, either by way of efficiency in crop production or economy of manufacture.

In connection with my experiments, especially in the Middle West, I have been astonished to find that as small amounts as 90-150 pounds of a relatively low-grade fertilizer, containing high percentages of phosphoric acid, have given increases of 8-15 bushels of wheat to the acre, 15-40 bushels of oats, and 10-25 bushels of corn. In one case 100 pounds of fertilizer were used to the acre for

sorghum. The sorghum was then manufactured into syrup from both the fertilized and unfertilized areas with the result that where no fertilizer was used, the yield of syrup per acre was 67 gallons; and where fertilizer was used, the yield was 140 gallons. This syrup was worth at that time from 90 cents to \$1.45 per gallon; hence, the gross gain even at 90 cents would be \$65.70, from which there must be deducted only the very small cost of the 100 pounds of fertilizer in order to show the net profit from the fertilization.

Such increases often seem to be more than might be expected from the mere plant-food effect of the fertilizers; and it appears possible that in addition to furnishing plant food in immediately available form in close proximity to the young rootlets of the plants, the fertilizers may also have a corrective effect by way of overcoming the toxicity of certain substances which may be present to an injurious extent in some of these soils. Furthermore, it is now known that fertilizers have a very marked stimulating effect upon the development of certain of the soil bacteria upon which soil fertility is very largely dependent. In connection with the first point raised, attention should be called to the fact that Conner, Abbott, and their associates in Indiana, found that in some soils aluminum nitrate was present in sufficient amounts to be toxic to plants. This is a substance which is decomposed by either lime or superphosphates; and wherever such compounds are present in the soil, the application of fertilizer containing superphosphate would be expected to make the con-

ditions more congenial to the development of young plants. Similarly, at the Rhode Island Agricultural Experiment Station, Hartwell, Pember, Damon, and their associates, have found that where sulphate of ammonia was applied to the soil for a series of years as the exclusive source of ammonia, aluminum sulphate had been formed in the soil in sufficient amounts to render the soil unable to longer support the growth of various kinds of crops. It had previously been shown by the author of this paper that the existing toxicity, regardless of its cause, could be entirely overcome by the use of lime. More recently it has been demonstrated by Hartwell, Pember, Damon, and their associates, that exceedingly large applications of superphosphate are also capable of overcoming or greatly reducing the toxicity of the aluminum sulphate; and this is due to the fact that the phosphoric acid upon combining with aluminum, changes it into a very insoluble form which the plant cannot assimilate. Ruprecht, while at the Massachusetts Agricultural Experiment Station, found soluble, or toxic, aluminum salts present in certain soils. It appears, therefore, that this is a condition which we have but just begun to recognize in this country. In fact, it is not improbable that certain soluble salts of the protoxid of iron may have similar effects, which superphosphates are able to correct.

Where sufficient quantities of soluble aluminum salts exist in the soil to prevent utterly the growth of onions, beets, lettuce, spinach, upland cress, asparagus, cabbage, cauliflower, and, in fact, a large number of other kinds of plants,

there are still others which can thrive on such soils without difficulty. I refer particularly to one of the flowering perennials, *Silene orientalis*, which thrived to perfection where most of the plants enumerated above died before they had made materially more growth than was possible from the stored-up food material in the seed. The blackberry, for example, grew well on such soil. The Lima bean was also able to make a fair growth, whereas the Golden Wax and other varieties of string beans were partial failures. Watermelons grew splendidly, whereas the cantaloupe practically failed. Other plants were found to range between these extremes.

Potash.—For most crops it is more or less immaterial what the source of the potash is, as long as it is soluble in water, or is available to the roots of plants. However, citrus fruits, tobacco, sugar beets, and hops are illustrative of noted exceptions. The usual potash sources are muriate, which contains about twice as much chlorine as potash; high-grade sulphate of potash, which contains little or no chlorine; kainit, which contains two or three times as much chlorine as potash; and the double manure salt, containing both sulphate of potash and sulphate of magnesia, and but relatively small quantities of chlorine. It is the aim of progressive fertilizer manufacturers to supply those forms of potash for special crops which are adapted to the kind of plant to be fertilized.

LIME

There are soils in Florida which contain a great abundance of carbonate of lime, in fact, far more than is desirable. On the other hand, there are some soils which are so acid and deficient in lime that its application is one of the first essentials to success. For citrus trees, as stated before, lime should be used with extreme caution, if at all, for we are well aware of its various ill effects on citrus trees of all kinds. But if any lime is used for citrus trees, one should probably employ only a small part of what is indicated as necessary to completely neutralize the soil; whereas, if one were growing cantaloupes, lettuce, spinach, beets, and many other truck and field crops which are greatly benefited by lime, liming approximately to the full limit of the quantitatively determined requirement may prove helpful.

I have been much interested in what one of the speakers has said regarding die-back; for in connection with an experiment which I have been conducting with oranges here in Florida, die-back was markedly increased where magnesian lime was used three years before at the rate of only one ton per acre. The disease was even worse when practically pure lime was substituted for magnesian lime. The die-back was also accompanied by wither-tip and frenching. The trees in the same experiment which received no lime were far less affected with die-back. Die-back was also present in

an adjoining grove in which all the trees were subsequently treated with bluestone (copper sulphate). Since it was my desire to ascertain to what extent different lime and fertilizer treatments would affect die-back, no bluestone was used on the three experimental areas. Nevertheless, die-back has now very largely disappeared. If bluestone had also been used on the experimental trees, it might have been inferred that the disappearance of die-back was chiefly or wholly due to the bluestone. In view of the circumstances, however, it is evident that climatic or other conditions were responsible for a good part of the improvement observed.*

I do not mean by this that I would not advise the use of bluestone as a means of combating die-back, for it seems, at present, to be the best-known remedy for this disease. It must, however, be used with care and moderation or trees may be injured by it. I say this, notwithstanding

*As the discussion following this paper was drawing to a close, one of Florida's authorities on citrus diseases, citrus culture, and especially on the use of bluestone, disputed the statement that die-back had largely disappeared without treatment, saying that he had visited the grove mentioned and found that this was not the case. I thereupon stated that what I said was based upon the report of a man also familiar with Florida and its citrus problems, rather than upon my own examination, although I had observed a marked general improvement in the grove. Soon after the meeting at Miami arrangements were made through Professor Newell to have the grove carefully examined and reported on by Mr. Gomme, county agent and citrus expert of Polk County, who reported as follows:

Section 1. No Lime.—Not as heavy growth as in Section 2 or 3. Slight indication of frenching. Hail has damaged young fruits—also young and old wood, causing the wood to split considerably. Fruit irregular in quantity. No S-shaped growth apparent. No indications of die-back by gum pockets or multiple buds. This section could not be recorded as having die-back.

ing that in some cases unusually large amounts have been used without injury. In the course of my travels for several years through the citrus sections of this State, covering in all many thousand miles and visits made at different times of the year, I have not found anyone who has been able to tell me positively all of the different causes of die-back nor how it can always and surely be avoided. Apparently, there may be several causes. At any rate, everything which can be done to throw light upon any one or more of these causes will be of material help to the citrus industry. It is for this purpose, among others, that the company with which I am connected is conducting several experiments in this State with citrus fruits on different types of soil. We cannot expect that the citrus industry of Florida will ever attain its highest and fullest development until the mysteries connected with the die-back problem have

Section 2. Limed Area—Magnesian Lime.—Hail damaged fruit and branches as in Section 1. Small amount of frenching. Growth in general is better than that in Section 1 or 3. S-shaped growth is present in almost all trees but there are no indications of die-back by gum pockets or multiple buds. This section shows vigorous and healthy growth.

Section 3. Limed Area—Non-Magnesian Lime.—Die-back present on a few trees which show gum pockets, multiple buds, frenching, and brown exudation on wood. This condition is not extensive, although it is marked on a few trees. The fruit and wood had been considerably damaged by hail. As in 1 and 2, the damage seems to be more marked on the younger wood.

The Grove Across the Road from the Above Three Sections.—This grove has been treated with bluestone. No die-back is apparent though a few S-shaped branches were noticed. There has evidently been die-back in this grove at some earlier period as some of the old wood is stained, but no gum pockets or multiple buds were found on the younger growth.

been more fully explained. Until we know more of the causes and of the means of avoiding this disease, we shall be in essentially the same position as the physicians and veterinarians who were attempting to combat yellow fever and malaria in the human family, and the Texas fever in cattle, before the relationship of the mosquito and the tick to the transmission of these diseases was definitely ascertained. Most thorough and careful experiments should be made on every different type of soil used in this State for the growth of citrus trees, and this seems to be one of the greatest needs of the citrus industry in Florida at the present time. It is not enough to have one experiment station, but experiments should be conducted in all of the important citrus districts in which different types of soil are represented.

FERTILIZER INSPECTION

Before closing, I wish to say a word about the fertilizer law in Florida. I trust I may be able to qualify as a competent witness for the reason that I was for four years connected with the fertilizer inspection in Massachusetts, and for more than twenty years had general charge of the chemical work connected with fertilizer inspection in Rhode Island.

I notice that there is a tendency in some states to require the manufacturer to name the sources of the materials used in his goods. In this connection it should not be forgotten that requirements of this kind are of no use whatsoever, unless the chemist can substantiate or disprove the claim of the manufacturer. Further-

more, such requirements are often contrary to the best interests of both the purchaser of the fertilizer and the manufacturer.

For example, there are a considerable number of materials rich in nitrogen which, in their natural, untreated condition, are generally known to have a relatively low crop-producing value, but when properly treated in the fertilizer factory, are capable of transformation into materials as valuable as or in some cases even more valuable than the best organic ammoniates with which we are familiar; such as, dried blood, tankage, and cotton-seed meal. If the manufacturer is obliged to state that these materials are used, it is likely to create a prejudice against the fertilizer, whereas the fertilizer really will be of very superior quality if these same materials are subjected to proper factory treatment at the outset. Furthermore, after treatment, the nitrogen may be present in compounds entirely different from those existing before the treatment was applied. Such requirements are about on a par with the requirement that a manufacturer of turpentine must state that he used long-leaved pine in his product. It is true that special crops seem to be of better quality when certain ammoniates are used than when others are employed, and any manufacturer with his future at stake strives to furnish that which will give the best results. It is of great importance to know the availability of the ammoniates in the fertilizer; but it can do no one any good to state *what they were once, what they are not now, and what they never will be again*. A law of this character, which requires the mak-

ing of statements that would be misleading to the purchaser, is in many respects worse than no law at all.

If I were to state that I used hair or wool in a fertilizer, the purchaser, knowing the low value of each in its raw or untreated state, would think that the fertilizer was inefficient. However, I can take the hair off your individual heads or the wool off the backs of your sheep (with your permission) and, by chemical treatment in the fertilizer factory, transform it into material as valuable as, or even more valuable than, the best organic ammoniate known. After such treatment it would certainly no longer be hair; but it would consist of a very large number of different nitrogenous compounds, many of which no chemist could practically hope to identify in making a fertilizer analysis, and much less determine quantitatively. In fact, if, under such circumstances, I were to state that hair was used, I should be telling you that something was there which was really not there.

I mention these points merely as illustrative of tendencies in connection with some recent fertilizer laws to require statements which are useless, absurd, positively misleading, and contrary to the best interests of the user of fertilizer. If you wish to know the source of potash in a fertilizer, a chlorine test in addition to the test for potash will usually tell all that is required. If you wish to know the real crop-producing value of a fertilizer, a determination of the percentage of available phosphoric acid and potash, and the availability of the nitrogen as shown

by the most reliable chemical methods known, affords the best possible means of protection for the purchaser. In those states where this plan has now been in vogue for several years, the results have been most acceptable to the farmers.

I wish also to say a word about the collection of samples of fertilizers. It is to be presumed that the object of a fertilizer inspection is to set forth the actual facts as to the quality and analysis of the fertilizer. This being the case, it is of the utmost importance that samples be so drawn that they will truly represent the fertilizers which are being inspected.

If you were to make up a fertilizer containing bone, tankage, and various other materials, including potash salts, nitrates, sulphate of ammonia, and similar materials, you might find, no matter how accurately the mixture had been made, that some of the lighter materials in the mixture would tend to come to the top of the bag when shaken up in transit or handled in the storehouse. Consequently, the only way that a truly representative sample can be secured is to have it drawn with a sampling implement which extends the entire length of the bag. The sampler should not be opened until it has been fully inserted. It should then be opened throughout the entire length, filled, closed, and then withdrawn. Such sampling-rods are in existence and are used exclusively in many of the states. These secure a true core of fertilizer extending the entire length of the bag. A perfect mixture of such cores will give a true test of the character of the goods, if properly handled and analyzed.

It is also important that samples be drawn from such a number of bags as will properly represent any given lot of fertilizer. If there is a small number, all should be sampled; and if there are many bags, samples should be drawn from not less than 10-20% of those present. Great care must also be taken in properly mixing the samples after they are drawn, so that a uniform, composite sample can be secured for analysis. If I were merely to draw a sample of fertilizer with my hand from the tops of bags in a shipment and were to send it to your state chemist for analysis, the chances are that he would report that the analysis did not agree with the guaranty. Imagine for a moment that each of you is a manufacturer and I the purchaser. You will appreciate the position in which you would find yourselves, if I used such an analysis as a basis for non-payment of the goods and as a means of having the goods confiscated. It must be obvious that such a situation as this would add to your overhead costs in the manufacture of fertilizers and to the prices which you would have to charge me for them; or the alternative would be that you would be driven from business in this State.

My conception of a fertilizer inspection is that it should be conducted in such a way, and the law should be so drawn, that it affords protection to the purchaser and at the same time protects the honest manufacturer from injustice, imposition and the perpetration of fraud on the part of any dishonest purchaser; in other words, the inspector of fertilizers should be backed by a just law and should stand as an absolutely neutral party, seeing to it

that absolute justice is done to both producer and consumer. No other plan is as good for either the purchaser or the manufacturer.

DISCUSSION

Question: Mr. Chairman, the speaker has already remarked that too much lime may be injurious to citrus fruits. Now I wish to ask if too much iron, too much magnesia or too much of other materials would be injurious, and at what point the limit should be set?

Answer: In regard to iron there may be a situation where, on account of large amounts of moisture and organic matter, an oxide of iron may be formed which, in certain combinations, may possibly be injurious to plants. We know, for example, that in some of the peat and muck soils of Holland and England, protosulphate of iron has been found in such quantities as to be destructive to vegetation. There are instances on record where soils contained so much magnesia as to be injurious or almost sterile; but this is doubtless inconceivable in the case of Florida soils, since most of them contain very little magnesia, so little, in fact, that I suspect some magnesia may be beneficial for some crops under certain circumstances. It is true that excessive amounts of certain plant foods may be injurious; but I do not think we have reason to fear the use of too much, especially in view of the present high prices, which have unfortunately placed too great a curb upon their purchase.

Plants differ very widely in their susceptibility to injury by excessive amounts of certain salts of iron, magnesia, and

other substances, which may be present in the soil. A concrete illustration is afforded in connection with experiments which I made several years ago in Rhode Island. It was found that soil which had possibly never received any fertilizer treatment was exceedingly acid and contained substances so toxic to lettuce, spinach, beets, onions, asparagus, and many other crops, that they could not be grown successfully, and the application of a highly acidic fertilizer further accentuated the difficulty; yet other plants grew to perfection on this soil. I mention this merely as an illustration of the fact that we cannot conclude necessarily from the effect of a given substance or substances upon one kind of plant what the effect will be upon others.

Question: What do you think of cottonseed meal as a source of ammonia?

Answer: If you get meal which does not contain an undue amount of cottonseed hulls, it generally has a fairly high availability, although it is not so quick in its action as the ammonia in dried blood, tankage, and dried fish.

Mr. Beech: What can you say regarding calcium cyanamid? I am aware that it is considered to be destructive to plant nematodes. I also understand it carries a considerable amount of lime and that it should be applied some time in advance of the date of seeding.

Answer: It is undoubtedly true that this material is destructive to nematodes; but in order to prove highly effective in this respect, it would have to be used in far greater quantities than should be recommended in ordinary agricultural practice, especially in view of its high content

of nitrogen and lime. The material does have the advantage of supplying some lime, providing the plants grown and the soils used require it. It is also true that dicyanodiamid is formed from it when it comes in contact with moisture in the soil; and this material exerts a poisonous action upon plant roots until it, in turn, is decomposed by the micro-organisms and by chemical changes taking place within the soil. In general it should be applied two or preferably three weeks before the seed is planted. It can be mixed with fertilizer in small quantities under such conditions that practically all of the nitrogen is transformed into urea, which is a most excellent source of ammonia for plants. Under other conditions of manufacture, dicyanodiamid may be formed, so that here again the skill and experience of the manufacturer come into play.

Calcium cyanamid has been found to be highly injurious to workmen who are brought extensively into contact with it in its natural state, especially if they have been imbibing alcoholic liquors. And I may add that I am not bringing this up as an argument in favor of prohibition, even in this dry city.

Mr. Gray: Just a question in relation to bluestone. There are thousands of barrels of it used annually in this State; and in connection with your experiment, you show that the recovery of the trees was not necessarily due to bluestone. Where there are thousands of dollars at stake in connection with die-back, what would you advise a grower to do if the disease appears?

Dr. Wheeler: I should by all means advise its use, until a time when some-

thing better is found as a remedy or until we know how to prevent the disease. However, I should also advise great care in its use and the application of relatively small quantities. I hope some day we may know more about it and how it acts. Until we do, we cannot use it most intelligently.

Question: I wish to ask what results would be secured by the application of sulphate of iron to the leaves of trees which show lack of color, or frenching?

Dr. Wheeler: I think it is impossible at this time to predict surely what effect spraying with protosulphate of iron would have. Pineapples have been sprayed with it successfully in an extensive way in the Sandwich Islands on soils which contained excessive amounts of manganese, and where the plants were not able to secure enough iron under the usual cultural conditions. Upon spraying the leaves, the plants absorbed the iron and developed a healthy color and normal crops became possible.

In Porto Rico, Gile found that lime caused chlorosis and a bleaching effect on pineapples, which was overcome by spraying with protosulphate of iron. This result indicates that the addition of lime to the soil rendered the iron so insoluble that the plants were not able to take up enough of it. Recent successful experiments have been made in spraying conifers with protosulphate of iron. Repeated sprayings with a 1% solution caused certain kinds of pine trees to develop normally and to develop good color, whereas the use of a 2% solution resulted in positive injury to the trees.

It should be determined at the outset by a few careful experiments what strength may be used on citrus trees without injury. The next problem will then be to ascertain whether frenching can be overcome to any extent by such spraying. Doubtless the results will depend upon what causes the frenching; for, according to many observations by our best authorities, it seems to be caused by several different conditions. It would be of the utmost interest and importance to have spraying experiments made with protosulphate of iron and possibly with ferric chloride wherever frenching has followed an application of lime, in order to ascertain if the condition can be corrected. In Porto Rico, Gile found that several successive sprayings were necessary in order to accomplish the wished-for results with pineapples; and obviously the finer the spray and the more generally it is distributed over the leaves, the better the results should be.

I should like to ask if anyone in this audience has sprayed with protosulphate of iron and, if so, with what result. I ask for the reason that about four years ago I suggested the idea of spraying with it to some of the members of this Society who were present at our meeting at Arcadia. I am not aware that any of them ever followed up the suggestion.

In general it has been found that when protosulphate of iron is applied to the soil, it is not so effective in overcoming chlorosis, or frenching, as it is when it is sprayed on the leaves, and very large quantities may often be necessary to cause material benefit if the application is made

to the soil. This is probably for the reason that lime and other basic compounds in the soil may make the iron insoluble as soon as the two compounds are brought into contact with each other.

Answer from the Audience: I have made experiments in spraying with protosulphate of iron, where the trees were very much frenched and bore small fruit, and the result from one to three sprayings was excellent. In other cases it apparently did little or no good, but I presume the conditions giving rise to the frenching were different in the two cases.

Another answer: About four years ago, one or two acquaintances of mine had groves which showed frenching, and they suspected that this was due to a lack of iron; and after spraying them with protosulphate of iron from three to six times at rather frequent intervals, a marked improvement in the trees resulted.

Another answer: I have noticed cases of frenching in the Indian River region where it seemed probable that too much fertilizer had been used, and I am satisfied that you must have a satisfactory amount of humus in the soil in order to get the best results from fertilizer.

Dr. Wheeler: I have had my attention called to cases of frenching which may have been caused by too much water and also by to deep cultivation and injury to the feeding roots. This injury to the roots results especially in cases where a

deep cutting disc or cutaway harrow is used instead of the acme harrow which works the soil only to a slight depth.

What has been said about the importance of humus in the soil is deserving of special attention, since it is fundamental to the best results in growing practically all kinds of crops, including citrus trees. The humus may also play an important part in connection with the assimilation of iron. It is well known that where great accumulations of vegetable matter come in contact with sands containing iron, the iron is often so largely dissolved out that the sands become greatly bleached. This shows that the humus has a solvent action on the iron. It is much better to maintain conditions in the soil, if possible, which will prevent frenching than to take the chance of curing it after it appears.

