

THE PLANT-INTRODUCTION GARDENS OF THE DEPARTMENT OF AGRICULTURE.

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FEW Americans, possibly not more than one in ten thousand, realize that plant introduction has given to the United States practically all of its commercial crops. Thousands of the new plant immigrants that enter the United States each year find their first home in the plant-introduction field stations, or gardens, of the Department of Agriculture. These are the "Ellis Island" of the plant immigrants, but they also are the workshops, field laboratories, and plant-propagation factories of the Office of Foreign Seed and Plant Introduction. They are situated at Miami and Brooksville, Fla., Chico, Cal., "Yarrow," near Rockville, Md., and Bellingham, Wash. Here the new plant arrivals are cared for and studied for the purpose of determining whether they are of economic importance, and those which promise to be of value are extensively propagated. From these stations the plants are distributed, upon orders from the Washington office, to specialists of the department and of the State experiment stations and to the thousands of private experimenters, special cooperators, and plant breeders throughout the country.

LOCATION OF THE GARDENS.

The almost complete freedom from frost and the general tropical character of the region in which the Miami station is located make it most advantageous for the propagation and preliminary testing of a wide range of new plant introductions from the tropical and subtropical regions of the world.

The Brooksville station, containing 35 acres in the hammock region of western Florida, was established after a careful search had been made for ideal conditions for the propa-

gation of plants coming from the moister but not tropical portions of China and Japan. The first Federal plantation of any considerable size of the Japanese timber bamboo is located at this garden. It is here that the propagation of the dasheen has been most successful and the chayote, a moisture-loving tropical vegetable, has grown luxuriantly.

The Chico Plant Introduction Field Station is located in one of the leading deciduous-fruit, nut, and citrus sections in northern California. The high summer temperature, abundance of water for irrigation, long growing season, and mild winters of this region make possible the propagation and testing of such widely different species of plants as alfalfa from the steppes of Siberia, hardy apples, pears, and cherries from Russia, chestnuts, jujubes, and persimmons from northern China, and citrus fruits from the Tropics.

The Yarrow garden was established primarily to meet the pressing demand for a place near Washington where newly introduced plants which the inspectors of the Federal Horticultural Board pass as apparently free from disease, but in regard to which there is a suspicion, may be cared for. Here they can be held or propagated and grown under observation for a season or until all possible danger of the development of disease is past and it is perfectly safe for the material to be distributed.

Extensive greenhouses, coldframes, and lath sheds have been provided at this garden, which admit of the propagation, care, and proper handling of the tropical and subtropical species in the rapidly growing stream of new plant immigrants. The hardy plant introductions are propagated, grown, and preliminarily tested in the nurseries and test orchards in the open.

The establishment of the Bellingham field station is the natural outcome of several years of experimentation carried on in various parts of the country to discover where flowering bulbs could be most successfully grown. It has been maintained for several years as a bulb garden, but is now being developed to include the propagation of a wide range of plants from western Europe, northern Japan, and the high mountain regions of western China.

PRECAUTIONS USED TO PREVENT THE INTRODUCTION OF INJURIOUS INSECTS AND DISEASES.

The thousands of new plant immigrants annually received in Washington in the form of seeds, plants, cuttings, etc., sent in by the agricultural explorers and correspondents of the office are unpacked and given an identification number in the specially equipped plant-inspection laboratory of the office in the presence of the inspectors of the Federal Horticultural Board, whose specific duties are to determine whether or not the material is in a condition to be distributed. If it is found to be affected with insect or other pests or with diseases, it is ordered into quarantine and the necessary treatment prescribed and administered. If found to be apparently free from insects and diseases, it is given a clean bill of health which permits it to be forwarded to the experimenters of the department for whom it was especially secured or to the plant-introduction gardens for propagation, cultivation, preliminary tests, and, later, if deemed advisable to be grown for distribution, to the special experimenters of the office.

The plant propagators at these gardens, who are personally responsible for the care and propagation of these new plant immigrants, have frequently to resort to every known practice of the craft to save an introduction arriving out of season or in a critical condition; and in some instances, when the plant introduced is unknown and no information regarding its identity can be secured, they must rely upon their own ingenuity in developing methods of handling such material in order to save what may eventually develop into an important new plant industry.