Another point concerning which I would utter a caution is in regard to making spraying experiments with protosulphate of iron on a large scale at the outset. My advice would be to determine in a small way on a few branches, or at least on a few trees, what strength of protosulphate of iron will be tolerated without injury to the foliage or trees. By proceeding cautiously in this way, no great damage can be done; and after this point is determined, you can then spray extensively with reasonable safety, provided you find it helpful.

The Branch Experiment Station

Wilmon Newell, Gainesville

A Branch Experiment Station, to be devoted primarily and essentially to the study of citrus problems, has been established near Lake Alfred, in Polk county, Florida. This is a branch station of the University of Florida Agricultural Experiment Station at Gainesville and, like the latter, is under the exclusive control and direction of the Board of Control. The branch station has been established in accordance with the provisions of Chapter 7379, Approved June 4, 1917. This Act authorized and directed the Board of Control "to locate, establish and maintain a Branch Experiment Station, in or near Winter Haven, Polk county, in the citrus growing section of the State, where insect pests, diseases and other agencies, affecting the production of citrus fruits and citrus trees shall be studied;" provided, that no branch station should be established until lands, moneys, groves and other things of the value of not less than \$10,000 should be donated for the use and purposes of the Branch Station.

By the summer of 1919, donations and subscriptions to this amount were secured by a committee of Polk county citrus growers, consisting of Messrs. S. F. Poole, J. A. Snively, J. H. Ross, H. W. Snell, L. L. Davis, A. M. Tilden, C. H. Thompson and W. L. Drew. The Board

of Control shortly thereafter, on July 14, 1919, held its regular monthly meeting at Winter Haven and, in connection therewith, visited and inspected various proposed sites for the Branch Station, finally deciding upon an 84-acre property located on the Dixie Highway, about one mile northeast of Lake Alfred and forming, at that time, a part of the holdings of the Florida Fruitlands Company. This tract of land was donated for the purposes of the station by the Florida Fruitlands Company, the Board of Control merely refunding out of the cash donations made, the actual cost of planting and bringing the 14½ acres of grove on the property to its condition at time the property was transferred to the Board. This amounted to \$5,900.00.

From December 1, 1919, to March 1, 1921, there has been expended on the property in fences, clearing, fertilizer, established seed beds, superintendent's salary, etc., the amount of \$3,005.53, so that on March 1, 1921, there remained, out of the original donation of \$10,000.00, a balance of \$1,094.67. Since the latter date the Florence Villa Packing Association has paid over to the Board, for the Branch Station, \$1,282.15 and the County Commissioners of Polk county, \$2,500.00, so that the total cash resources (as of date March 1, 1921), out of

which running expenses are paid and for permanent improvements are \$4,876.82.

On October 1, 1920, Mr. John H. Jeffries was appointed superintendent of the Branch Station and has given the property his constant and efficient attention since that time.

As a citrus property, the Branch Station is almost ideal. For the most part the land is sandy, typical of the Ridge Section and the topography gently rolling. As stated above, 14½ acres are in citrus grove. About 12 acres have been cleared and will be devoted in part to citrus and in part to ornamental grounds, seed beds, etc. About 17½ acres are in meadow and marsh and the remaining 40 acres are as yet uncleared. It is undoubtedly in the latter area that the principal experimental work with citrus will be conducted.

You will bear in mind that no appropriation has been made for the Branch Station, that no federal funds are available for use in connection with it and the total resources have consisted and still consist of the donations mentioned above. Under such circumstances work has had to proceed slowly. Nevertheless, considerable has been accomplished in the way of preparation for the serious business yet to come. Since acquisition of the property by the Board of Control about 12 acres of land have been cleared, plowed and placed in good tilth, about half the total area has been placed under substantial fence, seed beds laid out, and a small tool house constructed. Through the kindness of the City Council of Lake Alfred a road running the full length of the property, along its east side, has been sur-

faced with clay. Dr. R. W. Ruprecht, Physiological Chemist of the Experiment Station, is conducting on the Branch Station property a study of the cause of die-back and for this purpose is utilizing the young 10-acre grove consisting of four varieties.

It appears advisable, before proceeding with the clearing of the main tract, and with the platting and planting to citrus, to have a thorough soil survey, topography survey and biological survey made of the entire property. The information recorded by such surveys may go far, in future years, in explaining the outcome of experiments. We have not the funds now to make these surveys and they will have to wait upon legislative appropriations, but this work should precede all of the experimental work proper, as forming a proper basis for it. We do not want hap-hazard results from the Branch Station. We also have in mind giving careful consideration to the planting, so that plats strictly comparable as to drainage, soil and past floral history will be obtained. This calls for careful study, based on the preliminary surveys and, doubtless also, conferences with various citrus authorities. Do not be surprised therefore, if the plantings on the Branch Station do not show up with incredible rapidity, for it is going to be our policy to "make haste slowly" and, as far as possible, avoid undoing, in future years, things hastily done in the beginning. Kindly remember too, that we intend to have at Lake Alfred an Experiment Station and not a curiosity shop or a tropical fair.

The plans of the Board contemplate the early construction of a cottage for the superintendent, the cost of which can largely or entirely be defrayed out of the funds now in hand. In addition, as funds become available, it is planned to install a unit electric lighting plant and waterworks and sewage plants. As far as possible, these will be made models of what such outfits should be for typical and up-to-date Florida country homes.

The lines of experimental work to be taken up, when all is in readiness, will be greatly varied, including such research projects as variety tests, insect and plant disease problems, propagation methods, etc. One can see at a glance that there are unlimited opportunities for investigational work with citrus in Florida and all of the experiments and problems suggested by the growers cannot be taken up at once. On the contrary, attention must first be given to those problems most crying for solution or which presents prospects for prompt solution with results immediately applicable by the majority of growers. The establishment of the various citrus plats and the building and equipment of a laboratory, in addition to the superintendent's cottage, will open the way for co-operation with various workers of the U. S. Department of Agriculture and there is no doubt but what many co-operative experiments will be conduct-

ed at the station. In fact, some preliminary arrangements in this direction have already been made.

So far as actual research work is concerned, the Branch Station is now virtually "marking time," waiting for the legislature to provide for its needs. As a matter of information, you will be interested in knowing that the Board of Control in its budget shortly to be presented to the State Legislature, will ask for the following funds for the Branch Station:

Salary of superintendent, 2 years at \$2,000 -----	\$ 4,000
Current expenses, including labor, experiments, etc., 2 years at \$5,350 -----	10,700
Permanent improvements, includ- ing laboratory building, water supply, fencing, etc., per an- num at \$8,300 -----	16,600
Total for 2 years ending June 30, 1923 -----	\$31,300

It is well to remember, too, that no federal support for the Branch Station will be forthcoming at any time: the Branch Station is exclusively a State institution and if the legislators do not provide for this promising infant it must necessarily meet an early and untimely end.

An Example of Non-Cultivation in Citrus Groves

H. B. Stevens, DeLand

I have been asked to say something about planting and cultivating a citrus grove. I presume it is desired that I tell of our experience at DeLand in the growing of trees on the high pine lands where the trees were left standing.

About ten years ago, we decided late in the winter, to move some of our trees. As it was then too late to clear the land or even thin out the pine trees, we planted our orange trees among the pine trees without removing any of them. These trees have done well and during the cold of 1917 we found the pines a great protection. They bear every year and the fruit is fine in quality. We dug holes to plant the trees, but have not plowed, harrowed or even hoed the ground. The only cultivation that they have received is the mowing of the grass when necessary. We use a mineral fertilizer and scatter it on the ground, without working it in. We find that these trees do not take any more fertilizer than those planted in the open.

This first grove having done so well, we set other groves among the pines, in every case thinning out the pines to some extent because we thought the first grove had too many in it. In none of these groves have we done any plowing, or harrowing, either before or after we planted the trees.

In our older groves that had been plowed for years, we have adopted the same practice of non-cultivation. We now fertilize and do nothing more. We mow as often as it is necessary to keep the grass and weeds from making seed. By cutting in time, we make them give back to the soil what they have been gathering from the air, thus enriching our land by that much and supplying plenty of humus. The shading of the ground is also a benefit. Having followed this plan for a number of years, we find our fruit has better quality in addition to the good carrying trait of pine land fruit.

The number of times we mow, depends on growth of the grass and weeds; when they are high enough to cut we cut them; no matter how many times. I think four times is the most we have ever had to mow our groves in any one season.

In the fall we make fire lines around our groves, as we did when we plowed, and I do not think there is any more, if as much danger, of fire under this plan, than in the cultivated groves. As the grass and weeds are cut green, they rot quickly, and leave nothing but the stubble, which does not burn easily.

My observation has been that the soil is looser before it is plowed than it ever is after it has been broken up; except immediately after plowing. In addition, plow-

ing allows the growth of foreign weeds and grasses which take up more moisture, and make more work than the wire grass if the ground is left undisturbed. In 1877 I set out some trees in hammock land, and as I was very anxious that they do well, during the next spring I grubbed a circle around the trees and beyond the ends of the roots. During the second year I went back to grub a larger circle and found that I was cutting large roots that had grown beyond where I had grubbed the year before. I saw that those roots did not need any loosening of the ground, so I did no more grubbing.

We gave our young trees about one pound of fertilizer to each tree, three times a year during the first three years.

During the fourth year the amount to each tree was increased to three pounds, and applied three times during that year. We think now it would have been better if we had given two pounds to each tree at each application during the third year instead of only one pound, though the trees grew well and looked healthy. In the spring of the fourth year, we noticed some purple scale getting on the trees, which was the reason for increasing the amount of fertilizer so markedly at that time. We have found that a little additional fertilizer generally rids the trees of purple scale, but an over dose may cause die-back. We have no die-back in our groves at present.

Practices in Groves Planted on Low Hammock Soils

C. T. Pattillo, Shiloh, Florida

I am going to be brief so that when I have finished I may have time to sit back and listen to the discussion of the subject which I hope will follow. This I know will be both interesting and instructive to myself as well as to other owners of low hammock groves. It is not the purpose of this paper to discuss practices which may be applicable to types of soil other than the low hammock. In such a discussion it would be well to give a short definition of the term "low hammock" and to begin the discussion with the clearing of the raw land.

The term "low hammock" is generally applied to a body of land covered with a heavy growth of cabbage palmetto, oak, maple and other hardwood trees and usually requiring considerable drainage. The top soil is black or grayish in color and varies in consistency from a heavy muck to a light sandy loam, all types being sometimes mixed with marl or lime rock and containing a great deal of natural humus. The sub-soil is often of marl or lime rock, which varys in depth from a few inches to several feet.

Clearing is generally accomplished by underbrushing the small growth, cutting down or digging out and burning all

hardwood trees but leaving a large proportion of the palmettoes, which afford considerable frost protection to the grove.

After staking the ground for trees, mounds are prepared, and will vary in height and diameter in accordance with the elevation above the water table. When necessary the sub-soil is first broken up by blasting. These mounds should be left three to six months before planting, to allow the ground to become mellow. At time of planting the mound is practically torn down and rebuilt, all roots and such material being carefully raked out. It is also advisable to dig down several feet through the sub-soil, afterwards filling this in with surface dirt. In selecting the tree to be set preference is usually given to those budded or grafted on sour orange root. The actual planting is very much the same as is practiced in any grove except that the trees are always somewhat elevated.

Cultivation for the first few years may best be accomplished by flatweeding and hand mowing, for generally the ground will be found too rough for mule or tractor. After that time the disc harrow, well blocked up so that it may cut only about two inches deep, will be the principal implement for cultivation, plows be-

ing almost never employed. As a rule only one or two light cultivations a year are given with the harrow, this being done early in the spring. At the same time, the harrow is running the trees may all be circled with the weeding hoe or they may be spot-hoed, that is, hoeing the trees which need stimulation and allowing the others to go unworked.

From the time that cultivation ceases until midsummer the weeds and grasses are kept mowed, after which time they are generally allowed to grow until mowing is resumed in the fall.

Fertilizing is different in the amount of ammonia used, three per cent usually being considered sufficient. Preference is very often given to fertilizers of purely chemical origin or base. The amount used per acre is less than on the lighter types of soils, there being present more natural plant food and less chance for that which is put on to leach away.

Spraying is not often necessary in low hammock groves because the friendly fungi thrive in the moist atmosphere and with very little help will control the whiteflies and the scale insects. Rust mites are rarely found on this type of grove.

Drainage is discussed last here but in the grove it should emphatically come first. I want to place a great deal of emphasis upon drainage, for on that more than on any other one thing depends the building and maintaining of a successful low hammock grove. If the grove has just ordinary treatment in every other way but sufficient and proper drainage, the trees will be pretty sure to have on them a bountiful supply of thin, smooth skinned fruit of a good color and a delicate flavor, and which, best of all, will sell in the markets for a premium.

The Planting and Cultivation of Groves in the Ridge Section

Max Waldron, Crooked Lake

One of the outstanding characteristics of citrus culture in Florida is that there exists a wide range of opinion among growers regarding the most satisfactory methods for developing a grove. Few industries exhibit such a lack of standardization; few such a profusion of mere notions. An important duty, therefore, of this Society is to standardize our grove practices wherever possible or where reasonable differences of methods exist to indicate why these are necessary. It is to avoid confusion of ideas, then, that this paper is limited to certain grove operations in that part of Florida known as "The Ridge." It will be found, however, that even though these statements are confined to well defined and uniform conditions, there will still exist many differences of opinion on such matters as the depth of planting; sources, amounts and time of fertilizing; time of plowing; methods of pruning; mowing of cover crops; treatment of diseases, etc. These opposing opinions add zest to the already fascinating game of citriculture and serve as an incentive for constructive competition. In the efforts to demonstrate the effectiveness of our own methods, we incidentally do other things tending to benefit a grove that might otherwise be neglected. However, under present economical conditions, it is especially neces-

sary that we standardize our methods and reduce our operating expenses wherever it will not result in decreasing the vigor and capacity of the grove. Thus, for instance, one California Exchange packing house reduced the size of lemon wraps one inch each way, thereby saving \$6,000 in one season.

Nowhere, perhaps is the citrus industry so thoroughly standardized as in the Ridge Section, for many of the groves there have been developed and are being successfully handled by large corporations who adopted to a great extent the methods established by Dr. Inman, the father of the citrus industry in Polk county.

The "Ridge" is the backbone of Florida, extending from Haines City to Sebring, and like all backbones, is in the form of a series of elevations and depressions, the elevations being the rolling pine-clad hills and the depressions the wide and limpid lakes over which the cold winter winds are moderated to such an extent that the grower scarcely fears the frost. This backbone, however, is constructed mainly of sand instead of lime as are other backbones; in fact, there is so much sand on the Ridge that it seems to have become an integral part of the settlers there, resulting in a phenomenal development where a decade ago

there was a tractless wilderness. Several of the largest citrus projects in the world, together with thousands of smaller acreages, have made the Ridge of such major importance from a citrus standpoint that it is well for us to consider the methods obviously successful there.

Too much care cannot be exercised in the planting of a citrus tree; it rapidly becomes very valuable and will live through many generations. The planting of it is one of the least expensive items in its long history, yet faulty setting often causes trees to be weakened or stunted for years before the cause is recognized, or it may result in physiological disturbances, bringing losses far greater than the cost of more careful setting. If one has occasion to let a contract for setting his trees it might be best to let it to the highest bidder instead of to the lowest. It invariably pays well to get the soil in the best of tilth before setting trees, preferably allow it to lie over for a season, but at any rate thoroughly pulverize it and remove the roots as the accumulation of roots and bunches of grass prevent the soil from settling well about the tree roots when planted, as well as causes it to dry out.

The most important consideration in planting a grove (aside from the soil) is to select good trees—trees with grey-green bark, vigorous looking buds, and a dense mass of fiber roots. The experience of planting many thousands of trees has proven conclusively that invariably the ones which die or do poorly are those having a deficiency of fiber roots. The presence or absence of a tap root seems to be of little consequence, but if a tree

is weak on fibers you will be farther ahead to throw it away. Be merciless in culling out doubtful nursery stock; be merciless again after the tree has been set and made its first growth. All trees have enough vitality in them, if alive when planted, to push out a preliminary growth; in fact this would occur even if the roots were cut off, but if the growth the first year is not strong and vigorous it would be best to discard the tree and start anew.

On the loose sands of the Ridge section only trees on rough lemon stock should be used. This is a highly debatable subject in other parts of the State but with those of us on the Ridge, the question is very thoroughly settled and we know of no one who would consider a commercial planting on sour stock on typical Ridge soil, unless the ground is near the lake level.

The setting of trees is expedited by means of the following method: Stake the land with stakes one inch square set preferably 25x30 feet. Drive these stakes down about fifteen inches, shovel away a hole deep enough to accommodate the fiber roots, putting the dirt on both sides of the hole. Pull the stake and insert the tap root in the hole at such a depth that the crown roots will be level with the surface of the ground. The tap root being on a prolongation with the trunk, the tree will automatically right itself. With the stake, pack the soil thoroughly about the tap root so the tree will not settle, then carefully place the soil *with the hands* about the fiber roots, being careful to spread them out as they originally grew and to thoroughly pack

the soil as it is placed in the hole. Water well on the day of planting and cover with a heavy dust mulch. Trees thus planted are bound to give good results.

By this time we are led to believe that nearly every member of this Society knows the proper way to cultivate a citrus grove on high pine land; how often to cultivate, when to commence and when to cease. It is a subject frequently discussed and printed over and over again in our horticultural publications. Surely there is no excuse for not being conversant with it, yet a glance at many groves indicates that their owners have failed to observe some of the cardinal points of cultivation, the word cultivation here being confined to the use of tillage tools.

Briefly to summarize the methods then, it may be said that cultivation commences about the first of February with an acme harrow and is repeated every two weeks until the commencement of the rains, after which time trees over four years old are merely hoed while the younger ones are kept free from the voracious Natal grass by cultivating a strip six to eight feet wide along the tree row every two weeks. Once during the summer the cover crop is mowed. This cover crop is theoretically of beggar weed but somehow or other it always turns out to be Natal grass or else the very aggressive maiden cane. Shortly after the close of the rainy season, or surely before February first, all groves are plowed solid to a depth not to exceed four inches, thoroughly disced and acmed.

On account of the fact that Natal grass is on the jump every day in the year it often becomes necessary to harrow before February first, but it will usually be found that a winter warm enough to force the grass will also force the trees and after a tree has once started the withholding of cultivation will not protect it from the cold. One must not regulate his grove work entirely by the calendar or by written rule. When we plead for a standardized citrus industry we do not mean everything should be done by rote—we merely suggest the benefits accruing to the grower when he learns the correct reason for doing as he does and if he applies this knowledge the standardization will be to a great extent automatic. If the industry were thus put upon a business-like basis our northern visitors would cease to comment upon the unkempt condition of many of our groves and the inferior quality of our fruit, shipped when it has "70 per cent of color" and 30 per cent cholera morbus.

This paper is not meant to be an exhaustive treatise on any phase of grove culture—it presupposes a general knowledge of the subject on the part of the audience. The title has been chosen largely in order to emphasize to the grower the necessity of analyzing his business with a view of eliminating inexpedient methods and impractical notions, and it is believed the methods in use on the Ridge demonstrate the present acme of Florida citrus culture, also the great success achieved there is due to the intensive efforts and uniform system of culture.

Suggestions for Increasing the Consumption of Citrus Fruits

C. D. Kime, Orlando

It is human nature for us to seize upon a mole-hill, if you will pardon the abuse of the simile, and declare it the "mountain" that bars our path to success and higher prices. But calmer consideration makes us see that it is the multiplicity of "mole-hills" in our way that causes the trouble. One we can label exorbitant freight rates, another production costs, another cost of raw materials and supplies, and yet another lack of advertising to create a demand for our product. All of them are important, all of them big problems but none of them are the insurmountable obstacle we are prone to think them to be.

Florida is no longer a collection of individuals; it is a unity, a State. We are big enough to attack our problems together. And what is more to the point we are so big in this year of 1921 that with the co-operation of the available agencies, there is not one of our problems that cannot be solved. Let us forget, for a few moments, ourselves, the individual, and think in terms of *Florida* the State. Let us attack our problems according to the old fable of the wagoner. This man was driving a very heavy load along a muddy way. At last he came to a part of the road so deep in mud his

wagon mired to the hubs. Every pull of the horses sank it deeper and deeper. So the wagoner threw down his whip and knelt and prayed to "Hercules, the Strong," "O, Hercules, help me in this, my hour of distress." But Hercules appeared to him and said: "Tut, tut, man, don't sprawl there. Get up, put your shoulder to the wheel."

Self help often comes along unexpected channels. I beg leave to submit for your approval and action the following proposition.

FLORIDA ORANGE WEEK

Let us have a real, big, full sized *orange week*, for the State of Florida.

Let us plan this week to open our winter season of 1921-22.

Let us usher in this week with a proclamation declaring the first annual "orange week" for the State of Florida, said proclamation to be duly signed and sealed by our Governor. Have this proclamation backed up by similar manifestoes from the mayors of all towns within the State. Then let us secure the active co-operation of Chambers of Commerce, commercial bodies, newspapers, Rotarians, business houses, both local and State-wide, county commissioners, the Florida Citrus Exchange, fruit shipping compa-

nies, independent growers and shippers, hotel men, drug stores and soft drink dispensaries, Women's Clubs, schools, railroad development departments, and last but not least, and most important of all, the hearty support of every Floridian. A true Floridian is always with us on any proposition for the good of the State.

OBJECT OF ORANGE WEEK

First, to increase our knowledge concerning the use of citrus fruits at home.

Second, to increase the consumption of fruit and juice throughout the whole State during the shipping season.

HOW TO ACCOMPLISH THESE OBJECTS

These objects to be accomplished by publicity through the press; by placing of suitably colored advertising posters and designs in store windows, drug stores and fountains, in restaurants, and on sign boards; by using orange designs on letter heads, and special stamps designed to advertise orange uses. These posters should all illustrate the uses of orange juice, orange recipes, and the healthfulness of the juice as a drink. Let each town have an orange festival, with an orange "float" parade, orange week dances, orange week dinners by various organizations and in the private home use the fruit daily.

As the movement grows, and it is bound to grow, let us plan for an orange show week, and usher in the "*king of fruits*," with a pageant, making "orange week," a real event of each year.

RESULTS THAT CAN BE ACCOMPLISHED

Let us forecast for a moment what we may expect in the way of results from our efforts. During the winter our northern friends visit with us to enjoy our climate. The population of the larger towns of the State will show an increase of from five to forty thousand. It is not too much to say that for three months out of the year we have an increase of population in Florida of 100,000 people. In the land where fruit is produced by the millions of boxes each season, these potential consumers are actually denied the privilege of drinking orange juice. Good ripe fruit is secured with difficulty. Culls and drops are common. Here where fruit is plentiful these potential advertisers are neglected or are overcharged for a poor quality product.

At our drug stores and soda fountains the fresh juice is rarely to be had. We are neglecting an active demand amounting to thousands of boxes annually, that is already at hand. We are neglecting the development of a greater demand among the thousands that through habit or lack of interest are now drinking the poorer syrup and acid concoctions that have literally taken our market by storm.

We are not alone in this position, as from the pages of the "California Citrograph," we learn that the Fruit Growers Exchange of that State is adopting the "See-It-Made" plan. They have installed electric juice extractors in their experimental stands and instead of selling orange and lemon juice from large glass coolers the new way is to extract the juice from each orange in full view of the customer after he has ordered.

This "See-It-Made" way of serving pure fresh juice is the method they are urging for eastern fountains this year. The work is in charge of a Fresh Fruits Drink Department. It takes by this method only eleven seconds to prepare the fresh drink, brimful of ice and sweetened with pure sugar. The price has been raised from five to ten cents and the size of the glass increased from six to ten ounces. Their reports indicate that business under the new method will be both popular and profitable.

That they are alive to the gravity of the situation in this western State, the following editorial from the California Citrograph will show.

"Orange drinks have appeared by the hundreds since prohibition. Either the public has developed a tremendous thirst for orange colored concoctions or the bottlers think they have. Unfortunately many of the preparations contain no orange juice and are lacking in organic salts and acids and the vitamins which give the great health value to citrus fruits. In most instances they are made of sweetened carbonated water, flavored with oil extracts from orange peel, artificially colored and combined with a base of citric acid. It has recently come to the attention of the Bureau of Chemistry that in some instances mothers, misled by the labels, are feeding these 'fake' orange drinks to infants under the impression they were giving orange juice as recommended by physicians. 'The best way,' says the Literary Digest, 'is to buy the fruit and squeeze out the juice.'"

In California the employees, salesmen and growers are urged to order orange-

ade or lemonade and insist on getting a drink from the fresh fruit. For if you will allow another quotation: "It does not take a majority to establish a preference. Any merchant knows that only a few of his customers specify brands. The others don't specify anything. So he carries the goods preferred by the discriminating few with the assurance that these goods will satisfy the less particular."

The very life of our industry in Florida depends on increased consumption of fruit at a profitable price. Demanding limeades and orangeades is a sure way to increase fruit consumption enormously in our own State.

The California product is advertised tremendously. Every point is stressed and dwelt upon. Its defects are declared to be virtues. Even the thick skin is held up to the buying public as a virtue. Why? Because it will easily peel. California does not hesitate to advertise "Sunkist" orange juice. They push it not only throughout the East but also at home. Yet we all know that the Florida product is without a rival in the quantity and flavor of the juice it contains. The Florida orange is literally bursting with the delicious fluid, so full indeed, that it cannot be cut without overflowing. Drinking the juice is a privilege, an aid to health for the invalid, a tonic for the weak, and a pleasure and delight for the robust and healthy.

In order to forecast more accurately the results of an "orange week" representative soft drink dispensers were visited in person from Tampa to Daytona and down the East Coast. A list of ques-

tions were prepared to which the following is a summary of the answers.

Average price necessary for the pure juice drink in large glasses will be eleven cents with war tax included.

With the exception of those stores having a rush period it is better to extract the juice separately for each order in sight of the consumer.

With two exceptions (one at Tampa and another at Mt. Dora), no attempt has been made to advertise pure juice drinks on an extensive scale. These two stores have had wonderful results.

The demand for so-called orange drinks has been great or small in proportion to the attempt made to push the pure juice. In other words, where the pure drink has been pushed, the demand for artificially prepared stuff has materially lessened and disappeared entirely.

The motor-driven juice extractors have proven very satisfactory in those stands where the rush hour is not heavy and yet of sufficient volume to create a need for a faster method than the glass hand press. The glass hand press has been satisfactory in small towns having good trades but no rush hours of any volume.

In those stands having heavy rush hours, the electric driven extractor seems to be too slow. These places need a reserve supply of juice from which to draw. In the larger towns a delivery service of the fresh juice to such stands may be advisable, though the California result of eleven seconds per glass certainly deserves consideration.

One stand from Tampa reports that they have had wonderful success with the motor-driven extractor, paying for

their machine in less than a month of actual use. Their price for an exceptionally well prepared product is fifteen cents.

While many of the men feel that forty to fifty dollars is too high a price for a machine for juice-extracting purposes, not a one was found who was not deeply interested in the juice business and who was not heartily in favor of pushing increased consumption campaigns.

Sources of fruit supply varied according to locality. This means that in larger towns fluctuations in price are to be expected, depending on distance from packing houses, available groves, etc. One man with a nearby source of supply estimated total cost of drink including overhead, at four and one half cents per glass.

The method of squeezing juice out in advance and holding same in large glass containers has been tried repeatedly and invariably brought poor results and failure of the attempt in the end.

With the exceptions mentioned above the only attempt to advertise orange drinks have been by local editorials in the press and by the Florida Citrus Exchange. There is no question that these attempts, small as they have been, have brought results.

With one store in a small town, estimating a box and a half daily average for a four-months season, a very conservative estimate will give us a total consumption throughout South Florida of close to 400 cars of fruit, in drinks alone, to say nothing of the advertising value of such work and the additional fruit that will be sold to tourists for home consumption.

The thoughts left with you herein are not new. They have been advanced be-

fore but never with the time as suitable for action as at present. We need these things, this advertising to the winter visitor, this greater interest among our own people. The glory of achievement belongs to "us." Let us then follow the advice of this "Hercules, the Strong," put our united shoulder to this problem and make progress.

"Squeeze out some golden orange juice,
Stir in some sugar sweet,
Fill brimming full with fine chipped ice,
Then drink—'Tis Florida's finest treat."

Dr. Fairchild: I would like to make a suggestion and I would like to preface it with an experience I had during the war trying to popularize dried vegetables. A Californian got into the game of marketing dried vegetables and arrived in Washington with a carload of all kinds of dried vegetables with the idea of having President Wilson start the ball rolling. Somehow or another he got into my office. I said to Mr. H——, "You can't get President Wilson to eat your dried vegetables." The next idea he had was a luncheon to which he would invite the members of the cabinet and others and this luncheon was to be entirely dried vegetables. I had had some experience in trying to popularize some of these things and so I said, "Don't serve more than three kinds anyway." He thought that would be a good idea, but I saw him leaving the office where he had these things stored with an armful of vegetables. That luncheon remains in my memory and will always remain there. I was invited to it as a member of Mr. Hoover's staff,

which was invited as a body. I was particularly interested in dried vegetables because there is such a promising field in dried vegetables. He started off with dried spinach, dried cabbage, dried Brussels sprouts, dried carrots and dried onions on the beefsteak. By this time even the waiters had become much amused over the situation. The people ate these things, but this particular friend of mine on Hoover's staff, a young lady that I was very anxious to get interested in these things, went back and was deathly sick.

Speaking now as a man who comes down here every winter, I am heartily in favor of an orange week. I have never been able to understand why Florida does not challenge California to get competition of this orange business. There is no topic of conversation that is more interesting and more frequent among northern visitors than whether the Florida or California orange is the best. Now, why is it not desirable during your orange week to pick out men whose veracity on this subject is as reliable as members of the Supreme Court, stage it in one of your citrus centers here and challenge California to sell their best citrus fruit to you and have a try out on this citrus business and let the northerner know whether the California or Florida orange is the best orange? You would get a tremendous amount of business out of it if properly handled and, personally speaking, I believe they would go down in defeat.

Mr. _____: Mr. Chairman, I would like to ask Mr. Kime if he anticipates including grapefruit in his orange week?

Mr. Kime: Personally, I am very willing to include them both.

Mr. Sample: I have another suggestion and that is with reference to the speaker's suggestion of 1921 and '22. I would suggest that 1921 be eliminated and make it '22. It is the kind of fruit that is offered the visitors that is killing all the advertising that has been done. The northerner coming down here to eat ripe grapefruit and oranges goes into the stores and gets fruit that would not be offered by a Dago stand in the North and that is why they don't like Florida fruit. Another thing, we don't have fruit available in September for orange week. Now everybody that is an actual grower and not just a commission man who wants big prices will agree with me in this. January or February is the time for a grapefruit or orange week and I would like to see it a combination week.

Mr. Skinner: Undoubtedly this grapefruit problem, as Mr. Sample has mentioned it, is the real thing we are up against, because we are producing it so fast, but I want to relate an incident that has happened this winter in the Hillsborough Hotel in Tampa and in St. Petersburg. There is a professor there who is called a dietitian, who professes to cure certain diseases. He was arrested for using the mails to defraud. At his trial he had as many men as are here present, men of my age and older whom he had surely cured, and the court threw the thing out without ever letting it go to the jury. It came out in the trial that each of these persons, these men and women, mostly men, were using the juice of four grapefruit every day, and some

of them lemons in addition. I want to tell you it increased the consumption of grapefruit in the Hillsborough Hotel more than twice over and one of the grocery men told me that he just could not keep grapefruit in his store; they took them out as fast as he could get them in. Yesterday I heard some man make the remark that a physician at Lakeland had written some people that he had been following up the uses of grapefruit juice and that he had found that a grapefruit reduced blood pressure. Now, if grapefruit is advertised to do that and if it does it, we are going to have a big market for it if you will just let the market grow.

Mr. _____: If people threatened with influenza will simply undress and go to bed, abstaining from all food entirely for just two or three days and drink nothing but orange juice, they will be both sustained and cured and go out on the fourth day.

Mr. _____: I think it may be of interest to members of the Society to know that within the past week we have had the first reports of scientific investigations as to the vitamine content of grapefruit. Those of you who read the California-Florida advertisements of citrus fruits know that during the last year or two we have been rather guarded in referring to the vitamine part of the orange. We did it because we did not know very much; even the medical authorities at first themselves were just a little bit leery as to just how far claims could be made in that connection. Different statements were made as to the vitamine value of oranges. You understand, of course, that the claim is that the vitamine

element is the health-giving element of fruit and that has been quite clear to me but it was only by assumption that we could include grapefruit. There had been no definite experiments and we assumed a good deal in making grapefruit embrace the same qualities, trying to word our advertisements so that we could escape what happened to Mr. Skinner's friend. However, some exhaustive experiments have recently been carried on, and, as I remember them, they are almost uniform in showing that the vitamine content of grapefruit in proportion to that of oranges is as 8 to 7, so that apparently we have been quite thoroughly justified in including grapefruit.

Now, Mr. President, if I may include just one word more, whenever there is an effort to increase the demand for Florida citrus fruit and I want to appeal to the members of the Florida Horticultural Society as I have to a large number of commercial bodies in Florida, let us quit boosting California. Every time that we start to talk anything about a movement —this does not apply to citrus only—we hear a lot of talk about the spirited advertising of California as compared to Florida. Now, I yield to no man in my admiration for California, the way she does things and so on, but Los Angeles does not have a thing on Miami and the Florida advertisements for the popularizing of citrus fruits. I want to tell you this, which comes from the official record—the California Growers Exchange and the two next largest operators of fruit and fruit products have absolutely changed their plans of campaign made a year or two ago and have adopted almost in ex-

act detail and substituted therefor a plan that the Florida co-operative growers have consistently followed for the last seven or eight years. I am proud of the fact that they have done that for I think it is one thing that we ought not to fail to consider and that it ought in some degree to cause us to be just a little more proud of Florida and not quite so enthusiastically boost California every time we start to talk advertising. I thank you.

Mr. C. D. Kime: Mr. President, I make a motion that the Florida Horticultural Society go on record as favoring an orange-grapefruit week during the year 1922.

It was moved, seconded and passed that the Florida Horticultural Society go on record as in favor of an orange-grapefruit week.

Mr. J. W. Sample: If I may at this time, I would like to introduce a resolution. A year ago I am informed this Society went on record as indorsing what at that time was known as the "No Fence League." I would like to introduce today this resolution: (Reads resolution.)

I would like also to have a copy of this resolution sent to the Legislature—I should say to a member of each House. I should ask a reindorsement by this Society and the indorsement of this bill. I have not read the bill but if the members of the Society want the bill read I will read it.

Mr. W. J. Krome: I doubt whether there is any member of this Society who individually, personally, more heartily endorses that resolution and the bill than I do but this is a meeting of the Florida State Horticultural Society. Under our

by-laws the meetings of this Society are to be devoted to the discussion of the practical and technical side of horticultural topics only and under our by-laws it is made mandatory upon officers to over-rule any motion or resolution which will tend to permit this Society to participate in partisan politics or mercantile ventures. By that by-law I am obliged to ask the chairman to rule that motion out of order.

C. E. Calkins: Will the gentleman who has just left the floor please demonstrate to me what is more important to me than the destruction of my grove by cattle? I think this matter is perfectly incident to our consideration. (Applause).

L. B. Skinner: I will have to side with Mr. Krome although I live in a county where the people have cut the fences into

about six inch pieces and are suffering from cattle like my friend over there and a lot of people do that, and while we could vote on that at a mass meeting I doubt as to the wisdom or the advisability of doing it as a Horticultural Society, although I am in favor of it.

H. H. Hume: I know that in committing ourselves one way or the other today we are treading on very thin ice—I happen to be one of those who are in pretty close contact with the Legislature and I would like for Mr. Sample to have gotten his bill through without appealing to the Horticultural Society but I will have to rule against Mr. Krome. Those in favor of adopting resolutions read by Mr. Sample will signify same by the show of the hand. Opposed same sign. Resolution as read by Mr. Sample was passed.

Some Problems in the Preservation of Citrus Fruit Juices

Seth S. Walker, Tampa

Probably there is not a member of this distinguished Society who does not realize to some extent the importance of the fruit products industry to the citrus growers in particular and to the State at large. It has been freely predicted by those who are in a position to know, that this is the real key to the situation; that the enormous increase in production each year is soon going to out-strip the increase in consumption of fresh fruits and that the only hope of keeping prices up to a profitable figure lies in the withholding from the market of the low grade, off sized, and unattractive article which at present constitutes a large proportion of the fruit shipped. Another, perhaps equally important, factor is the huge amount of drops and packing house culls which now go to the dump, a dead loss. It has been variously estimated that ten to twenty per cent of the entire crop will come under this head. Probably ninety per cent of this wasted fruit, if used at once, is perfectly suitable for manufacture into fruit products. In this connection let me emphasize that "cull" fruits are not as a rule "spoiled" fruits. In fact they are often the sweetest, juiciest fruits in the bins, and are culled out merely because of skin blemishes, thorn

pricks, or other minor defects which render them unfit for shipping long distances.

If the lower grades of fruit now shipped are withheld from the market there will be no difficulty in disposing of the higher grades; and if the dead loss of the cull pile is converted into money, there will be an enormous decrease of the overhead cost per box of fruit marketed, making it actually possible to sell the good fruit at lower prices than are now necessary. Thus the consumer as well as the grower will benefit.

What then shall be done with the low grade fruit? The answer seems easy. "Convert it into fruit products," everybody says in the same breath. But if it were as easy to do as it is to say the future of the citrus growers would loom up bright indeed.

There have been many different attempts made to solve the problem. Some have made marmalades, others jellies, and others candy; some have bottled the juice, and still others have extracted the essential oil from the peel. A number of these endeavors, especially those in connection with marmalade, candy, and juice, have met with a gratifying degree of success, but it is evident to the most casual observ-

er that the citrus fruit product industry in Florida is still in its infancy.

It is not the purpose of this paper to discuss, except in an indirect way, the various reasons why this industry is not better developed. I shall rather confine myself to my subject as it appears on the program and discuss some of the problems which are met in the preservation of citrus fruit juices.

There are several reasons why it is desirable to produce juices, as well as the more usual products such as marmalade and candy. The volume of fruit to be utilized is so great that we need a variety of products in order to get better distribution. The juice is the real, essential meat of the fruit—practically the only constituent for which the fresh fruit is eaten. The bottled juice more nearly resembles the original flavor of the fruit than do any of the other products thus far produced commercially. The juice requires less sugar than do such products as marmalade and candy. There is an enormous demand for all kinds of soft drinks, particularly in these days of desert dryness (of course this argument does not apply to Miami, thanks to its nearness to Bimini!). Not only are soft drinks in demand, but those with citrus fruit flavors are especially popular, as evidenced by the large number of imitations on the market. These considerations leave little room to doubt that there is a real demand for citrus fruit juices.

What, then, are the characteristics of a desirable bottled juice, and what are the difficulties to be overcome in producing it?

It would seem perfectly obvious that the desirable thing is to preserve the juice just as it comes from the fruit with all of its original flavor and appearance, so that the consumer may pour from the bottle the same identical juice that he might squeeze from fresh fruit. This has always been the high ideal of those scientists who have worked with other fruit juices, and it has been the ideal of most of those working with citrus juices. But the difficulties to be overcome are much greater than those encountered with most of the other fruits.

First of all comes the mechanical problem of extracting the juice. With grapes, apples, or berries, the fruit can be chopped up and placed directly in presses, but citrus fruits are built along different lines and have to be handled with more respect. Although there are a few authorities who recommend pressing the whole fruit, most of them agree that it is very desirable if not absolutely necessary to peel the fruit first. If the fruit is not peeled, the juice will contain large amounts of essential oil and of glucoside, which in the case of grapefruit is extremely bitter. A reasonable amount of the essential oil is not objectionable in the fresh squeezed juice, since it adds to the characteristic citrus fruit flavor, but in most cases such juice will, on keeping, develop a decidedly unpleasant "turpentiny" flavor due to changes which take place in the oil. It may be possible to work out methods for treating the juice so as to destroy the bitterness and prevent changes in the oil. In that case it would doubtless be much more economical to omit the peeling process.

After the juice is extracted the next step is the clarification, or removal of cell membranes and other suspended solids. Some have attempted to accomplish this by filtration but in most cases have met with small success because the colloidal, gelatinous material contained in the juice immediately clogs up the filtering medium. I know of only one case where the filtration of freshly extracted juice appears to have been successful on a commercial scale. This company is said to have a special secret process which removes not only the suspended solids but also the colloidal matter which is an inherent constituent of the fresh juice.

Other methods of clarification depend on the use of centrifugal machines (something on the order of a cream separator) and in still other cases the juice is allowed to stand until the solids settle out and the clarified juice can be drawn off from the top. A very important point, on which opinions differ widely, is the *degree* of clarification which is most desirable. This point will be referred to again later on.

The clarified juice must next be pasteurized before it is ready for the market. The problem here consists of finding the happy medium between too much heat and not enough heat. And right here let me emphasize that the average person seems to have an absolutely wrong impression of the real problems involved in preserving citrus fruit juices. Most of them think that the main trouble is to prevent alcoholic fermentation, but this is a great mistake. In fact it is really astonishing how little heat is needed to accomplish this, particularly in the case

of grapefruit juice. However, there are other biological factors to contend with, such as mold growths and certain secondary fermentations which produce a very unpleasant taste. On the other hand, if too much heat is used the delicate fresh fruit flavor is injured and a "cooked" taste develops. Another important factor is the time of heating, and so we must find just the right combination of time and temperature and the best way to apply the heat, in order to secure perfect results.

And now we come to the *real* troubles. A good many workers have solved the above mentioned problems in a more or less satisfactory way only to find that the juice was not permanent. After keeping it for some time—anywhere from a few days to several months—the color turns dark, the colloidal solids precipitate out, and, as a rule, a stale, unpleasant flavor develops. This combination of dark color and precipitated solids renders the product unsightly and unsaleable, for it is a well known fact that the sale of such products depends very largely upon their appearance. A few workers, especially in recent years, have met this situation by following the line of least resistance. That is to say they have given up their efforts to produce a cloudy, natural colored juice and are recommending a product from which all of the colloidal solids have been removed and which has more or less darkened in color.

This brings us right down to the heart of the matter—the real point of my paper—which is a discussion of cloudy, natural colored juice versus clear, dark, unnatural juice. Which is the better prod-

uct? And, aside from the question of real merit, which is the more saleable product?