The necessary records of each new plant immigrant received at Washington include a Federal Horticultural Board inspection card, upon which is recorded the inspection and introduction number, the source and amount of material received, the dates of inspection, names of inspectors, and treatment prescribed; a plant-introduction card giving the plant-introduction and inspection numbers, by whom and from whence introduced, when received, its probable economic value, and such other available information as is considered important or of special interest; a plant-order card showing to whom the material was forwarded and the

amount sent; and a shipping tag upon which is a certificate of inspection signed by the inspectors of the Federal Horticultural Board.

PRELIMINARY AND EXTENSIVE TESTS MADE.

The propagation houses, coldframes, lath sheds, greenhouses, and other equipment at the plant-introduction gardens of the department, together with trained superintendents, experienced plant propagators, and a corps of capable gardeners and laborers, afford excellent facilities for the propagation and preliminary testing of the thousands of new plants annually introduced by the Office of Foreign Seed and Plant Introduction. They also make possible the efficient distribution of new plant material to specialists of this and other bureaus of the department, the State experiment stations, and to the thousands of private experimenters who, in occupying and developing the vast areas of agricultural lands of our country, are calling for something new to grow, either as an entirely new crop or to take the place of one that locally can no longer be grown commercially with profit. Ornamental trees and flowering plants for yard and park planting are also very much in demand.

The new plants annually propagated at the department gardens, together with the test nurseries, test orchards, and permanent plantings, afford exceptional facilities for study to all who are interested in the development of a broader agriculture, and can avail themselves of the opportunity to visit these gardens and become personally familiar with the interesting new plant introductions.

It is at these plant-introduction field stations of the department that the agricultural experts determine which of the new plants show promise of being of economic value as direct producers and which are likely to prove valuable in plant breeding and selection experiments.

RECENT INTRODUCTIONS NOW BEING TESTED AT THE GARDENS.

Among the host of interesting new plant introductions which have been propagated at the various gardens, a few selected examples will give some idea of the range of species handled and the variety of the problems presented.

The jujube, *Ziziphus jujuba*, from China, is possibly as promising a plant commercially for California and the semi-arid South and Southwest as any of the other valuable crop and ornamental plants that have been introduced from the Far East.

The experimental tests made with this new alkali and drought resistant fruit at the Chico Plant Introduction Field Station, to determine the possible value of the strains and varieties that have been introduced from among the several hundred known to exist in China, have been very satisfactory. The fruit of the better varieties is fully as large as a large prune, and reddish or mahogany brown in color when ripe. While the jujube is a very good fresh fruit, it is undoubtedly of greatest value when processed with cane sugar or honey. Prepared jujubes are as delicate in flavor as many dates.

From the seed of the tung-oil tree (*Aleurites fordii*) an oil is made which the paint manufacturers of this country consider one of the best drying oils known to the trade. The importations of this oil are valued at from \$2,000,000 to \$3,000,000 per annum. Trees of this new plant immigrant distributed from the Chico garden in 1906-7 are doing well and bearing fruit in many places in the region extending from northern California to and throughout the Gulf States, but appear to be doing best in northwestern Florida and the southern parts of Georgia and Alabama.

The oil manufacturers are watching the experimental plantings of this tree with a great deal of interest.

The pistache tree (*Pistacia vera*), a promising introduction from central western Asia, presages another new industry for the United States. The small, green-fleshed nuts are most excellent to eat when roasted and salted, and are extensively used in the coloring and flavoring of ice cream and confections. The entire supply of these nuts at present comes from abroad. This country can, and surely should, grow what it needs. The trees do exceedingly well in the Sacramento and San Joaquin Valleys in California. A few of the grafted trees of some of the commercial varieties in the Chico test orchard are bearing a few nuts this season. Seedling trees near Fresno, Cal., have borne large crops of nuts for some years. Mr. Walter T. Swingle and several others

who have studied the subject and are familiar with the conditions believe that in the not distant future pistache culture will be an established commercial industry of considerable importance in this country.

Budded and grafted plants of some of the best commercial varieties have been distributed to experimenters interested in testing out this introduction to determine the possibilities of its cultivation as a new plant industry.