It seems to me that there can be no serious doubt as to the first question. Surely the ideal thing in all such work is to imitate Nature as closely as possible. Nature has made citrus fruit juices cloudy and of certain definite colors, and any product which does not conform to this description is not fresh, natural juice, whatever else it may be. But the trouble goes deeper than that. For, although it does seem that the colloidal material—the material which gives the juice its natural cloudiness—has little to do with the flavor or food value, the darkening of color is nothing more or less than a mild form of decay and is always accompanied by injury to the flavor. If you should cut a fresh grapefruit and then let it stand around until the outer surface darkened ever so little, you would immediately pronounce it "spoiled" and consign it to the garbage can. Why then, should you use any lower standards for judging the bottled juice?

Nevertheless, when it comes to a commercial proposition—particularly the soda fountain business—there is something to be said in favor of a clear, dark juice. The argument is that the general public, not being acquainted with the appearance of genuine fresh squeezed juice, will nine times out of ten choose a dark, clear liquid because of its resemblance to Coca-Cola and other popular drinks. There is no doubt much truth in this, at least so far as the first trial is concerned, but it seems probable that a customer who could be persuaded to sample both kinds

of juice, would specify the natural colored and flavored product on his repeat orders.

In fact, if a satisfactory product can be made to retain its natural color and cloudiness indefinitely, it would seem to be merely a matter of judicious advertising to educate the public up to an appreciation of its genuineness. It is a very significant thing that some of the largest advertisers of artificial and imitation citrus fruit drinks are laying great stress on the statement that their products are "cloudy like the natural fresh fruit juice."

Please note that this last paragraph contains a big "if"—"if a satisfactory product can be made to retain its natural color and cloudiness indefinitely." That's where the rub comes. Some very creditable products are already on the market and they are getting better with the added knowledge gained from each season's experience, but I do not believe that even the most sanguine enthusiast would claim that perfection has yet been reached. There is still room for improvement. The laboratory of the Exchange Supply Company is attacking this problem with the purpose of finding out the effect of various factors and conditions on the behavior of the juice, so that eventually we can tell just what combination of conditions is necessary to obtain a given result. We have set for ourselves the ambitious goal of producing a perfect natural juice, "Sealdsweet" in the bottle just as Nature sealed it in the fruit. We are making no predictions of the outcome. Other, more able scientists have given it up and said "it can't be done." It is at best a long-time problem, since

it is impossible to tell what a given sample will be like in a year or two years except by keeping it that long to see.

In the meantime we are meeting with considerable discouragement from those who believe that a clear, dark juice is a better commercial proposition than a natural juice. They tell us that our labor is all in vain, since it is a relatively easy matter to produce the first mentioned product. We are open to conviction on this point and should like to get an expression of opinion from those present as to what our goal should be. We have asked advice from many people but find ourselves almost as badly puzzled as a certain man about whom I have heard. This man had a little too much to drink—and it wasn't grapefruit juice either. He approached a passerby with the query, "Mister, can you tell me where ish the other side of the street?" "Why, of course, you simpleton, its right over there!" "Ish that so?, the blanked fool over there told me thish was it!"

Dr. Fairchild: I hate to see an opportunity go by to talk about so interesting

a subject as drinks. It is a fact that the manufacturers of beer for generations attempted and in many countries unsuccessfully to get perfectly clear beer. The German beer very seldom kept at a low temperature, a temperature at which it is kept in this country. As I understand it, when the Americans went into the beer business they ran into the difficulty of a low temperature and it took a great deal of experimenting to get rid of that cloudiness. I think you will find it pretty difficult to get uniform cloudiness in drinks.

C. E. Calkins: I may say that we found a better sale for the clear than for the natural but I don't recommend the drink. So many people say that "This is so weak and insipid looking—that is for women and children." The public know nothing about what grapefruit juice looks like—don't want it. That is not the stuff they want to drink and the real point it seems to me in this connection is that juice like this does not lose any of its flavor, but a clear juice without any coloring or cloudiness either, does look insipid, more so than the natural juice it seems to me.

The Commercial Possibilities of Florida Fruit Products

Miss A. Webster, State College for Women, Tallahassee

Production without conservation is like a foundation without the house. Since the days of the ancients people have made use of two types of conservation, first that of marketing the fresh product, and second, that of preserving it before placing it on the market. Too often, the Florida grower employs only the first method in disposing of his crop. Statistics show that Florida exported \$80,000,000 worth of food products last year and in return brought back \$70,000,000 worth of these same products, a large per cent of which might have been produced within our own boundaries. And, more surprising than the knowledge that they might have been produced, is the fact that a large part of them were produced, and then allowed to go to waste.

Reliable authority states that sometimes as much as ten per cent of the products delivered to the packing house are discarded as culls. This loss sometimes measures the difference between profitable and unprofitable production. Products known as culls are often so called only because of an external defect that does not injure their value for table or canning purposes. Year after year Florida walks by her own packing houses, where these culls lie, on her way to buy similar products put up in containers in

other states, to distribute to her own people.

A visit to three grocery stores in as many localities in the State revealed the fact that only one Georgia and two Florida firms were represented on the list of some seventy-five different factories whose fruit products found their way into the homes in the State. A visit of this kind is like a tour of America. From Washington with her loganberry fields and apple orchards, down the Pacific to the home of the famous Sunkist fruits, across the Rockies to Chicago, St. Louis and New York, with their factories to which center systems of transportation lined with carriers of fresh fruits and vegetables and from which radiate car loads of containers that find their way into all sections of the country. A closer inspection of these shelves further disclosed the fact that all of the products, with the exception of apples and cherries, could have been put up within our own State.

As unthrifty as the situation looks it is not as bad as it has been. About ten years ago commercial canning in this State developed simultaneously along two lines: the home proposition in which individuals working on a small basis put up a fancy product for a fancy price; and

the factory proposition operating on a larger basis put up a commercial product to compete with similar products on the world's market. The introduction of Home Demonstration work into the State in 1912 gave this industry tremendous impetus. During the intervening years there are many instances where exhibits of products made in the home have stimulated the commercial work on both a large and small scale.

A few of the many worthy examples of production for fancy trade from the home kitchen in one season, is the work of such people as:

Mrs. J. J. Willie, Lloyd, Florida, 2,000 containers of figs.

W. H. Haskins, Winter Haven, Florida, 25 gallons of guava jelly.

Mrs. Ballentine, Ft. Myers, Florida, 2,000 glasses of guava jelly; 1,000 glasses of Cattley guava jelly.

Mrs. Barfield, Caxambus, Florida, 2,000 No. 3 cans of guavas; 100 No. 2 cans of mangos; 200 gallons of roselle juice; 2,000 glasses of guava jelly; 1,000 12-ounce jars of orange jelly.

Mrs. Hess, Ft. Myers, Florida, 200 12-ounce jars of kumquats; 400 lbs. of crystallized peel.

Calls constantly come to the Home Demonstration Agents and the Home Demonstration office at Tallahassee for the Florida State College Bulletin No. 34 on Jellies, Preserves and Marmalades. This bulletin has not only gone throughout our own State, but also into every State in the Union. "If a penny saved be a penny earned," then the filling of the home pantry by the girls and housewives is but another method of marketing Flor-

ida products at home. Since the fall of 1918, through home demonstration work there has been reported 3,197,188 containers filled with fruits and vegetables.

Although citrus fruits rank first in point of production they are but one of the many varieties that can be grown. In addition to the citrus, chief among those that lend themselves readily to commercial canning are the guavas, roselle or Florida cranberry, mangos, strawberries and others that grow in abundance throughout the middle and southern sections of Florida, while in the northern section of the State we find figs, muscadine grapes and uncultivated blackberries growing in abundance. There are many others with promising possibilities, but these are grown at present in sufficient quantity to be utilized for commercial purposes. No less interesting in number and variety are the products to be made from these fruits, some of which are, preserves, jams, jellies, marmalades, chutneys, juices, vinegars, pickles and confections. Plans are now under way for the development of a muscadine vineyard in North Florida with an idea of placing grape products on the market.

The demand within our State for soft drinks, such as pepsi-cola, cheri-cola, coca-cola and many other of similar nature is sufficient to pay a yearly revenue of approximately \$3,503,210.88, according to figures obtained from the Internal Revenue Director of the State. Commercial production of the wholesome juice of the muscadine grape and various citrus fruits would in all probability find not only a welcome, but also a ready demand from the public. The juice of the musca-

dine grape which is a native of the State need only to be known to make a place for itself on the market. A satisfactory method of putting up this product has been developed by Mr. Chas. Dearing of the United States Department of Agriculture.

The manufacture of satisfactory citrus products has been only partly solved, but the possibilities seem so great that, in spite of discouraging failures and par-

tial successes the problem claims the time and thought of scientists and manufacturers. The fact that in other sections of the country the commercial production of other fruit products has long since passed the experimental stage indicates that this industry backed by the required capital, necessary training and perseverance can be entered upon with a minimum chance of failure.

Bordeaux-Oil Emulsion Spray

J. R. Winston and W. W. Yothers, U. S. Department of Agriculture,
Orlando, Florida

Bordeaux mixture, one of the standard spray compounds, is generally conceded to be the most effective all-round spray that has been devised for the control of plant diseases. Co-existing with its desirable qualities there are several undesirable features and for this reason numerous substitute materials have been exploited or otherwise introduced from time to time.

The experienced fruit growers of Florida are too well acquainted with the various sprays to need a discussion of the several types, especially their limitation, but for those who have taken up citrus growing more recently a few words of explanation may be justified.

In general, the copper sprays, such as Bordeaux, Burgundy, and ammoniacal copper carbonate mixtures possess fungicidal properties of considerable potency which kill beneficial fungi or those which cause insect diseases as well as those causing plant diseases. They possess no material insecticidal values, consequently scale insects increase rapidly after such sprays are applied, unless proper insecticides are used following these applications. This is especially true where Bordeaux mixture is used for this material

is effective over a considerable length of time.

Sulphur sprays, for example, lime-sulphur, soda-sulphur, and barium-sulphur solutions, possess both fungicidal and insecticidal properties to a fair degree. They are much less effective against fungi in general than copper sprays. The reaction of the sulphur compounds on fungi is milder than copper sprays and operate over a much shorter length of time. On the other hand, these sulphur compounds kill young scale insects and therefore these pests do not increase very rapidly following the application of such sprays.

Because of the very serious scale infestation which is almost sure to follow applications of copper sprays, most fruit growers select the sulphur compounds as a means of controlling citrus diseases. However, conditions for severe infection frequently arise which warrant the use of Bordeaux mixture. Heretofore, when such was the case, several additional applications of oil emulsion were necessary in order to reduce the scale infestation to a normal level, thereby adding no small amount to the annual cost of spray materials and their application. Aside from the scale and white fly increase, rust mites are known to become more abun-

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dant and the injury resulting from them more pronounced following applications of Bordeaux mixture than is the case where no sprays are used.

With this information at hand it was deemed advisable to determine whether or not Bordeaux mixture could be combined successfully with the present day oil emulsions and applied without injury on citrus trees and fruits at various stages of growth. Accordingly, a series of laboratory tests were commenced during the early fall of 1917 with the view of combining these two sprays. It was found that any dilution of the various oil emulsions combined readily with any strength of Bordeaux likely to be used and showed no detrimental effects upon either the Bordeaux mixture or oil emulsion. The first field test of this combination spray was made during the late fall of 1917 on a large bearing citrus grove near Orlando, Florida.

The Bordeaux mixture was prepared in the usual manner, using three pounds of bluestone and four pounds of lime for each fifty gallons, and the oil emulsion was added afterwards to the spray solution with the agitator running. Both "cold stirred" (1) and "boiled" (1) emulsions were used, each in quantities that would give one-half per cent and one per cent of oil in the diluted material. Three applications were made at intervals of two weeks.

(1) Farmer's Bulletin 933, U. S. Department of Agriculture, Washington, D. C. "Spraying for the Control of Insects and Mites Attacking Citrus Trees in Florida."

During the scab spraying seasons of 1918 and 1919 this combination spray

was given rather thorough trials in bearing groves at various points in the State. During the execution of this work trees were sprayed at all stages of growth; on the tender flush, in the bloom and at intervals thereafter, but no one grove was sprayed more than three times with this Bordeaux-oil emulsion combination. Both the "cold stirred" and "boiled" emulsions were used in these tests.

In addition to these a more critical test was made in the experimental nursery at Orlando on seedling grapefruit, rough lemon, and sour orange nursery stock. A part of this nursery was sprayed with 3-4-50 Bordeaux mixture and another part with Bordeaux oil emulsion (3-4-50 Bordeaux plus one-half per cent oil emulsion.) The applications were made at weekly intervals beginning in March and ending in October, 1919. Usually the ordinary "boiled" emulsion was used, but occasionally the proprietary emulsions, such as Schnarr's Spray Formula" and "Fico 60" were substituted. All of these emulsions served equally well.

Again in 1920 extensive experiments to prevent citrus scab were carried on in several sections of the State. Tests were conducted on both nursery trees and bearing groves. At Orlando a nursery consisting of sour orange, rough lemon, and grapefruit seedlings was sprayed twice a month from April until October with various strengths of Bordeaux combined with emulsion at the rate of one-half per cent oil in the diluted material. The sulphur sprays, such as Dry Lime Sulphur, Barium Tetri Sulphide, and Lime Sulphur Solution, used on the basis of equal

amounts of sulphur in the diluted spray, were used along with the Bordeaux for comparison. Bearing trees were sprayed with 3-3-50 Bordeaux and one half per cent oil emulsion at intervals of one, two and four weeks during the scab and melanose season. Both deep well and lake water were used in the spraying. At Orlando and vicinity extensive experiments were carried on for the prevention of melanose and stem-end rot.

While this work was in progress certain rather interesting and important observations were made which may be summarized as follows:

All brands of commercial oil emulsions and miscible oils tested by us, and the government formulae "cold stirred" and "boiled" emulsions were found to combine readily with Bordeaux mixture.

Bordeaux-oil emulsion settled less rapidly and spread more evenly than plain Bordeaux.

Bordeaux-oil emulsion adhered to the sprayed parts as well or better than plain Bordeaux. (2.)

(2) Department Bulletin 785, U. S. Department of Agriculture, Washington, D. C. "The Field Testing of Copper-Spray Coatings."

This combination was successfully made with shallow well and lake waters and with various types of untreated deep well waters except on two properties where slight injuries to tender foliage followed the failure to secure a perfect mixture. Even plain Bordeaux gave injurious results on these properties. These failures were undoubtedly due to unusual chemicals in the water.

The presence of the oil neither increased nor decreased the effectiveness of Bordeaux against citrus scab. This combination spray was very effective against melanose and indications are that it can be used with success against stem-end rot.

The presence of the Bordeaux neither increased nor decreased the effectiveness of the oil against the various species of white flies and scale insects present.

The critical time for the application of the plain oil emulsion following the combination is during the last week in June when the second generation of purple scale have just hatched and are therefore more easily killed.

More than 50,000 gallons of this combination have been applied on fruit, twigs, and foliage of all commercial varieties, at all stages of growth, including the full bloom period, during all weather conditions which permit of spraying operations, and no spray injury was observed on trees receiving the normal number of applications except as noted above. Where the bloom spray was applied, oil emulsion was used at the rate of one-half per cent oil in diluted spray. At all other times the emulsion was used at the rate of one per cent oil in the spray which is the regular strength for scales and white flies. It thus appears that oil emulsion combined with Bordeaux mixture has less tendency to injure tender growth than oil emulsion alone.

Rust mites became much more abundant on trees sprayed with Bordeaux than on unsprayed trees. There was no appreciable difference in the number of rust mites following applications of Bordeaux and following applications of Bor-

deaux-oil emulsion. However, the maximum infestation was reached from two to three weeks earlier than on unsprayed trees.

Scale insects became very abundant and did considerable damage following applications of plain Bordeaux. They became less abundant and did far less damage where the Bordeaux is combined with oil emulsion at the rate of one-half per cent, or one-half the strength usually used against scale insects and white fly. Where Bordeaux was combined with one per cent oil emulsion, followed by a straight oil emulsion spray, scale insects did not increase more rapidly than on unsprayed trees, but became somewhat more numerous than where lime-sulphur was used, at the usual dilutions for controlling fungus diseases.

Bordeaux-oil emulsion spray should never be expected to take the place of the oil emulsion spraying for white fly and scale during May and June and should always be followed by at least a single application of the latter.

Most of the commercial Bordeaux pastes and powders will give satisfactory results if used according to their copper content basis, and can be mixed with the various oil emulsions. Some of them, however, will not mix with the oil emulsion without being treated. This objection can be overcome by the addition of a small amount of lime after the Bordeaux has been dissolved and put in the spray tank. *Severe injury has been reported following the use of a commercial substitute for Bordeaux-oil emulsion. On investigation it was found that the article was in no sense a Bordeaux-oil emul-*

sion combination and should never have been used as such.

The results to date of tests with the Bordeaux-oil emulsion mixture have been highly satisfactory and indicate that it will prove very effective in the control of certain fungus diseases of citrus and that its use is not followed by injury to the trees or fruit or by abnormal increase of scale insects such as follows plain Bordeaux. While it may be too soon to make definite recommendations of it for extensive grove treatments, it seems proper at this time to inform growers on the subject and suggest the desirability of their trying it out in a limited way in this season's spraying. Since plain Bordeaux must be followed by an application of oil emulsion and since the combination of Bordeaux and oil emulsion is equally effective as when these sprays are applied separately, there is no apparent reason why they should not be applied in combination, thereby reducing the cost of spraying operations. To this end the writers will be glad to give through correspondence any further details that may be required by any individual.

W. W. Yothers (after reading paper): I should say that this matter of spraying with Bordeaux-oil emulsion combination is, in my opinion, beyond all question the most serious one that confronts any orchardist who practices spraying. There seems to be no other way of controlling some citrus diseases except by Bordeaux and when you put Bordeaux on the trees then you practically eliminate the benefit which the grower receives from beneficial fungi. This then places the entire control of both diseases and insects on an

artificial basis and that is the real reason that we desire that the horticulturists of Florida should help us out in this matter. We want the growers to use the material three or four times and find out what results they get and see how they like it. Now, Mr. Nichols of Clearwater will follow me with a paper and I am very glad to know that he has a paper and will give you his experiences as a grower and I should say here that I admire Mr. Nichols very much; I think he is one of our very finest growers.

Mr. Hume: Is there any discussion of Mr. Yothers' paper? Any question?

Mr. Skinner: I wish to say that we sprayed with Bordeaux-oil as Mr. Winston and Mr. Yothers have suggested and in one portion of our grove where we had had much stem end rot, during the following year we had much less, hardly any for that matter, and we felt that the Bordeaux-oil did a great deal of good. We felt sure of it at all times but my experience does not prove anything. I want to ask Mr. Yothers how many times a year and at what times he would recommend using Bordeaux-oil spray.

Mr. Yothers: I suppose it is a very

fortunate thing that I am not a pathologist, but last year Mr. Winston kept track of melanose by going out in the groves pretty nearly every week and I was very, very much pleased over the result that we obtained with one spraying with Bordeaux-oil emulsion for melanose. He seemed to know almost exactly the day and the week to spray for melanose and by applying it at that particular time I believe that was enough for melanose.

Mr. Skinner: Would you recommend the oil-Bordeaux spray for the last of April or just an oil spray?

Mr. Yothers: I think we sprayed for melanose as late as the last of May. One thing certain to remember: Anybody who puts Bordeaux on their trees in any shape will practically be compelled to spray the last week in June for scale and I would not wait until the last week in July for it is a critical time in June. I regret that Mr. Winston is not here for really he is a very, very brilliant, highly trained technical man and he has an enormous amount of information about this.

Mr. _____: Will Lime Sulphur Solution mix with Bordeaux?

Mr. Yothers: No.

The Spraying of Citrus Trees

A. C. Nichols, Clearwater

This title might lead you to think that I was going to tell you all about this subject. But actually all I have planned is to tell you how I handle the subject on my own grove, with no intention of offering advice to these experienced growers.

When I first began to spray, and this was when I first owned a grove, I started out with one of these man-power lever 2-plunger pumps rigged up to a 50-gallon barrel and as an absolute novice, since I had never even seen any spraying done. The only reason I can see now for success with such inexperience and inadequate outfit was the surprise on the part of the insects on these heretofore unsprayed trees. I call this outfit inadequate for, while it would handle two nozzles, it was only at a pressure of 80 to 100 pounds, and because of its inability to get over any job at all sizeable and get it done quickly. My only excuse for its use was lack of cash to get anything more expensive. My next effort was to hire power machines. This proved generally unsatisfactory because there were few machines available, they were difficult to get just when wanted and often the work of the operators did not suit me. Then I got a used machine myself but it was of small capacity and I finally graduated some two years ago to a new, large machine having a triplex pump ca-

pable of handling four nozzles or two guns at 250 pounds pressure. Since then we have been able to get out and get a job done with certainty and dispatch.

But no matter what machine a man uses, I believe one of the most potent factors for results from spraying is in thorough work. I have seen a mist drifted around and through a tree which was called spraying. I think a better term for it would be a waste of money, for such work can not be expected to produce results. In my own grove, though we try to spray thoroughly, I have seen where some bunches of oranges were missed by an operator in a lime-sulphur spraying for rust, and this fruit continue to rust right on in spite of the known killing power of the fumes as well as of contact. Then what effective control can be expected of careless spraying, say with the emulsions, where only actual contact kills? In our own grove we first get inside of the trees and thoroughly spray there, then take the outside beginning on the side away from the machine and, if using rods, thoroughly working the nozzles in and out amongst the foliage. We generally go back inside the tree a second time on the opposite side in order to thoroughly cover. We normally spray under 225 pounds pressure. For the emulsions, at the beginning of each

spraying, I take it slow and send the men back repeatedly to see for themselves whether or not they are actually getting the under sides of all leaves. As to whether we use rods or guns depends upon the trees and what we are spraying for. We always use guns on seedlings and always for lime-sulphur sprayings on all trees but for the oil sprayings on budded trees I believe rods with angle nozzles give us more thorough results. On rust sprayings we are not quite so careful when covering the insides of the trees, but for our spring 1 to 40 lime-sulphur application on grapefruit we try to be as thorough inside as out, for only in this way can we get the fruit covered when the new growth hides and shields so much of the new fruit from outside work. As to the amount of liquid used I believe we cover a trifle more ground with guns when trying to do equally thorough work.

Now as to *when* to spray, we have the spray schedule admirably worked out for us by the several men and agencies that are helping us growers in the State. If completely followed, I have no doubt it will accomplish its purpose, that of giving us high-grade fruit, and more of it, from clean trees. But, for my part, while I follow the schedule in a general way, I try to exercise some judgment in its application to my own grove just as I suppose the rest of you do. For instance, I very seldom make any spraying in the bloom but follow it immediately with a lime-sulphur application, on both oranges and grapefruit. On grapefruit I use lime-sulphur solution 1 to 40 irrespective of weather conditions or whether I have

noted any scab on young growth. I do this because this preceding by only two or three weeks a spraying that would be necessary for red spider or rust mites or both, makes that unnecessary and the extra two gallons of lime-sulphur per tank is used as insurance against scab, should scab weather develop. (1.)

(1) Sometimes, by making only this one spraying, I do get some scab showing up on the young fruit, but it does not seem to develop and the fruit outgrows it. Of course, if serious scab infection should begin to show upon new growth, I should probably get out and spray in the bloom.

The application of lime-sulphur solution on oranges at this time is 1 to 66. As to the reasons for making this application at this time instead of waiting until there are spiders or mites to justify it, can only say I would rather do it when convenient than to drop everything else as a matter of necessity; that I would prefer to have no indication of spider at all; and as I believe lime-sulphur solution aids early maturity of fruit, I like to begin as early as possible. I also think it acts as a tree tonic and hence if applied at this time may cause a bit more fruit to stick. This one lime-sulphur spraying, thoroughly done, holds down rust generally until the first part of July and in only one season that I can remember has any further spraying for rust mites been necessary. I have tried to reconcile the statements I have heard at times that for effective rust mite control a spraying is necessary every six weeks with my own experience that two sprayings are ample, and the only answer I have been able to reach is that perhaps we spray more

thoroughly when we do spray than do others who spray oftener. (2.)

(2) Soluble sulphur I seldom use unless I happen to need a sulphur spray at the same time as an oil spray and this does not prove often. In my own experience it does not begin to be as effective in the control of rust mites as is lime-sulphur solution.

I invariably make the oil spraying in the fall, although if feasible I like to wait until the fruit is picked. Of course, if the fruit is badly sooted an earlier spraying is necessary. The spring application depends upon my need. I have been at odds with the spring application, especially on grapefruit, because I have generally gotten oil spotting or shadowing of the fruit and sometimes permanent injury in the form of burns. I have tried different insecticides but with no different results in this respect. Often, when just the right time comes to spray for white-fly, the fruit is pretty small, and these considerations have led me to omit the May spraying unless fly or scale is prevalent enough to make its application imperative. This past year, however, the use of a very weak Bordeaux in the oil spray, and in hard water, that is, at the rate of not over one-half pound of bluestone and lime each, to fifty gallons of water enabled me to make this spraying without producing so much as one oil spot on the fruit that I could discover. And I am perfectly satisfied that the result was due to the addition of the Bordeaux, for in a neighbor's grove where our equipment was used, the same oil emulsion in soft water but without the Bordeaux produced very considerable oil shadowing.

Now sometimes things come up that are not mentioned in the schedule. For instance, some three years ago I had a very bad infestation of Mealy Bug on grapefruit. Wishing to do something, but not knowing what, I sprayed experimentally with lime-sulphur and Black Leaf 40, lime-sulphur and nicoticide, whale oil soap and nicoticide, and with a proprietary insecticide. While all of these combinations appeared to have some effect on the old bugs, shortly afterwards there were great numbers of crawlers so that I was satisfied that my spraying had been ineffective. Yet, in three to four weeks, all of this infestation appeared to be dead. But I never gave spraying any credit for it and learned later that doubtless fungi that attack the Mealy Bug had overtaken and conquered the bugs at last.

Again, when experimenting last year with the Bordeaux-oil combination spray, I sprayed two rows through the seedling grove with it. The seedlings had shown serious ammoniation on the previous crop and in the fall of 1919 I had dosed the trees with twenty pounds of ashes and three pounds of Bluestone each. On the 1920 crop a little ammoniation showed up in July, a little of the young fruit split and fell off and that was the end of it. But on the two rows sprayed with the Bordeaux-oil, although through one of the worst ammoniated sections, no ammoniation showed up whatever at any time. A similar result was obtained on a few pineapple trees where the fruit had previously persistently shown some little ammoniation in spite of applications of bluestone and of ashes.

While mentioning this as one very definite and favorable result from the use of this combination spray, my principal use of it was on grapefruit. Here I did not obtain the results I had hoped for and I have been rather hesitant about discussing them here. But I realize that the trouble might just as easily have been with myself as operator, and probably was, as with the material. And I decided that if you will understand that what I say is not at all intended as any criticism of the spray but simply for discussion, I would tell you what I did. It was used first as a clean-up spray on a block of trees six years of age, before the spring growth came out and also on a few rows in the larger grove. We had a very long blooming season last year and my follow-up spray with lime-sulphur solution 1 to 40 was not put on until April when finally all the bloom had shed. Up until April comparatively little scab infection was noted but just shortly after the April spraying there seemed to be considerable infection on the fruit. There seemed to be no difference, however, where the Bordeaux-oil had been used previously. Later, in June, I saw a few indications of Melanose and it occurred to me that this spray might protect the most of the crop from infection during the summer rains. So I put it on all grapefruit excepting about fifteen trees. This one spraying, but on some parts two if the clean-up spray is counted, did not prevent Melanose (perhaps I should have used more or infection may already have taken place), and the fruit on the unsprayed fifteen trees was certainly just as good as that on the other trees. So,

because of the lack of results as I used it, the heavy dose of scale that followed on these trees, and of its cost, of which I will speak in a moment, I am not, at present at least, in favor of its further use on my grove.

As to cost, I figure the Bordeaux-oil spray cost me about one and three-fourths cents for material and one cent for application for each gallon of spray used. It took on an average ten gallons per tree or a cost for a single spraying of twenty-seven cents per tree. As these trees picked on an average just under six boxes to the tree—they had just a good average crop—it gives a cost per box of four and one-half cents. It seems to me that if many sprayings are necessary for results that my need would have to be very serious—much more so than it has ever been yet—to justify the expense. They would practically be entirely additional to the regular four sprayings and which I figure, at present prices, at about twelve to fourteen cents per box total. I might add that, except for some Melanose, these normal four sprayings give me reasonably clean trees and crops of bright desirable fruit.

Another thing I might speak of in this connection, although it has no relation to the efficiency of the material. The Bordeaux-oil was used in June and of course in July I had to use lime-sulphur for rust. The combination of these two sprays produced a brilliant reddish brown spotting on leaves and fruit. This gradually weathered to a black and persisted on the fruit until picking. I had to explain to every prospective buyer what it was and show how easily it rubbed off, for it

made the fruit appear as though it needed explanation or apology. Actually too, in the early stages of coloring, these spots

hindered the coloring of the skin directly beneath so that when rubbed off the skin showed a mottled green and yellow.

Gummosis and Frenching

Eugene L. Pearce, Clearwater

This is not a scientific paper. I shall mention no measurement finer than the thousandth part of an inch; no time limit shorter than the hundredth part of a second. I shall not differentiate sharply between a fungus, a female bacteria and a group of pupae.

This paper will represent some part of the experience of a plain grower. I trust it will possess one quality worth while—brevity.

And now to business:

Gummosis is a serious matter, when neglected. If noted when tree is first attacked, it is one of the least difficult of citrus disorders to check. Whenever the grower sees gum breaking from the bark of a grapefruit tree or a tangerine—in my section it is chiefly these varieties of the citrus which are attacked—diagnose the trouble as Gummosis and go to work. Should the trouble prove not to be Gummosis, you have ordinarily done no particular harm. If the gumming is caused by Gummosis, you have bettered the situation.

In the above advice, the writer is assuming that Citrus Canker has been virtually eradicated in Florida and that Psoriasis has not yet been listed as an incurable disease.

The treatment for Gummosis is simple. Cut out all bark which seems to be af-

fected by the disease, until bark is clear white where cut. The same rule applies to the sap surface beneath the bark. Scrape it until the wood is white and free of all discoloration, especially of those raised, pulpy spots which seem to be the seats of infection. Examine the tree carefully, the trunk and the limbs, for other evidence of the disease. Treat all gumming, even the slightest, as prescribed.

Three or four days after these surgical operations, when sappy surface is entirely dry, paint all bared surfaces with Bordeaux paste or protexol (Avenarius carbolineum). In rather young trees it is safest to dilute the protexol to half its pure strength by adding whaleoil soap and water. Every grower knows of this treatment. The only element in it which has never been sufficiently emphasized is prompt action. The work is trifling, if done in time. Vigilance and immediate treatment are the chief ingredients in the remedy.

While the "stitch in time" adage is the secret which usually marks the difference between the man who grows oranges for a profit and the man who grows them to look at, with Gummosis, let me repeat, prompt attention is the all-essential.

After such a treatment, inspect the trees attacked at intervals for a recur-

rence of the disease. Nip a recurrence at once. Should you fail to inspect your trees frequently and systematically, or should you neglect to treat them promptly when trouble is found, Gummosis will often become so firmly established, from lower trunk to upper branch and throughout the entire life-system of the tree, that it becomes impossible to check its work of destruction.

Gummosis seems to be a fungous disease, but as this paper is merely in the nature of a few practical suggestions from one grower to other growers, I am only interested in effects and treatment and not in cause or causes. From my personal experience I should say Gummosis is contagious. Where a tree affected by Gummosis is not promptly treated, other trees in the vicinity will often contract the disease. It is recommended that a cloth be spread around the trunk of a tree about to receive treatment and that all bark and scrapings be gathered up carefully and burned.

A new and more deadly form of Gummosis in all probability must be added to the enemies of the citrus—the disease identified as Psoriasis.

The writer has recently lost two vigorous young seedling grapefruit, about twelve years old. One of these trees, in the judgment of several expert observers, was killed by lightning. Tops of other trees close by were slightly affected. The bark about the tree from the crown to a distance of two feet above the ground was entirely dead.

The second tree at first showed no sign of wilting, but the bark about the crown was without life and had much the ap-

pearance of the tree described. It was entirely girdled, but there seemed to be no gumming on trunk or limbs. Trees in the vicinity did not appear to be affected in the least.

Reasoning from the angle of elimination, the tree in question did not seem to be affected by Blight, nor would the usual lightning tests apply. It did not have the appearance of Mal-di-goma. Also the seedling grapefruit is not subject to Mal-di-goma unless strongly exposed by contagious contact, which was not the condition in this case.

It may be that this new manifestation is a physiological disease. Certainly it seems to have the stealthy, deadly action of Blight, but as a preliminary the bark was killed above the crown. The tree was entirely girdled.

There is always the possibility, in the instance cited, of a single-track lightning stroke—somewhat like our ex-President's mind—one of those strokes which had some place in particular to go and went right there.

FRENCHING

Under this head the practical grower is interested in cause, for Frenching in many cases is the result of an overt act by the grower.

Frenching may be caused by any of a number of conditions unfavorable to the health of the citrus. Green vegetation in quantity, plowed under in the summer or early fall, inducing fermentation and greatly increasing the humic acid condition of the soil, will bring about Frenching.

Dead leaves or grass in quantity buried close about a tree will cause the same

condition. I know, for this was a personal experiment.

Deep plowing, thereby breaking more roots than the trees can afford to lose when carrying a heavy top, will sometimes produce Frenching. The working balance between root and branch is often upset by such a practice.

Removing the cover crop from a grove, for any purpose, or failing to grow such a crop once a year, until the humus becomes insufficient, will result in depleted vitality and bring on an attack of Frenching in connection with Melanose and other diseases which are always associated with trees whose reserve of strength is at low ebb.

In building up quickly and renewing the soil bacteria, use organic manures as well as chemical sources of food.

Land not properly drained will cause Frenching and in unusually wet times great and permanent damage to the trees.

Remedy: Avoid the bad practices and experiments suggested above. An orange grove is not a plaything. It is a business, and one that has its problems. There are losses sufficient and unavoidable without courting new trouble. When in doubt, consult the Experiment Station. Let the State of Florida pay for the mistakes which you hanker to make yourself.

Observations of Diseases and Insect Pests of Citrus

C. W. Lyons, Tampa

My observations have been confined more to foot-rot and gummosis than to other diseases. I have, however, found a great amount of withertip in old seedling trees and also in budded trees.

Withertip. It is important to cut back trees affected by withertip. I had occasion two years ago to visit a grove where I recommended that *two* trees affected with this disease be cut back. This was not done, and now there are about thirty-five trees affected, which will have to be cut back practically to the trunk to save them. This quite clearly demonstrates the importance of pruning and above everything else, burning the limbs cut from these trees.

Foot-rot. I have encountered this disease frequently among the old seedling trees, and the greatest benefits which have been derived from treatment have been accomplished by removing the dirt from the base of the tree, back about twenty-four inches, and down under the crown roots, allowing the air and sunlight to penetrate. I have seen more good results from the air and sunlight cure than from any other method. A great many growers use some good disinfectant. However, if the tree is badly affected there is no use treating the roots and allowing the dead and sick wood to remain in the top of the trees. I have seen this

tried, and it has proven a failure for the reason that you cannot expect live sap to circulate through half dead wood.

Sourness. Another disease that goes hand in hand with foot-rot is that of sourness, which is caused from the fermentation of leaves and trash, etc., which are allowed to accumulate and remain in the forks of old budded and seedling trees. If the hollows in the trunks of these trees are not taken care of, it is only a question of time until there will be no trees. I observed one grove where this rubbish or solid matter was removed with a small garden trowel, and a hole bored in the trunk of each tree, at the bottom of the cavity, thereby allowing the water to drain out. This treatment benefited the trees greatly, and in the same grove where there were trees that were not treated, a great many limbs were either blown off or fell down from being badly decayed. This is really a first aid method that costs very little, but naturally the cost of treating a great many trees in a large grove has to be given some consideration. It should not be necessary to have a special man brought in to do this work, as it is very simple, and the grower should have very little trouble in doing it himself. Some growers may contend that this is only a makeshift and would not be a permanent cure for the tree, but from ob-

servation and experience I find it necessary to keep up the work to hold trees of this character in good condition, and keep them from going back.

Gummosis. I have seen some very bad cases of this disease on both young budded trees and old seedlings. I saw one old grove in particular that was run down, and work was commenced in this grove by giving a very liberal application of fertilizer, and in addition there was applied about five pounds of nitrate soda to each tree. During the period, to use a common expression, I might say that the grove was almost "cultivated to death," and was followed by a very bad case of gummosis. The following recommendations were carried out: Cultivation was entirely stopped for a period of seven months, and the wounded places on each tree treated with crude carbolic acid and soapy water, the mixture being made of equal parts. This was applied at least three times to the affected parts, and the results of this method have proved to be very beneficial, and the grove is now in what might be called normal condition.

The Hoeing of Trees, Especially Young Trees. Hoeing trees, especially young trees, is very important. It lessens the chance of insects accumulating and doing harm. Great care should be taken to remove the banks from about the trees, and to see that the entire amount of dirt is taken away from the trunk of the trees down level with the crown roots. Any rubbish, dead wood, etc., which may have accumulated against the banks should be picked up for the reason that it lessens the accumulation of ants.

A FEW DONT'S

Don't give your trees an unusual application of spray material when you are spraying, especially of the oil emulsion, and particularly when the trees are in bloom, as it will burn young growth.

Don't dig a trench around your trees and put bluestone in it and then pour water in the trench thinking you will give your trees a good application, and direct to the spot. This may kill your tree. I have seen this very thing happen twice. If you have occasion to put bluestone into the tree, do not use more than two small pieces, about the size of a pea, as this amount will inoculate them, and probably give you the desired results. I came across one grower who had given them what he called "a good dose" and now he has no trees.

Don't paint the trunks of trees with oil insecticides to get rid of lichens without first diluting it. I saw some fine old trees absolutely killed by this method.

Don't cut a ditch down the middles to the extent of two feet, to drain the land, and especially when trees are in bloom, as this may cause them to shed their bloom. One grower attributes the cutting of these roots to this ditching, and I know of one grove where the trees were thick with bloom and the trees put on practically no fruit last year.

Don't spray with a strong solution of Bluestone to cure *dieback*. I have seen this tried, and it defoliated the trees.

Don't put Bluestone under the branches close up around the trunk of the trees; also don't apply Bluestone during the rainy period.

Don't fill up holes in old seedling trees with cement, without first having all the old dead and rotten wood taken out, for the reason that the cement will do absolutely no good. Dry rot will set in and you can accomplish nothing whatever, by simply putting a cover over the hole, while the real damage is being done underneath by decay on the inside. I have seen several groves where this cement work on trees has been proven a failure for the reason that from the surface everything looked good and sound, but decay was fast rotting away the inside of the tree. I believe that the best method that I have seen has been to chisel or cut out all the affected parts and leave them exposed to the air and sunlight.

Hume: Is there any discussion of this paper at this time? I would like to appoint two committees at this time, first, the Committee on Final Resolutions—Messrs. Edgar A. Wright, R. L. Goodwin and S. F. Poole, and an Auditing Committee to consist of M. G. Campbell, J. G. Grossenbacher and G. W. Peterkin. Before going on with this morning's program, Dr. Mark Sample has a matter which he wishes to present to the Society and I will give him an opportunity to do so at this time.

Dr. Mark Sample: A number of months ago we growers of Polk County from Haines City to Sebring assembled together as the Association of Boards of Trade, and talked over a matter which finally resulted in a committee of three being appointed to draft a bill to be known as "Pest Control Act," which we hoped to have passed in this Legislature, A number of years ago a bill very simi-

lar to this was started but when the Plant Board learned that the functioning of this law if put into effect would come within the jurisdiction of the various County Boards of Commissioners of the counties they immediately took steps, which was right, to kill the bill. We have in this State perhaps the best functioning Plant Board in the United States. A little over a year ago in my travels in California I heard it very favorably spoken of by the Californians and whenever they go to the limit to say anything good of any other country they are going some; and they certainly complimented the Plant Board of Florida in that they said they had watched it very closely and tried to follow. Being one of the committee to draft this bill, I got in touch with the Plant Board and they tentatively drafted a bill which they thought would meet our requirements as growers and still bring it within the functioning of the Plant Board to put into effect.

Some may want to know why we didn't include all the diseases and pests. You could not do that if you were going to have your county commissioners put it into effect or if you were going to leave it to your growers to exercise. Therefore, they have only included in this bill such pests and diseases as it is possible for the grower, under the instructions of the Plant Board, to eradicate or control. For instance, you could not, as a grower, eradicate citrus canker as has been done, nor the black fly and some others; so the Plant Board has seen fit to include in this bill only such as can be controlled by the grower himself under the instructions from the Plant Board. If we should

leave it to our county commissioners to put into effect we would be just where California is as that is their law and they have cautioned us not to make that mistake because very few of our county commissioners are plant men. Now, I am going to read this bill as tentatively drawn by Judge Hunter, the Florida Citrus Exchange attorney, who is interested in this kind of work, and then submitted to the Plant Board. They have made their corrections and again returned it to Judge Hunter for the final touches. This bill that I will read you here is the tentative draft which has not the corrections of the Plant Board. However, the Plant Board drew the original. (Reads bill.)

Growers, the time has arrived in the growing of our fruit when the quality of the fruit we are growing and are going to grow must be improved. This year there will be shipped thirteen million boxes of fruit and the crop for next year is estimated at twenty million. You can all certainly see the necessity of growing good fruit or going out of business. Unless we properly cultivate, fertilize and spray our fruit, keeping it clean and bright, we are certainly going to have to go out of business. It has been coming to that point and it is right on us—it is here now. We have seen during this year of cheap prices, that good desirable fruit has brought only fair prices. However, considering the reconstruction period we have not fared nearly so poorly as some other lines of business.