The peculiar beauty of the Chinese pistache (*Pistacia chinensis*) and the great age to which it lives have suggested its trial as an avenue tree, and thousands of young trees have been distributed to parks throughout the country. A trial avenue a quarter of a mile long, planted at the Chico garden in 1910, already makes an excellent appearance.

The udo (*Aralia cordata*)¹ is a new salad plant from Japan that will probably succeed in practically every State in the Union. The crisp young shoots produced by this plant, when properly blanched, make a delicious salad or are excellent when cooked like asparagus. The culture and handling of udo is similar to that of asparagus. A few plants of udo should be in every home garden. It is believed that when the merits of this new introduction, both as a salad and vegetable, are better known, its cultivation will develop into an industry of considerable economic importance.

The Chinese varieties of persimmon (*Diospyros kaki*) vie with those of Japan in size, quality, beauty, and hardiness. Many varieties have been propagated at Chico and Yarrow, and the special Chinese stocks upon which they are grown in China have been used. The region in which the oriental persimmon can be successfully grown commercially includes California and the South, where the temperature does not fall much below zero. The culture of this excellent fruit is destined, sooner or later, to develop into an important industry. Dried persimmons form a staple food product of China and Japan.

The Chinese chestnut (*Castanea mollissima*) is an extremely interesting and possibly very valuable new plant introduction. This species, according to Mr. Frank N.

¹ Fairchild, David. Experiments with Udo, the New Japanese Vegetable. U. S. Department of Agriculture Bul. 84, 1914.

Meyer, to whom belongs the credit of discovering that the chestnut bark disease (*Endothia parasitica*) is indigenous to China and Japan, is more or less resistant to this disease, which is threatening to destroy the American chestnut. A considerable quantity of nuts of this species sent by Mr. Meyer have been propagated and the trees distributed from our plant-introduction gardens to interested experimenters for growing and testing in disease-infested areas.

We have in Dr. W. Van Fleet's hybrid chinkapin-chestnut the result of a cross between *Castanea pumila* and *Castanea crenata*, an extremely promising new chestnut. A considerable number of the trees that are being grown experimentally appear to show rather marked resistance to the disease. Many of the plants have borne good crops of nuts within 18 months to 2 years from the planting of the seed. The trees will no doubt be small; the nuts, however, are of good size and of very good quality.

The Chinese dry-land elm (*Ulmus pumila*) is a promising new plant immigrant. This elm is found throughout northern China and Manchuria and is known to be very resistant to drought, neglect, and extremes of heat and cold. Seedling plants of this elm secured at Fengtai, near Peking, Chihli, China, in 1908, were grown and distributed from our Chico Plant Introduction Field Station. These early distributions proved sufficiently promising to justify its propagation in quantity for distribution throughout the United States. Our stock at the Chico garden being limited to a few small trees retained for permanent planting, it was necessary to resort to propagation by dormant hardwood cuttings. The tests with this elm at the Government Great Plains Field Station at Mandan, N. Dak., indicate that it is likely to be of very great value for windbreaks, shelter belts, and other plantings in the Great Plains region.

A promising small, early sweet cherry (*Prunus pseudocerasus* Lindley), introduced from Tanghsi, China, in 1906, was saved to the country by a chance graft. When this introduction was received at the Chico station, the gardener, after working practically all of the scions received upon nursery stock in the usual way, conceived the idea of running the few he had left into the small limbs of an old seedling cherry tree. The scions worked upon commercial stocks

in the usual way all perished; two of those worked upon the old seedling tree survived, and in the following spring these grafts were in full flower before the buds of the seedling tree began to swell, and they ripened their fruit by the time the old tree was in flower, which was 10 days earlier than the earliest commercial cherries of that region. From the scions thus saved a large number of plants have been propagated and distributed throughout the country for experimental tests. At Yuba City and Vacaville, Cal., this introduction gives promise of being of considerable commercial importance as an early cherry for the eastern markets.

It is a curious fact that this Tanghsi cherry and not the Japanese flowering cherry is the true *Prunus pseudocerasus*, and its introduction puts in the hands of the American plant breeder a new oriental species of fruiting cherry which may prove valuable in the production of early strains of cherries.