If I did not spray my grove and you across the road did, it means that you have got to do more spraying and more cleaning up of your grove to bring it in a

proper sanitary condition than you would if I kept mine clean. So we want to see to the man who will not properly spray his grove. If he has insects or diseases sufficient to become a menace, which will be decided upon by the Plant Board, and that can be eradicated, or controlled, if he won't do it, the authorities will go in and do it for him and charge it to his property. I would like to see this Society go on record as favoring this law. It will help us some. It gives each county the opportunity to vote on it. You, in a county, can have it or not, as you wish. We of Polk County believe we want it and if given the opportunity we will have it. We believe if it is ever tried out the rest of you will have it. I am called away this morning and will have to leave now, but I want to leave this in your hands. I hope you will pass a resolution endorsing the passage of this bill. I thank you.

Hume: What is your pleasure in regard to this matter? Shall we leave it now and take it up later?

Mr. _____: I move that we endorse the bill as read.

Mr. L. B. Skinner: This may not be called "compulsory spraying" but that is its name. I am in favor of a bill of this kind. I am in favor of spraying—there are many people who are not, and who are, in fact, absolutely opposed to it. It is a question to which there are a good many sides. This Society is made up of all these different people. This Society has certain work to do and I don't think that endorsing bills of this kind is the business of this Society. I think it is a great mistake. I think it is aside from the order of its business and it is an un-

wise thing to do just at this time. The Plant Board is going to have hard sledding this year to get along; it is going to have hard sledding to have the legislation passed that it needs and it is my idea that we have got to concentrate, that the Plant Board has got to concentrate on as large a program as they think they can carry through and stick to it. Every one of these things will make enemies and, believe me, we haven't too many friends. I think it is a serious mistake and it is not, to my mind, the policy of this Society and I think it is out of order.

H. H. Hume: I listened to the reading of the bill very carefully myself while Dr. Sample was reading it and unless there were some modifications in it I would not be willing to endorse it myself because it requires in that bill the destruction of certain insects and pests which I know cannot be destroyed in Florida and yet that is plainly stated in that bill. It stands for established instructions, names the pests that are to be destroyed or exterminated and I don't think it can be done. Now, I am in favor of a bill of this type if properly drafted but I don't believe this bill will fill the bill. It refers to the extermination of whitefly, to the extermination of pecan scab and refers to the extermination of a number of things that cannot possibly be exterminated, and that clause is so tied up in it that I know what we would be going up against. I know what we have gotten up against in our present Plant Act.

F. W. Raine: I am very much interested in hearing the reading of this bill. I have been in public life about thirty

years in five different states and if there is anything it strikes me that you want to go carefully on it is the question of legislation. I am with a new organization that desires to go into various lines of horticulture and we are coming into the State where conditions such as tropical conditions, insects, diseases and all that sort of thing, are different, although I have had actual training along these lines. Now, I am delighted to hear the Plant Board patted on the back, as it were, and I believe they are patting themselves on the back, but, after all, the laws that we have already are not properly carried out; they cannot be properly carried out. I know myself, having been a State official. To pass the legislation is the last thing. The thing to do is to get something that will work out and give us the desired results. Now, notwithstanding the training and experience I have had, since I have come into Florida I have run into many little technical misgivings here and I think those things ought to be cleared up rather than the passing of new legislation. Now, as a matter of fact in Palm Beach County we have many orchards there that doubtless have almost all the various pests or insects in them if you go after them with a microscope. The laws that have been passed by the State I believe don't apply to many of these conditions and I believe you have got to go mighty careful in passing a bill of this kind. Throw our energies on what has already been done and get results from them. From talking with practical men I think there is an undercurrent of feeling that the Plant Board, for instance, is too chesty and

that the laws are too sweeping and I tell you, gentlemen, while it appears in the State Horticultural Society as one of the finest laws being worked out, etc., under ground you will find that the strongest men and those we are looking up to, feel that there is a lot of red tape about it and we have got to all pull together and work out something satisfactory. I would by all means kill a proposition of this kind immediately.

H. H. Hume: I think, Mr. Raine, you are in a very unpopular place to be talking against the Plant Board, for the most of us are well aware of the wonderful work which has been done and is being done by that institution.

Mr. Mark Sample: As I understand it, this is a tentative bill and the title of the bill is "Pest Control Act," is it not? It is, as Mr. Skinner has just said to you, practically compulsory spraying. If there is anything we need in this State it is compulsory spraying. I believe all the best growers will agree with me that we must have spraying and the only way to have these things is by compulsory spraying. This particular bill is not the one that will be presented perhaps, but is the bill prepared by the Plant Board to be corrected as deemed necessary. It is practically impossible to exterminate whitefly, but, Mr. Chairman, I do think it is very important that we have a bill enacted in our legislature called "Compulsory Spraying."

Mr. M. G. Campbell: From my experience in attending the legislature of this State in 1917 and 1919 I would say that that would be a bad bill for this association to indorse, although I personally am in favor of that bill. If the whole

State of Florida were a citrus-growing State instead of the southern part, it would be a different proposition but had that bill been in effect when we were asking for an appropriation for citrus canker you know what the legislature would have told us. They would have said, "Citrus canker is not included in that bill because you did not know it. We will include citrus canker in this bill and let each county pay for eradication." If we should get black fly we would meet that same proposition in Tallahassee, I am positive. We may have to go there for an appropriation for that purpose and if we do, you know what the legislature would say to us—"Black fly was not in Florida at that time; we will include it in your compulsory spraying bill and let each county handle it." If that had been the case with citrus canker we would still have citrus canker. That is a good bill and I think every citrus man is in favor of it, but I think every citrus man who has had experience in Tallahassee knows what he is up against. When the entire citrus industry was threatened some thought it would be simply a matter of going to the legislature and asking for an appropriation, but, take it from me, it was not such an easy matter to get it. The citrus industry was seriously threatened and if we had had a bill of this kind we would have citrus canker today, although it is a good bill.

Mr. H. H. Hume: I most thoroughly indorse what you have had to say, Mr. Campbell. Any further discussion?

Mr. Skinner: Moved that bill be laid on the table.

Moved and seconded that bill be laid on the table. Motion passed.

The Refrigeration of Citrus Fruits

Paul Mandeville, Orlando

Nothing is so dispiriting as to see a great opportunity passing unimproved. Never mind who said it, this is the dispiriting part of the situation today. The greatest fortunes of the last generation were laid in the reconstruction period after the civil war. There were in those days the hang-overs from the war days, the profiteers and the cunning men, Jim Fisk and Daniel Drew, but who hears of them today when the great fortunes are mentioned?

And what was the foundation of the great fortunes? First of all a basic field of work, essentials, steel, oil, food and I might add drink. The names of the men who made these fortunes are too familiar to recount them. Their methods were, on the whole, commercially sound and honest. Above all, they had vision.

Yet Carnegie said in the seventies that no man would ever make a large fortune in meat, and, behold, how soon was his vision out-run by the Armours, Swifts and the Morrises! And who can say that oranges and eggs are not the great opportunities of today?

I mention eggs because I want, with your permission, to digress briefly from the subject given me, to say that I have observed an opportunity for profit in your groves that is not generally taken advantage of in Florida. I speak with a

broad and particular knowledge of both trade and farm conditions in the poultry industry when I say that there is not only a good profit in raising poultry and eggs for the Florida markets; but you have a wonderful natural range for poultry in your groves, unexcelled anywhere for soil, shade and feed. And without my having much knowledge of the needs of your fruit trees I can see all about me the use of enormous quantities of fertilizers and enormous sums spent for spraying and fighting insects and I can tell you that poultry is an enemy to insects, feeding on them, and where poultry ranges in sufficient numbers, the ground is constantly fertilized.

I also see the splendid groves and splendid poultry where these industries have been combined in Florida. And I have a suggestion to make that I believe is worth thinking about. You men who are used to co-operation should get together in groups according to the size of your groves and the number of head of poultry which one man can care for, and you should get specialists to introduce poultry into your groves. Some of you are good poultry-men and might turn to this development with profit; and there are thousands of skilled poultry-men in the North who would seize the opportunity to come to Florida, did they know the

conditions in their line and if you would see the need of their help and the profit you are letting slip out of your hands.

AGGRESSIVE ECONOMY

Tales of the Chicago fire were still fresh in my childhood. I remember a neighbor who lost property in the heart of the city and who was found the morning after with hammer in hand cleaning off the mortar from the smoking brick. This should not be surprising, but it is human nature to talk a good deal, especially after a great disaster. Our neighbor saw the bricks where his building before stood and he entered at once into the spirit of his problem. Our neighbor died rich.

We have got to forget the aims of yesterday and clean the brick from our own house before we can build again. We have got to build with the bricks at hand. There have been changes too far-reaching for us all to begin with new materials. We cannot borrow freely from one another. All have met the same turn together and all have got to build anew. The sooner we get at this business the better. After glorious times of aggressive expansion, we have got to practice aggressive economy. Let us enter into the new spirit heartily, to win. Economy is not a negative thing. It means the investment of time and money. Economy means husbandry and prevention of waste. As all have been liberal in times of expansion, so all now have got to economize and the problem is a scientific one. We have a great work ahead.

Of the sum represented by the selling price of citrus fruit today, about a third

consists of freight; a third, of packing house charges; and a third, of the growers' costs. There is no profit. If we are to get a profit in the future, we must get it out of these charges, or out of what we can save of the fruit that is spoiled.

What the buyer can pay for your fruit is all you have to work on, and you may be sure he will for some time to come take advantage of every general economy which you can devise and will reduce his price. He is not looking out for your profit but is practicing economy like you. All are buyers and all are doing the same thing. So if growers and shippers are to make a profit, they have got to be aggressive, more aggressive than the buyer and more aggressive than other growers and shippers. You have got to get your brick cleaned first and be the first to build. That is what I mean by aggressive economy.

REDUCING THE FREIGHT AND OTHER SAVINGS

I have said something about one chance for getting a profit or saving in the *grove* and I want to say something of the savings to be made in the freight, and from what we can prevent of the spoilage.

A great deal is said these days about high freight rates in connection with your costs. Like all the rest, we are crying down the other fellow. But do we offer a constructive remedy? There is a constructive remedy for high freight rates and it is to get value for what you pay; better service and, above all, better cars. You need the very best refrigerators because of certain climatic conditions in Florida which I shall mention

later. You have had to stand for using poor and worn out cars which no other section of the country will consent to use. It is the belief of some railroad men that winter shipments do not require as good equipment as do summer crops, so you are asked to use up the old cars. I saw one last week that had a hole in the door large enough to throw a base ball through it. Whatever your needs, these cars are not right and are the cause of grave losses. They make uncertain the benefits of one of the greatest savings you can make today, the saving in ice. And they undo all fine work in refrigeration.

There are today enough refrigerator cars built to the so-called United States standard, and enough more building, to scrap some thousands of these cars that are not only worn out, but never were refrigerator cars in the right sense of the word. I believe it lies within your power to do this thing now. The railroads have taught you how to do it. They tell you how many nails you must put in your orange boxes before they can be used as standard and take the rate applying to oranges properly packed. Why do you not petition the Interstate Commerce Commission for a tariff defining what is a standard refrigerator car, how it must be built and in what condition it must be before the railroad can charge you for refrigerator service? How can the Interstate Commerce Commission refuse this demand for *your* protection with all the definitions now in the tariff put there on petition of the railroads for *their* protection? Why not outlaw these old cars and do it now?

Then there is the saving in ice on fruit that has been pre-cooled. Ice will not be cheap for some years to come. That is one reason why your freight bills are high. The railroads rightly charge you for the ice, for the cost of icing the cars and for the interference to their schedules for frequent icing in transit. Pre-cooled fruit is not iced in transit. The cars are iced once before shipment. When pre-cooling has become general, train schedules can be shortened and further savings made.

Fruit and vegetables that have been well pre-cooled enjoy all the benefits of full icing in transit at the cost of once icing before shipment. In dollars this means that five hundred cars of pre-cooled fruit will save sixty dollars a car in cost for ice or thirty thousand dollars. And one of the pre-coolers completed last fall has done just that. And the pre-cooler is already paid for out of this saving among others.

Another saving is in the price of the fruit and the prevention of decay. All citrus fruit is not equally perishable and some of it is quite hardy. But seedlings and late varieties that are shipped in warm weather are greatly benefited by pre-cooling. Some localities will never be able to solve their losses from decay in any other way. It is not possible to reduce savings from benefits of this kind to dollars as we can in the case of ice because such a figure would be mere guess work, but the savings are very great nevertheless and they are greater in some districts and for some fruit than in other districts and for other and harder fruit.

Pre-cooling is beneficial to *all* shipments when the weather is wrong.

ACTION OF WATER

Now what do we mean by wrong weather? I have seen strong men in tears when the wind was in the east. You who grow vegetables know even better than do fruit growers that the warm, moist winds from the east carry sickness to these products. Fungus and all kinds of parasites now appear to add to the grower's risks. Just what happens is the very same phenomenon that we reverse when pre-cooling. The warm, moist winds, blowing over the fields and through the packing houses deposit their wetness on everything just as the cold dry air of the pre-cooler must take up that wetness again.

It is at this point that most of the past mistakes have been made in pre-cooling and in shipping after pre-cooling. But I shall explain. A simple illustration is this glass of ice water which you see is covered with dew. *Now the dew is forming on the surface of the water even faster than it forms on the outside of the glass, but the dew on the surface of the water is dissolved in the water as fast as it forms, so it is not seen.* Thus the cold water drinks up the moisture from the air and keeps on drinking it up as long as the water is colder than the air. In time, if the ice is not renewed, the water will become as warm as the air of the room and will cease drinking up the moisture from the air. And should something happen to make the water warmer than the air, or the air colder than the

water, then the water will give back its moisture to the air.

So you see that in a country surrounded by the sea and full of lakes and rivers with winds blowing from everywhere, these changes from damp to dry and from dry to damp are constantly recurring. What we must do is to see that they occur the way we want them to. That is what proper refrigeration, properly applied, enables us to do.

But we have to keep the principle of the evaporating and condensing waters always in mind from the time we harvest until the vegetables or fruit are sold and eaten. And when once we commence to refrigerate, we must carry these principles in mind until the end of the journey for we are working with products that are colder than the air and that will attract moisture just as this glass of ice water.

Again, while our perishable is being pre-cooled, it is warmer than the air in the pre-cooler and consequently is giving off its moisture. You can even see it steam, clouds of vapor appearing when the vegetable or fruit is quite warm. And without some provision to take away the vapor in the air, it loses its capacity to cool as well as to take up moisture because, to cool freely, the product must evaporate. Fast pre-cooling is not only better for the product but it requires less of an investment in rooms in which to do the work, because more fruit is pre-cooled in an equal time. There are other savings due to fast pre-cooling and some of them are important. I do not know of any advantages of pre-cooling slowly. The difference in this respect between

cold storing and pre-cooling, or getting the first heat out of a warm, fresh product, is frequently not well understood. It *must* be understood in order to make progress in the art of pre-cooling.

Now all successful methods that I know of for pre-cooling hot products that have moisture to give off, provide a way for removing the water given off. Citrus fruits, most deciduous fruits, berries and watery vegetables contain a large amount of water and have to give off part of it in pre-cooling. So we come back to our glass of ice water and say that modern practice has adopted the so-called open brine methods for pre-cooling, because they are much faster than methods which use brine or ammonia in pipes. Moisture does deposit on pipes in the form of frost, but not in the quantities taken up by the finely atomized open brine. And as the pipes become encrusted with frost, they lose not only their power to take up water, but also their power to take up heat.

Open brine pre-cooling has now been applied in Florida to citrus fruits and has been tried on celery with excellent results.

WORK OF THE EXCHANGE

I need make no apologies for saying that without the backing of certain officers and others interested in the Florida Citrus Exchange, this important development would not have been undertaken, and could not have been carried to the point where we have arrived. I have had long experience in my line with so-called independent packers all over the country and I have met many progressive and broad-minded men, some of whom would

not hesitate to go the limit, within their means, to advance the interests of their associates, and competitors, too, along with their own. All co-operation does not lie in co-operative movements. But I have been captivated by the enthusiasm of these Florida men, and their vision. The specialists working with them were encouraged to great efforts, and all will benefit. You will have to explain to me *why* it was. You may say that their relation to the original and final owners until your products reach the final market, enables them to do things which an independent cannot do and keep his head above water. I do not assume to explain. I simply say that the support given to our efforts by these men was bound to bring results and has brought results of the most far-reaching importance to Florida and the interests represented here tonight. In the discussion that I understand is to follow this paper, I may have an opportunity to tell you some particular applications that have resulted from our recent work together.

I have, of course, only touched on the need for pre-cooling and the changes that will follow in trade practice. When we learned to ride a-horse-back, travelling on foot was a weary way. And when we learned to ride in a Pullman, the old day coach was somehow uncomfortable. I like to walk. No man can tell me that it is better to ride in a Pullman than to walk in the original fashion of travelers. One sees more and feels better at the end of a day's walk than at the end of a day in a Pullman car, at least I think so, but I ride in a Pullman because my business

is to get there in the work which it is my mission to do.

That is the way with refrigeration, when it comes, it stays. And it is not unlike the Pullman car either. Refrigeration is an anaesthetic, it puts all the little parasites to sleep to the journey's end and permits you to do in comfort and certainty what only the most skillful of you can do by watching the weather and governing your day-to-day practice according to the changing conditions. Like an anaesthetic, too, refrigeration enables us to perform operations that without it would be impossible. So soon as refrigeration appears, new trade practices fol-

low in and before we know it, we all have to have it. The most profit is to the man who gets it first. This has been the experience with every product to which refrigeration has been applied; it will be your experience.

I have not been here long enough to speak with authority on some problems ahead of us. In the fifteen months since I came to Florida for this work, I have returned north seven times and have as promptly felt the pull and returned to Florida. Whitman would probably say that I am hooked and don't know it. I may have swallowed the hook; but I can truthfully say that it does not hurt a bit.

Going in Partnership With Nature

W. E. Sexton, Vero

Mr. Floyd has given me the subject of "Packing and Shipment of Citrus Fruit." Why Mr. Floyd continues to put me on the program when he knows that I have only been in your State for seven years, to attempt to talk on a subject to men who have been living here for 25 and 30 years is something I cannot tell.

I do not pretend to know much about packing or shipment of citrus fruit, so you will please bear with me while I take up my lot of time on this program. I will try to make this talk as short as possible. I feel like a "tender-foot" when I get among you men who have had many years of experience. While I am growing some fruit and have a packing house at Vero, yet I am always conscious of my ignorance on certain lines of this work and it was never brought so forcibly before me until last winter when one of the old "hard-boiled" growers in our county who had successfully out-guessed most of the buyers of citrus fruit for the past five or six years, sent word for me to come and buy his fruit. I have a man who works with me in the buying of fruit and picking and when I called on this "hard-boiled" customer I took my field man with me. We looked over the grove very carefully and after getting his idea of prices and number of boxes on the different groves we could tell from our own

estimates that this man had planned a fine trimming for us should we have taken the fruit at his figures. This we did not do and the next day, in talking to one of my friends this gentleman said, "I would like to know why that big tender-foot brought that d—— little 'cracker' with him."

However, I believe that I have been able to get up some information in the past two years of operating our packing house, which might be of interest to the growers who are selling their fruit. First I want all the people who are actually growing citrus fruit to hold up their right hand. Now, I want the people who are selling fruit on the trees to hold up their right hand. Now, I would like to ask a few of these gentlemen who are selling fruit on the trees what percentage of their fruit grades fancy, what percentage goes in the second grade, what percentage in the third and what percentage in the plain. For your own information we have shipped during the past year, up until the time I had these figures prepared for me, 6,562 boxes of oranges. Out of this number of oranges 18 per cent were fancy; 47 per cent were F. G. brights; 21 per cent golden; 5 per cent russetts; 7 per cent plain. We shipped 27,067 boxes of grapefruit, which represents the grapefruit from some of the best groves along the Indian River and

from groves whose owners would almost be willing to swear, if we were to talk to them about buying their fruit, that 50 per cent or more of their fruit would grade fancy. Our records show that only 5.5 per cent of this grapefruit packed out fancy; 23 per cent F. G. brights; 34 per cent goldens; 12 per cent russetts and 21 per cent plains, and I mean by plains that the fruit was so poor and indifferent that we did not want to place our brand on this fruit at all.

Now it is very easy to sell the fancy fruit, and I would be willing to pay a premium of \$1.00 a box for all fancy fruit that goes through my packing house, over any other price which I may pay for the general run of fruit. The result of our past experience with packing fruit is somewhat discouraging as far as buying is concerned, and I believe if the growers in our State, and particularly in our community, do not use the very best method of spraying, the quality of our fruit will deteriorate to such an extent that it will be hard for them to market it at any price. A lot of this fruit does not run uniform and it looks to me like a hopeless proposition, to get a high grade of citrus fruit until some new groves are set, where men have taken some pains in selecting their bud wood with an idea of getting uniform color, size and quality.

It reminds me of the man in Indiana, the state from which I came, who took his children to the country to visit one of his friends. Arriving there he found four big, husky boys, and remarked to the farmer, "I am wondering if you can tell me how I can care for my boys in

such a way that they will grow up like your boys." The farmer said, "I cannot help you out. If you want to grow boys like mine, you would have to begin with your grandfather." I think that the growers of citrus fruit should have a standard of perfection in their minds and try to produce fruit as near this standard of perfection as possible. I have had some experience in improving corn and at one time was a corn judge in my state. You people here who are familiar with growing corn may know that Shelby county, Indiana, has for a number of years taken all the prizes at all the National Corn Shows; a great many of the State shows and some of the World Fairs. Growers there have a score card by which they judge corn, and all growers of any importance keep these score cards before them in selecting their seed corn. They are always attempting to reach this standard of perfection which the score card represents and by doing this they have made wonderful progress in the development of corn in their community.

With this in mind we advertised and encouraged the growers in our community to submit samples at our County Fair so that they might have their fruit judged and get some idea of a perfect fruit. Several of the growers got together and adopted a score card for judging citrus fruit. We gave the qualities which we considered the most important, a certain number of points according to their importance in judging the fruit, and I will read this score card to you in order that you may know what we are doing. The

growers got a lot of good from this little exhibit that we had and it gave them something from which to work and by which to judge their fruit. I believe that it will have a beneficial effect on the crops to be produced in the future.

Uniformity was given -----	10 points
Color -----	10 points
Trueness to type -----	10 points
Quality -----	70 points

Under the heading of quality we had:

Texture and thickness of skin	10 points
Percentage of juice -----	15 points
Sweetness -----	10 points
Acid -----	10 points
Seed: number and position-----	5 points
Flavor -----	10 points
Tissue -----	10 points

We gave quality 70 points because we figured that quality, from a market standpoint, is the most important thing to be considered in fruit. In describing these different points so that the growers would understand them we explained that Uniformity (10 points) takes into consideration color, uniform size and shape. You all know the Color (10 points) we look for in both grapefruit and oranges. Trueness to type (10 points) refers to the different varieties. Quality (70 points) takes into account thin skin with velvety texture, heavy per cent of well-flavored, sweet juice, with enough acid to keep it from being insipid. Seed should be nested near center with as little core and as few seed as possible. Flavor should be pleasing to the taste and

true to variety. Tissue should be free from excessive fibre and coarseness.

In regard to the packing of fruit and preparing it for the market, I think of grapefruit and oranges singly and as individuals. You have, or should have, an ambition and that ambition is to have as nearly perfect fruit as possible for before the close of its career it should find its way into some of the finest homes in our country. In order to do this these fruits must be groomed and dressed up, if you please, the same as an individual, when getting ready to go to any of our large cities, would first think of seeing that his clothes and everything were in perfect shape, in order that he might make as good a showing as possible. The man who overlooks this fact and allows his fruit to go into the market with its "heels" run down and in a shabby condition will find his fruit will receive about the same reception as an individual would who attempted to go in under the same condition. It is very easy for the individual, who prepares himself before going, to get most anything he wants when he gets into the large cities. If he does not prepare he will have a hard time and it is the same way with fruit. The fruit which is well-packed and dressed up and prepared for the big event of its existence, finds open hands to receive it in the Northern markets and men eager to help it along and get it into the very best families. But the indifferent fruit is scoffed at and left standing in the street and as a result is a disappointment to the grower and also the man who has attempted to sell it and distribute it for the grower.

Problems in Shipping Citrus Fruits

A. R. Sandlin, Leesburg

This is a question which concerns more than the grower or shipper, for upon the final solution rests the success and prosperity of the industry as a whole, and this prosperity will naturally spread in all directions and make for better times and conditions, not only for the grower but for the grove labor, packing house labor, the banks and the transportation companies, etc.

The citrus industry has made a large growth within a comparatively short period, and with conditions promising a crop of from 15,000,000 to 18,000,000 boxes for the season of 1921-22 the growers, shippers, the many marketing agencies and the transportation companies are thinking and discussing this shipping problem as much or more than they are the further development of the industry.

The grower is beginning to realize the vital importance of growing the very best quality of fruit possible to produce in his locality; and the time is not far distant when the grower who does not grow a higher grade fruit and does not better his shipping conditions, will be compelled to abandon his grove.

With all grades of fruit, it is important and necessary that the best care possible in picking and handling the fruit from the trees to and through the packing

house into the car be practiced. The once tough and leathery rind seems to be passing to a more sappy and tender condition, and this together with the many different factors that shorten the carrying life of the fruit, has compelled our government and our better thinking people to set to work to better our shipping conditions. The result is better packing houses; better ventilation; better machinery, which is being improved from season to season; and what is probably of as much if not more importance, the pre-cooling plants are beginning to find their place where needed most. In the long warm and damp climate where we grow our fruit we can pack and cool it to that degree which will insure safe shipment under most any and all conditions.

The industry has grown to such a point that it is important that the growers and shippers keep well posted as to the daily shipments so as not to be forced to use improper cars until the transportation companies can furnish sufficient and proper equipment. It is also important not to pick the fruit in foggy, misty or rainy weather, which is too often done merely to hold the crews together. This invariably brings grief and especially so where a pre-cooling plant is not available.

All the above requires heavy expenditures but if judiciously handled, it is an

investment and not an expense and strengthens the confidence in all shipments.

Our crate material has received the most critical consideration during the past season, and rightly so, as the crates should be strong and capable of standing any reasonable punishment which is liable and will come to most any shipment. Therefore, it is necessary that the crate be made of the very best material, well stapled, and made with from four to five cement coated nails to the cleat. They should be loaded into cars, with each box on end, and tightly loaded so as to prevent shifting and breaking; with two strips on the top of the bottom tier, and with a nail in each strip to the box. The top tier should be loaded likewise, one strip to each tier and this strip should be against one side of the car and alternating for each tier. However, the safer loading would be two strips to each tier on the top with the ends of the strip in contact with one side of the car and the other to the opposite side of the car, leaving space for ventilation in each car and between each row of boxes.

As above stated, with the enormous amount of fruit to be shipped and taking into consideration the high cost of material such as boxes, nails, paper, etc., there is no doubt in my mind that the time has arrived when the lower grades of fruit will necessarily have to be shipped in bulk. During this season the packing material and labor have cost in the neighborhood of from 90 cents to \$1.00 per box, after the fruit reaches the packing house, to place it aboard the cars

ready for shipment. The continual flow of this lower grade of fruit from the State in this manner only adds to the cost to the consumer without helping the quality of the commodity. It is somewhat like going into a store and buying a dozen eggs for 50 cents and paying the merchant a dollar for a container in which to carry your eggs home. There has been possibly more bulk shipments from the State during the past season than during all other seasons combined and has proven to be a successful and satisfactory method of shipment. With the fast depletion of the forests and the increasing cost of manufacturing, crate material seems to be settling on a base of higher prices than ever known except during the war and yet the law of averages should bring the prices to a reasonable figure, and especially so if the crate manufacturers will permit the business to revert back to the old quality and on a competitive basis. The present prices only tend to make necessary the devising of some plan whereby the low grades and off quality of fruit must be handled with less expense, if the industry survives with this class of fruit.

In transporting our citrus fruits there are many problems in which we are all more or less concerned and the foremost thought in the minds of the growers and shippers is that freight rates must be reduced. The rates are evidently slated for a reduction but just how much still remains to be figured out and settled on by the shippers, transportation people and the Interstate Commerce Commission. The transportation companies are in a

precarious condition for they fully realize the importance and the necessity of freight readjustment though they are not in a position to and cannot take action because they are hampered in every direction, either by the Interstate Commerce Commission or the Labor Board. Recently the Southern railroads willingly agreed to allow unlimited diversions or re-consignments, after they were convinced that this practice was not being unnecessarily used and that the service for same was figured in with the freight rates, and that the right to divert cars would reduce the claims filed against the carriers. But when the matter was submitted to the Interstate Commerce Commission it was refused.

The Labor Board in Washington has refused, and is refusing the transportation companies the privilege to reduce labor on their respective lines. With the Labor Board dictating wages and the Interstate Commerce Commission dictating rates, it leaves nothing for the officials of the transportation companies to do except try to survive the situation until such time as we growers and shippers will take hold of the situation with the view of having the Labor Board removed and bring the fact before the Interstate Commerce Commission that freight rates must necessarily be in proportion to the value of the commodities transported. About 50 per cent of the gross sales of our fruit, boxes, paper, nails and labor have gone to the transportation people as freight during the past season. For the growers to produce fruit requiring from ten to twelve months to make and to invest in

packing material, and then have 50 per cent of the gross sales deducted for a service of from six to ten days transportation is nothing short of suicide for the industry and will bring conditions to such a point that transportation must necessarily be figured out in some other manner and on some other basis.

It seems to me that the time schedule of these cars in transit is also important as the transportation companies are now taking from 50 to 100 per cent more time to transport the cars to destination than they did five years ago. The more or less dilapidated condition of the equipment and cars together with the extra time for movement to destination, has caused the growers an almost inestimable loss, not only on specific shipments, but by poisoning the minds of the receivers to the extent that they fear Florida citrus fruits are weakening to such an extent that the elementary risk is more than they are willing to take, without an excessive allowance in this direction.

We must have more cars that are better equipped for the protection of the fruit in transportation, both during warm and cold weather. Our present refrigerator cars are inadequate to move the bulk of fruit and are in a very bad physical condition and are not protecting the fruit as they should; neither are they holding or maintaining ice as outlined and planned by the refrigerating engineers. Statistics show that there is entirely too much difference in temperature between the first and second tiers of fruit. A car fully iced will refrigerate the contents until the ice has melted away one-third and

will retain that temperature until the ice has been reduced to one-half. After that the temperature of the contents will begin to rise and with the present equipment of cars and the long distance between the designated icing stations this does not seem to be sufficient to carry the fruit between the regular icing points. Hence, we find on practically all shipments heavy extra icing charges which were necessary between the designated icing stations from the different original points of shipment.

The refrigerating car service people have placed orders for about 10,000 cars which will still be inadequate to handle the volume of fruit from the State and take care of the commodities from the other states that require refrigerator cars when our fruit is going forward. The situation has reached such a serious point that the growers on the Pacific coast are now trying an experiment with refrigerator boat shipments through the Panama Canal to the Eastern markets. Two of these shipments have already arrived and their condition was highly satisfactory. The shippers of this State are watching the experiments very closely and I understand that there is a large company in the East which is now ready to figure with the growers and shippers of this State on the transportation problem, with the view

of building boats to carry such shipments, either under forced ventilation or under full iced refrigeration. If boat shipments meet their expectations and prove satisfactory to the receivers, there is no doubt that many boats will be converted and properly equipped for the handling of perishables; and if it were possible to secure reasonable rates from the different seaport points to the inland markets, it would relieve the congestion and would eventually expand into large export shipments which we will need within a very short time. And unless the transportation people or the refrigerator car companies are more particular and come to the relief of the situation we will no doubt be compelled to encourage the water transportation in order to move the bulk of the different perishable products from our State.

If we will set to work to grow a better quality and a higher grade of fruit, using every discretion in the grade and pack, and insist upon a faster schedule and better equipment, cheaper rates and better shipping conditions, we will no doubt push forward and prosper and the industry continue to grow and expand and meet fully the expectations of all the growers who are operating and co-operating economically for the betterment of the conditions of the industry.

Annual Reports

REPORT OF AUDITING COMMITTEE

We, the undersigned, your Auditing Committee, beg to report that we have carefully examined the books of the Secretary and Treasurer, finding them correct.

M. G. CAMPBELL, *Chairman.*

GEO. W. PETERKIN.

April 14, 1921.

REPORT OF SECRETARY

Cash Account to April 14, 1921.

Receipts

Receipts from membership fees, interest on bank deposits, sales of back re- ports	\$4,284.93
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Expenditures

19 bills including remittances to Treas- urer	\$2,297.45
Balance on hand	1,987.48
Total	\$4,284.93

REPORT OF TREASURER

Treasurer's Account on April 6, 1920.

Receipts

1920	
May 7, To balance in treasury	\$1,149.73
July 24, Secretary Floyd	1,600.00
Sept. 14, Interest	1.38
Dec. 10, Interest	21.49
1921	
April 6, Interest on Bonds	61.00

\$2,833.60

Credits

1920	
May 12, By \$1,100.00 L. Loan Bonds	\$ 988.62
Oct. 22, By \$600.00 Victory Bonds	593.00
1921	
Feb. 12, Telegrams	1.00
March 7, E. O. Painter Printing Co.	1,171.60
April 6, Balance	79.38

\$2,833.60

W. S. HART, *Treasurer.*

REPORT OF EXECUTIVE COMMITTEE

Meeting of Feb. 16, 1921.

The Executive Committee of the Society held its usual spring meeting in the office of President Hume at Jacksonville, on February 16, 1921. The meeting was called to order at 10:30 a. m., there being

present Messrs. Floyd, Hume and Niles and Hubbard by proxy; and Messrs. Frank Stirling and A. A. Coulter as visitors.

The minutes of the meeting of May 6, 1920, were read and approved. The

dates for the thirty-fourth annual meeting of the Society at Miami were set for April 12, 13, 14 and 15. Plans for the program of the meeting were discussed in detail.

The resignation of P. H. Rolfs as member and chairman of the committee was read and accepted.

Mr. Frank Stirling, chairman of the Membership Committee, outlined his plans for a membership campaign. They were discussed in detail and approval given. Mr. A. A. Coul, chairman of the Publicity Committee, discussed the plans of his committee for advertising the Miami meeting.

The secretary brought to the attention of the committee that the Society lacked \$931.64 to complete payment of the printer's bill. The treasurer was instructed to complete payment of this account by means of a ninety days' trade acceptance. Plans for raising money to take up the

trade acceptance were discussed, but action was deferred until the annual meeting at Miami. There being no further business, the committee adjourned.

Meeting April 14, 1921.

The Executive Committee of the Society held a meeting in the Central School building at Miami on the evening of April 14, 1921, there being present Messrs. Hume, Niles, Hubbard and Floyd.

The minutes of the meeting of February 16, 1921, were read and approved. The secretary reported a total of 1,867 members to date. He was instructed to have the proceedings printed in amount of one hundred copies exceeding the total membership at time of going to press.

The deficit reported at the February 16th meeting was discussed and it was decided to raise the amount by subscription. There being no further business, the committee adjourned.

REPORT OF MEMBERSHIP COMMITTEE
(Frank Stirling, Chairman)

Your committee respectfully submits a report of the membership of the Society for the year 1921.

The following table briefly shows the growth of the Society for the past twenty years.

Year	Place of Meeting	Patron Members	Honorary Members	Life Members	Perennial Members	Annual Members	Total
1902	Tampa -----	2	51		362	415	
1903	Miami -----	3	55		744	802	
1904	Jacksonville -----	3	59		553	615	
1905	Jacksonville -----	3	63		512	578	
1906	Jacksonville -----	3	73		459	535	
1907	St. Petersburg -----	2	79		608	689	
1908	Gainesville -----	2	83		597	682	
1909	Daytona -----	5	81		509	595	
1910	Orlando -----	5	89		440	534	
1911	Jacksonville -----	4	94		417	515	
1912	Miami -----	4	96		773	873	
1913	DeLand -----	4	104		665	773	
1914	Palatka -----	4	108		864	976	
1915	Tampa -----	4	110		873	987	
1916	Arcadia -----	4	114		608	726	
1917	West Palm Beach -----	4	113		553	670	
1918	Fort Myers -----	4	119		840	963	
1919	Orlando -----	3	121		1244	1368	
1920	Ocala -----	21	3	134		1469	1627
1921	Miami -----	31	5	133	8	1777	1955

Resolutions

GOVERNMENT LABORATORIES AT ORLANDO

Whereas, The investigations of insect pests and diseases of sub-tropical fruits being carried on at the Government Laboratory at Orlando, Florida, are of inestimable value to the citrus fruit industry of the State; and

Whereas, It is recognized that a careful study of the organisms causing scab, melanose and stem end rot of citrus and their reactions to varying conditions of weather, etc., is of vital importance in formulating economical and effective methods for their control; and

Whereas, The appropriations for the furtherance of this work have not been increased in a number of years, so that owing to lack of funds and insufficient personnel and the increasing amount of work resulting from the growth of projects in hand and the taking up of new work, the output is unavoidably slow; and

Whereas, It is of increasing importance that a thorough study be made of the life-history of the various insect pests of citrus to formulate more efficient and economical methods of controlling them; and that a study be made of the parasitic enemies, both insect and fungus, of the insects attacking citrus, with a view to their future introduction into the State; and

Whereas, It is of paramount importance that increased funds be forthcoming immediately for the purpose of expediting the work on the insect pests and diseases of citrus now under way so as to release reliable information at as early a date as possible;

Be it Resolved, That the Florida State Horticultural Society express its deep appreciation to the Hon. Secretary of Agriculture for the valuable work being carried on in the State by the scientists of the Department of Agriculture and respectfully requests his support in obtaining increased funds for the furtherance of the work;

And Be it Further Resolved, That copies of this resolution be furnished the Congressmen and Senators from Florida.

H. H. Hume: At various times we have had before this Society Mr. Yothers and Mr. Winston. The moneys asked for under this resolution and the request for continuance of the work, is the work being handled by Mr. Yothers and Mr. Winston very largely and knowing that work as I have known it in the past, and knowing the quality of the men that they are, I am very sure you will agree with me when I say that no more important work has been carried on in the State of Florida and it has been of inestimable

value to the industries in which we are so deeply interested and in which we are engaged. You have heard the resolution as read—those in favor of its adoption will let it be known by saying "Aye," opposed "No." The "Ayes" have it and the motion is carried.

H. H. Hume: Ladies and Gentlemen, there is a matter that I want to bring to your attention in connection with our membership at this time. For many years Prof. and Mrs. Rolfs labored very diligently in this State and very much of the upbuilding of our horticulture in Florida has been due to their efforts. He

is a life member of this Society and Mrs. Rolfs also has been a life member—members for at least twenty years. I think it would be a very nice thing as recognition of their connection with this Society during these many years to elect these two members to honorary membership in the Society. (Applause.) I believe that means that you approve taking care of the matter along this line.

Moved by Mr. Skinner and seconded by Mr. Goodwin that we elect Prof. and Mrs. Rolfs to honorary membership in the State Horticultural Society.

Motion carried.

APPROPRIATIONS FOR INSTITUTIONS OF HIGHER LEARNING

Whereas, Florida's State institutions of higher learning have not been financed adequately in the past to keep pace with the increasing numbers of young men and young women who wish to avail themselves of the educational advantages for which those institutions were established, and has resulted in large numbers of our young people having to forego the education they had hoped to secure; and

Whereas, The same lack of financing by the State has seriously curtailed the work of the Agricultural Experiment Station, placing a great handicap on the development of the horticultural, agricultural and live stock industries; therefore be it

Resolved, By the Florida State Horticultural Society in convention at Miami

on April 14, 1921, that we urge upon the members of the 1921 Legislature, the appropriation of the full amounts recommended by the Board of Control for: The Florida State College for Women, Tallahassee; the University of Florida, including the Agricultural College, the Agricultural Experiment Station, and the Extension Work, Gainesville; Florida School for Deaf and the Blind, St. Augustine; and the Agricultural and Mechanical College for Negroes, Tallahassee; and

Be It Further Resolved, That copies of this resolution be furnished to Governor Cary A. Hardee; to each member of the Senate and of the House of Representatives; and to each member of the Board of Control.

Passed.

NO-FENCE LAW

Be It Resolved, By the State Horticultural Society of Florida, comprising a membership of two thousand growers, at its thirty-fourth annual session in Miami, Florida, that;

Whereas, At the thirty-third session the platform of the Florida No-Fence League was unanimously indorsed, and

Whereas, The Agricultural and Horticultural interests of the State are of prime importance and are the hope of the State's future greatness, and

Whereas, The encouragement and protection of the industry by proper and reasonable laws, respecting the prevention

of the roaming at large of live stock is the next step of prime importance; Now therefore

Be It Resolved, That we heartily indorse the proposed bill to prohibit the running at large of domestic animals within the State of Florida.

That a copy of this resolution be sent to Senator Oscar M. Eaton and Representative F. P. Foster and that telegrams be sent by the secretary to the Speaker of the House and to the President of the Senate of the present Legislature, evidencing this indorsement.

Passed.

Election of Officers

On Thursday evening, April 14, 1921, the following officers were elected for the year beginning January 1, 1922, and ending December 31, 1922.

PRESIDENT—H. Harold Hume.

VICE-PRESIDENTS—L. B. Skinner, W. J. Krome, S. F. Poole.

SECRETARY—Bayard F. Floyd.

TREASURER—W. S. Hart.

EXECUTIVE COMMITTEE—L. D. Niles, B. L. Hamner, Frank Stirling.

Selection of Next Meeting Place

At the evening session on April 14, 1921, Lakeland was selected as the meeting place for the thirty-fifth annual meeting of the Society in 1922. The exact time of meeting will be set by the Executive Committee at its annual spring

meeting in 1922. The invitation for Lakeland was extended by Mrs. Geo. W. Peterkin. Invitations were extended by representatives from Gainesville, Tampa and Orlando, but were withdrawn in favor of Lakeland.

Final Resolutions

Edgar A. Wright, Chairman

The Florida State Horticultural Society, in thirty-fourth annual convention assembled, is mindful of obligations under which it rests, to numerous individuals, and others, and being grateful, wishes to express such gratitude as is possible and adequate, and therefore be it

Resolved, That we thank the city of Miami for its hospitality and we lay our tribute at her feet in expression of amazement and wonder at her marvelous growth and extreme beauty. That we thank the School Board of Miami for the generous offer for the use of the school building auditorium, where our meetings have been held, and we congratulate the citizens on the possession of such a building. That we thank the officials of the Miami Beach Aquarium for throwing open their doors to members of our Society, and we recommend them for the excellent work that has been done in collecting rare specimens of sea life, believing that this is the best aquarium south of New York City.