The Davidiana peach (*Amygdalus davidiana*), a promising new stock for stone fruits other than the cherry, appears to be quite resistant to alkali and drought and well adapted to the deep alluvial soils of California. It is also succeeding at San Antonio and other places in Texas and has stood a temperature of -40° at the State Agricultural Experiment Station, Ames, Iowa, with little or no injury when 50 other varieties tested in comparison were either killed outright or seriously injured.

The fruit of this wild peach is small and inedible; however, the introduction may, on account of its extreme hardiness, prove valuable in hybridization experiments for the production of hardier types of commercial peaches.

Upward of 200 trees of this promising new plant immigrant have been planted in orchard form at the Chico station for the purpose of insuring a domestic seed supply.

The chayote (*Chayota edulis*), a little-known vegetable from tropical America, has been successfully grown in a limited way in California, Louisiana, and Florida, and can possibly be grown successfully in other parts of the country where the temperature does not fall much below freezing.

Many of those who have eaten the chayote consider it superior to our summer squash or vegetable marrow. The plant is a perennial vine that is comparatively easy to

grow. The single-seeded, pear-shaped fruits, light green or creamy white in color, are produced in quantity in the fall and can be used then or stored and used as a fresh vegetable throughout the winter.

Bamboos are among the most useful and ornamental economic plants in the world. The first systematic planting of the timber and edible bamboos for experimental purposes in the United States on any considerable scale was made by the Government at the Plant Introduction Field Station at Brooksville, Fla., and at Avery Island, La., in cooperation with Mr. E. A. McIlhenny.

Canned and dried bamboo shoots are imported into the United States in considerable quantities for consumption by Chinese residents. The importation of bamboo canes for fishing rods and other purposes amounts to several millions of dollars annually. All of this material can and no doubt some day will be grown at home, for already most excellent shoots have been harvested from plantings in this country and poles of marketable size have been produced.

Flowering bulbs, which are imported into this country for forcing and ornamental planting at an expense to the people of the United States of at least \$2,000,000 annually, have been grown at the Bellingham station with excellent success. Judging from the results of these experiments, there are many reasons to believe that the so-called "Dutch bulbs" can be successfully grown in commercial quantities in the Puget Sound region and probably in other sections of the United States. Tests so far made show that the home-grown bulbs are fully equal and in some respects superior to the imported stock.

In the spring of 1916 the flowers at Bellingham were unusually fine. The extensive masses of gorgeous colors made a scene of exceptional beauty. Fully 2,000,000 bulbs were in bloom, and in a single day upward of 2,000 people visited the garden and inspected and admired the flowers.

The avocado (*Persea americana*) as a salad fruit stands without a rival. It is also excellent served in the "half shell," with salt or with lemon and sugar. The tree is adapted for culture in southern Florida and southern California.

To assist in building up the avocado industry, which has recently awakened widespread interest in southern California and southern Florida, considerable areas of the Miami garden have been devoted to the preliminary testing of a large number of varieties, and some of the more important problems of the new industry are being worked out there.

The introduction of hardier types from Mexico and the hardier, hard-shelled varieties from the highlands of Guatemala, which ripen their fruit at a different season from the West Indian and South American varieties, it is believed, will result in an extension of the commercial culture of the avocado and secure a practically continuous crop of this most excellent fruit throughout the season.

The introduction of the East Indian mango (*Mangifera indica*) has been stimulated in Florida by the growing and fruiting of nearly 100 imported varieties at the Miami garden. The investigational work incident to the building up of the mango industry in this country has occupied a prominent place in the activities of this station, where most of the varieties now growing in Florida were propagated and where many of them have fruited.

While the foregoing brief descriptions indicate a few of the interesting new plant industries which are finding their beginnings in the Government plant-introduction field stations, even a bare list of the hundreds of species and varieties of plants which are now in process of propagation there would much exceed the limits of this article.

The work of the Office of Foreign Seed and Plant Introduction is to find, introduce, propagate, and distribute valuable new plants and also to assist in making possible the cultivation of some economic new plant immigrant upon every available acre of our agricultural lands. The field stations of the office are filled with the new beginnings of plant industries which later will add to the wealth and beauty of the country.



L. C. C. Krieger pinx.

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FRUITING BRANCH OF ONE OF THE LARGE-FRUITED VARIETIES OF THE CHINESE JUJUBE GROWING AT THE CHICO PLANT INTRODUCTION FIELD STATION (*Natural Size.*)



FIG. 1.—ONE OF THE PROPAGATING HOUSES AT THE YARROW FIELD STATION.

This illustration shows a block of young broad-leaved evergreens, *Pittosporum floribundum*, from the Himalayas, large enough to be distributed to experimenters. The utmost care has to be exercised to keep these plants free from disease and insect pests.



FIG. 2.—LATH HOUSE AT THE MIAMI FIELD STATION FILLED WITH TROPICAL AND SUBTROPICAL PLANTS.

The Miami garden has contributed largely to the agriculture of Florida through the study made there of new methods of propagating tropical plants, which heretofore were only grown from seeds.

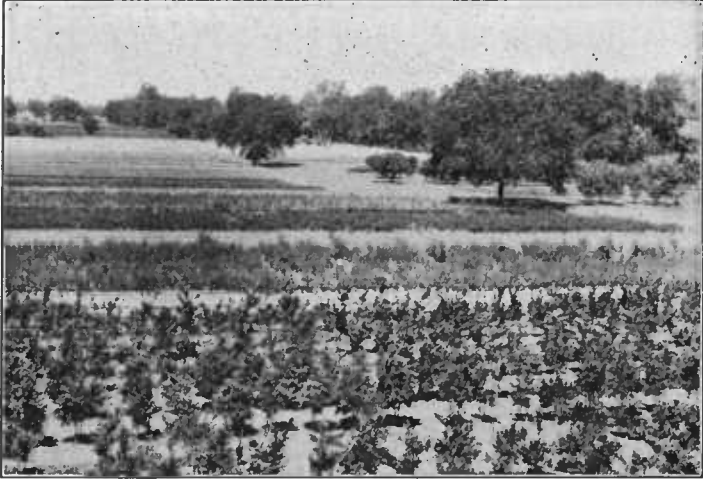


FIG. 1.—A PORTION OF THE NURSERY PLANTINGS AT THE CHICO PLANT INTRODUCTION FIELD STATION.

Beyond the test nursery of citrus hybrids in the foreground are thousands of new plant introductions that are being grown for distribution during the season of 1916-17.



FIG. 2.—TEST ORCHARD AT THE PLANT INTRODUCTION FIELD STATION, CHICO, CAL.

Hundreds of varieties of new plants are here given a preliminary test, and it is here that many now plant immigrants fruit for the first time in the United States.



FIG. 1.—FRUITING BRANCHES OF ONE OF THE LARGE-FRUITED VARIETIES OF THE CHINESE JUJUBE S. P. I. 23455.

FIG. 1.—In the test orchard at the Chico Plant Introduction Garden this tree thrives remarkably well. The fruit is borne in quantity upon the deciduous leafy twigs, which resemble the compound leaves of leguminous trees, and not directly upon woody fruit spurs like those of most other northern fruits. FIG. 2.—A portion of a nursery block of young seedling tung-oil trees, Chico Plant Introduction Garden. From the nuts of this tree one of the best drying oils of commerce is obtained.



FIG. 2.—SEVERAL THOUSAND YOUNG TUNG-OIL TREES.



FIG. 1.—CHINESE PISTACHE IN THE CHICO PLANT INTRODUCTION GARDEN TEST ORCHARD.

This species is an excellent pollen bearer and is being experimented with as a stock for the commercial pistache (*Pistacia vera*), a tree of which is to be seen at the right. It is also a fine ornamental, shade, and avenue tree for California, parts of Arizona, New Mexico, Texas, and the South.



FIG. 2.—LATH SHED AT THE CHICO FIELD STATION FILLED WITH UDO SALAD PLANTS.

These were distributed during the season of 1911-12. The partial shade afforded by a lath shed of this character makes it possible to grow many species of plants which otherwise could not be propagated where the sunlight is most intense.



FIG. 1.—A BLOCK OF DR. VAN FLEET'S YOUNG HYBRID CHESTNUT TREES AT THE CHICO PLANT INTRODUCTION FIELD STATION.

These were distributed during the season of 1915-16. They are hybrids between the Japanese chestnut and the American chinquapin, and although smaller-growing trees than the American chestnut, they produce good nuts and are more or less free from the chestnut-bark disease.