That we thank the managers of the Exotic Garden Exhibit, Messrs. Donn, Reasoner and Soar, for the beautiful exhibit of exotic shrubs and flowering plants presented by them in the auditorium of the Halcyon Hotel, believing that the equal of this exhibit of such exotic plants has probably never before been shown in this

country. And we also appreciate the efforts of packers and individuals for the display of citrus and other fruits, believing that they are the superior in quality of any like fruit grown anywhere in the world.

We appreciate the efforts of the U. S. Plant Introduction Garden and of Dr. David Fairchild, and we commend the part he has personally taken in our program, and we recommend that the work of the Garden be continued and enlarged.

We thank J. S. Raney, county agent, for his efforts in our behalf in making all the detailed arrangements for the successful conduct of our proceedings and for our comfort, and we congratulate Dade county for having as agent a man so efficient, courteous and untiring in his efforts in behalf of others.

We thank the railroads of Florida for giving us a rate and a half for the round trip to the convention.

We thank those responsible for the offer of automobiles which made the motorcade to Redlands possible, and we also thank the management of the Deering Estate for throwing open the gates of the estate grounds for us.

And, finally, we thank the officers of our society for good work, regretting that Treasurer Hart is not here to receive these expressions of good will.

Report of Committee on Necrology

W. W. Yothers, Chairman

The Committee on Necrology has the sad duty to report the deaths of the following members:

T. I. Arnold, Oak.
George W. Adams, Thonotosassa.
James C. Carver, Sutherland.
E. E. Cannon, Gainesville.
J. P. Felt, Eustis.
H. A. Hempel, Gotha.
Charles J. Haigh, Philadelphia.
Dr. T. G. Julian, Clearwater.
A. S. J. McKenney, Stanton.

Andrew McAdams, Melbourne.
W. W. Mann, Winter Haven.
Chas. Pugsley, Winter Haven.
John Schnarr, Orlando.
David H. Scott, Arcadia.
Edward Scott, Arcadia.
W. N. Wilson, Gainesville.

Appropriate biographical sketches follow. These have been especially prepared to show the part the deceased members had in the development of the citrus industry.

T. I. ARNOLD

Mr. T. I. Arnold was born near Byron, Ga., June 16th, 1860. At the age of twenty-four he came to Florida and engaged in orange culture near Anthony, Marion county. After the big freeze, because of which he lost his grove, he became manager of a phosphate mine owned and operated by Mr. McDowell, in whose employ he remained for some years. Later he again took up orange culture in the employ of H. B. Stevens, at Citra, Fla., where some of the finest oranges in the State are grown.

Still in the employ of Mr. Stevens, some years later he moved to Orlando, where he entered the pineapple industry, in which he spent eight or ten years, during the last four or five years being associated with J. C. Talley in the business. Owing to the difficulty of competing with

the Cuban growers of pineapples, also those of the east coast of Florida, the work at Orlando had to be abandoned, because the price received for fruit was not sufficient to compensate for trouble and expense of raising the fruit under cover.

During the first year of his stay in Orlando, in January, 1896, he was married to Miss Pauline Pugh, a teacher in the Orlando High School, whom he had known ever since coming to the State.

In 1905 Mr. and Mrs. Arnold removed to Jacksonville, where they bought a home, and where Mrs. Arnold taught for years in the Duval High School.

During the remainder of his life he was engaged in the lumber business at Oak, being manager and part owner of the Arlo Box Company.

GEORGE WILLARD ADAMS

The subject of this sketch, familiar to many of the older members of the Florida State Horticultural Society, for he and his wife were most enthusiastic members for many years, passed away on January 3d, 1921, at the ripe age of eighty-three years and six months. In 1837 George W. Adams was born in Northbridge, Massachusetts, moving from there to Milford in his boyhood. Until young manhood he spent his time on his father's farm. The call of business in Boston came to him and he went there to live prior to 1867.

In July, 1868, he married Miss Hattie S. Humphrey and they made their home in Chelsea for a few years; in 1873 Mrs. Adams died. For some years Mr. Adams and his older brother represented the Davis Sewing Machine Co., throughout the New England States, with headquarters in Boston. After a few years his health failed and his physicians ordered him away from the cold climate. In March, 1875, he married Miss Elizabeth Conant, and they immediately left for Florida, where they spent the remainder of the winter. Mr. Adams improved in health and their next move was to Iowa and Colorado. In 1877 they came to South Florida to live.

Mr. Adams was the first Northern settler to get his homestead from the gov-

ernment and settle at Lake Thonotosassa (Lake of Flints), Hillsboro county. He and another would-be settler traveled by wagon over a large portion of South Florida but found nothing so beautiful as this lake. Here they became pioneers in earnest. There was no railroad as far south as Tampa until 1883, so these travelers from the North went to Cedar Keys thence by boat to Tampa. When he had his land cleared so a house could be built, the lumber was ordered from Pensacola and one can imagine the wearisome days they were hauling this lumber sixteen miles through the pine woods to the present location. Mr. Adams said, "he could feel himself getting better every day," and he did entirely recover from the tubercular trouble with which he was affected.

He set out orange trees, going miles to get trees or nursery stock to put in his grove, then he raised quite a stock of nursery trees, supplying many of the newcomers with trees for groves. Mr. Adams set out about twenty acres in grove but recently sold out all but five acres surrounding his house when he found his strength was not sufficient to care for so many trees. In 1892 he put in an irrigating system that gave the finest results in watering the grove, and gave him more uniform crops yearly.

JAMES C. CRAVER

Mr. James C. Craver was born at Jonesboro, Ill., December 27, 1849. Early in boyhood he gave evidence of that eager desire for scholarship and knowl-

edge which lingered with him to the end. He was a studious lad. Stories are still abundant of his taking his books to the field and resting his tired horse often

that the boy's mind might gather some more gems of poetry from the book on the stump or fence corner before him. After reading all the books he could find in the neighborhood and passing through the public schools, he entered the University of Illinois. Here he made fine progress, and would have been graduated with honors but for the collapse of his health. In his senior year he was forced to abandon his beloved studies and begin the fight for his life. After a second collapse he determined to seek a warmer climate and selected Florida.

He journeyed by boat and rail to New Orleans. From there he sailed May 18, 1877, for Tampa on the Lizzie Henderson. He landed in Tampa, May 22, 1877, and soon thereafter settled at what is now called the Tampa-Ozona cross roads, where he took out a homestead in the midst of the piney woods. Here he undertook the colossal task of developing a home, without capital, without food and without strength. His diary, which he kept through life, bears most eloquent testimony to the hardships that he suffered during his early days and his humility at

times in having had to borrow the necessary food to sustain life until he could become established. With dauntless determination he struggled on and was rewarded by a great improvement in his health and by seeing the orange and lemon grove which he planted on his homestead develop into a property of value.

With the permanent recovery of his health, Mr. Craver began to prosper in business. He had the first postoffice at his homestead, which was called "Yellow Bluff" and was commissioned on September 10, 1886. This name was afterwards changed to Ozona. After the town of Sutherland was started, he built a store and opened a mercantile establishment, added a line of drugs, became the postmaster, a notary public and general consultant for the entire community. He was conservative and wise in investing his earnings and soon accumulated considerable property. On February 25, 1920, he died, being survived by a nephew, David Craver, of Tampa, and two nieces, Miss Alice Craver and Mrs. Mary Williford, both of Sutherland, Fla.

JOSHUA PITT FELT

Mr. Joshua Pitt Felt was born in Bigg Flats, N. Y., December 7, 1844. Removed to Emporium, Pa., in early childhood with his parents, where he spent the greater part of his life, being engaged chiefly in merchant milling. He became interested in citrus fruits in 1885 and came to Emporia, Volusia county., where

he planted his first orange grove, and where he built his winter home. His faith in the future of the orange business was never shaken by subsequent freezes and he was actively engaged in the growing and shipping of citrus fruit from 1885 until his death in Eustis, July 3, 1919.

HENRY A. HEMPEL

Mr. Henry A. Hempel, founder of Gotha, Orange county, Florida, and a former member of the State Horticultural Society, died March 31, 1920, at Buffalo, N. Y.

Mr. Hempel was born in Waltershausen, Gotha, Germany, on October 21, 1836, and after the early death of his father, a weaver, he became an apprentice in a large printing establishment. Coming to the United States in 1867 he followed his printer's trade in several Western states, coming to Buffalo, N. Y., in 1876. He had in the meantime become an American citizen and decided to make Buffalo his home.

Mr. Hempel is the inventor of the printer's metal quoin which is now used all over the civilized world in printing establishments.

In 1879 Mr. Hempel took his first trip to Florida in a search for better health, and was so enchanted by the climate and

natural beauties that he purchased a large tract of land in Orange county, near Orlando. Here he established the village of Gotha, named in memory of his birth place, building himself a handsome residence and bringing to it as permanent settlers many German-speaking families. For the next thirty years he continued to make Florida his home, going North to Buffalo each summer to look after the manufacture of his printer's quoins.

Mr. Hempel was much interested in orange culture, establishing and operating a number of groves, and brought to southern Florida a number of improved varieties of economic plants and breeds of stock.

He is survived by his widow and four children, Mrs. F. L. Lewton, of Washington, D. C.; Adolph Hempel, of Sao Paulo, Brazil; Mrs. J. C. Lang, and Otto F. Hempel, of Buffalo.

DR. T. G. JULIAN

Dr. T. G. Julian was born Sept. 19, 1864, at the old home place near Frankfort, Ky., which had been the home of the Julians for four generations. He attended and graduated from the old Kentucky Military Institute, then studied pharmacy, graduating with high honors at the School of Pharmacy, Louisville, Ky. He then went into the drug business in Mt. Sterling, Ky., where he remained for eight years.

He had suffered with rheumatism for fifteen years so in 1894 he came to Flor-

ida for his health. From that time he made a study of orange culture, devoting all of his time and attention to it. He came to Clearwater to locate in 1899 and purchased several orange groves which he owned at the time of his death.

I have heard Dr. Julian say many times that he owed his improved health to Florida climate and wished to repay by doing something for the people of Florida. He made a special study of the disease in citrus trees called "foot-rot," and was so successful in curing it in his own groves

that his friends and neighbors came to him for advice as to how to treat their trees for this disease. He wished to make a present of his discovery to the growers of Florida so that they all might be benefited by his study.

Dr. Julian has long been considered an authority on citrus culture in South Florida and was known by growers all over the State as a man who, having made a success in the business was always glad to be of assistance to any one who went to

him for help or advice. The Pinellas County Growers' Association at their annual meeting at Largo in 1918, passed unanimously a resolution thanking Dr. Julian for his work and advice for the growers of Pinellas county.

Dr. Julian died on April 26, 1920, at Clearwater, and is survived by his widow, Mrs. Pattie Chenault Julian, and two daughters, Mrs. S. C. Elbert, of Birmingham, Ala., and Mrs. L. G. Abbott of Clearwater, Florida.

A. S. J. McKENNEY

Mr. A. S. J. McKenney, late of Stanton, Marion county, Florida, was born at Smarrs, Ga., April 6, 1862. In 1886 he went to Florida and was in mercantile business at Stanton for several years.

He was married in 1889 to Miss Lula Calhoun, of Macon, Ga.

He had an orange grove at Stanton which was cut down by the freeze of 1894 and 1895, which he afterwards rebuilt.

In 1900 he moved to Lakeland and was engaged in mercantile business again, but

as orange culture was what he liked best, he returned to Stanton in 1912, where he made orange growing a success. He gave his entire attention to horticulture and always attended the annual meetings of the Horticultural Society whenever it was convenient.

He had just returned from the meeting at Orlando, May 8, 1919, and was taken ill the next day. On May 11th he passed away, and is survived by his widow.

WALTER W. MANN

On April 30, 1920, Mr. Walter W. Mann of Winter Haven, Florida, died at Clayton, Georgia. Mr. Mann was one of the most prominent real estate men in the Winter Haven section and was in no small way responsible for the great development which has taken place in that section in recent years.

Mr. Mann was born in Jonesboro, Georgia, October 8, 1870. On August

12, 1896, he married Miss Lola Brassell in Marion county, Florida. About fifteen years ago he moved to Winter Haven, where he has been actively engaged ever since in the development of that section into the garden spot of Central Florida. He is survived by his wife and three children, Walter Herman, his son, being the eldest.

JOHN SCHNARR

Mr. John Schnarr was born in Hessian Cassee, Germany, April 4, 1851. At the age of about two years he came with his parents to this country. The journey was made in a sail boat and they landed at New Orleans. From New Orleans they went by boat up the Mississippi River to Quincy, Illinois, where he grew to manhood. For a while he was engaged in the mercantile business. From this employment he entered the service of the Noxal Shirt Company, as a traveling salesman. During the next thirty-one years he travelled for this company and the Hargadine-McKitrick Company. After this long period of service there came from exposure incident to the work a decline in health and he sought relief in Florida. He came to Seville about 1905, but very soon found his way to Orlando, where he lived until he died, October 28, 1919. He was married to Mrs. Laura Gilliam of Elgin, Illinois, January 5, 1912, who now survives him. Soon after arriving in Orange county he purchased a grove in the Conway section near Orlando. At this time the ravages of the white fly was

uppermost in the minds of the citrus growers not only in Orange county but the entire State. Mr. Schnarr, together with his nephew, Mr. Hahn, proceeded to develop an insecticide which would be especially adapted for Florida conditions. After many years of experimental work they succeeded in compounding Schnarr's Insecticide. This work alone would entitle him to a very prominent place in the history of citrus culture in Florida. He had many very amiable qualities and traits. He was intensely loyal and his honesty was never questioned. He possessed a most marvelous faith in humanity. To illustrate this particular quality of mind an incident should be mentioned. With possibly one or two exceptions, he never refused to ship insecticide to anyone who ordered it, regardless of their financial condition or standing. During all his business experience of about fourteen years, he lost practically no money from bad accounts.

Besides his wife, a brother, William Schnarr, survives him.

CHARLES PUGSLEY

Mr. Charles Pugsley was born December 5, 1851, in Athens County, Ohio. The family of eight moved west in 1855, settling in Harrison county, Iowa, on a farm, where he had the advantages of the common school, high school being out of the financial reach of the small farmer in that day and place.

At the age of twenty-one he associated himself with his two older brothers in the

growing of nursery stock. After this experience he went to Texas, where he spent a season on a sheep ranch. During the years 1883-1884 he had his first residence in Florida, coming to Mannville with his father, who settled there on a tract near town.

In the fall of 1884 after spending the summer traveling in the west he returned to Mannville, and made his home with

his father's family. Here he planted an assortment of fruits which grew with varying degrees of success. His peaches bore a pleasing crop, but when the express bills were paid, he would have been better off with a complete failure. He had a promising grove of oranges beginning to bear when the great freeze of 1894-1895 killed it to the ground. He immediately ordered scions from California, sawed off the trees at the ground, and inserted grafts into the stumps, which grew nicely, and were beginning to bear when the freeze of 1899 came, and he found himself penniless.

The years 1901 to 1903 were spent at Cutler, Dade county, where he accumulated two thousand dollars raising truck. Then he and an older brother, George Pugsley, took a one-horse camping outfit and started on a search for a good location for an orange grove, driving from Punta Gorda north. They finally chose

Winter Haven, where they planted forty acres to oranges and grapefruit. This grove was coming into bearing when he engaged to manage the packing house of the Florida Citrus Exchange at Winter Haven. Failing health, however, compelled him to withdraw from hard work. The grove was sold, and he purchased a small tract near town.

During the last two years of his life he was engaged in experimenting with the avocado, planting the best and hardest of the Guatemalan type. He was meeting with encouraging success when he was called, on October 15th, 1919. In his death the State of Florida has suffered a distinct loss, for had he lived he would have settled the adaptability of the avocado to the latitude and vicinity of Winter Haven. He is survived by his brothers, Marcellus and George, and his sister, Frances E. Pugsley.

DAVID H. SCOTT

Mr. David H. Scott was born in Ontario, Canada, in 1868. He moved to Virginia with his parents in 1878. Came to Florida to engage in the fruit growing and shipping industry in 1893. He was a graduate of Richmond College. At

the time of his death, which occurred July 12, 1919, he owned 80 acres of bearing grove and ran a packing house in Arcadia. He leaves a wife, a daughter and a son.

ED. SCOTT

Mr. Ed. Scott was born in July, 1866, and died at home, December 11, 1920. He was very active in promoting good roads and was a member of the State Road Department at the time of its organization. At the time of his death he

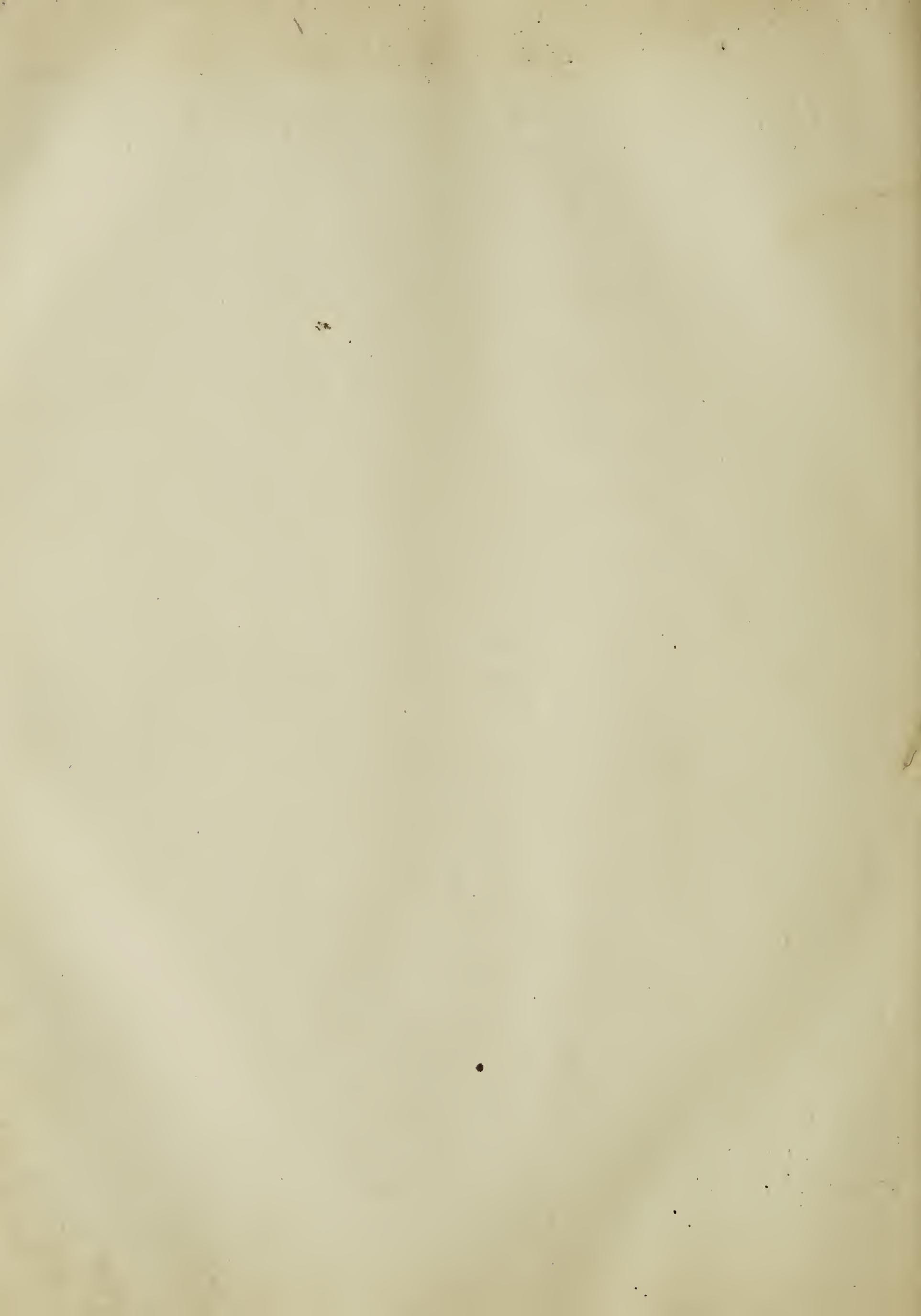
owned about twelve acres of orange grove and his principal holding was the Scott Telephone System of Arcadia. He is survived by a wife and six daughters. He was a brother of David H. Scott.

WILLIAM NATHANIEL WILSON

Mr. William Nathaniel Wilson, the son of Col. Lemuel and Mrs. Rafaila Wilson, was born at Newnansville, Florida, June 18, 1864. At a very early age he moved with his parents to Gainesville, Florida. In 1886 he was married to Mrs. Ruth Scarratt, who with one child, Miss Rafaila, survive him. His death occurred March 15, 1920. Though prominent as

a dry goods merchant, he was intensely interested in horticulture and truck farming and owned several large citrus groves in different parts of the State. He was also a member of the Standard Fertilizer Company of Gainesville, and Vice-President of the Gulf Fertilizer Company of Tampa.





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