FIG. 2.—DAVIDIANA PEACH SEEDLINGS IN MARYLAND.

This shows a portion of a nursery block of seedling stocks of a Chinese wild peach (*Amygdalus davidiana*) at the Yarrow Plant Introduction Field Station that were distributed throughout the country to experimenters desiring to test a stock for various stone fruits or to utilize it in plant-breeding experiments.



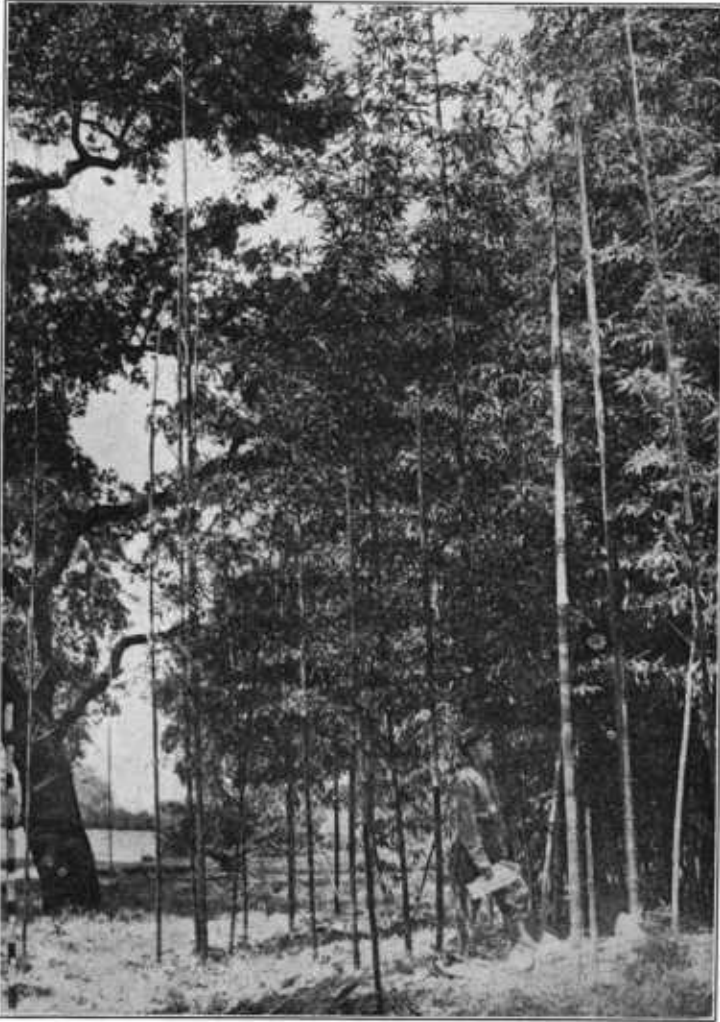
FIG. 1.—CHAYOTE ARBOR AT BROOKSVILLE, FLA.

One of a number of experimental plantings at the Brooksville garden for the purpose of determining the desirability of this method of training the plants. The chayotes produced will be utilized in cooking and demonstration experiments and to direct public attention to the delicate character of this valuable vegetable for the South.



FIG. 2.—VIEW IN THE BROOKSVILLE PLANT INTRODUCTION FIELD STATION.

The road runs between a 3-acre planting of Japanese timber bamboo on the left, now 6 years old, and a nursery of young bamboo plants on the right, set out for the purpose of propagation. The small 3-room field laboratory on the right is equipped for preliminary field studies and has been used for microscopic investigations and cooking experiments in connection with the dasheen and chayote investigations.



JAPANESE TIMBER BAMBOO IN NORTHERN CALIFORNIA.

Portion of a 9-year-old planting of one of the large timber bamboos, *Phyllostachys bambusoides* (S. P. I. No. 12180), at the Chico Plant Introduction Field Station. Large, young, growing shoots in this planting have made a growth of 16 inches in 24 hours. This is about the usual rate of growth under normal conditions. Growths of 26 inches in 24 hours have been reported; such rapidity of growth, however, is under exceptionally favorable conditions.



FIG. 1.—BUDED AVOCADO TREE AT THE MIAMI FIELD STATION.

FIG. 1.—Seedling avocado tree with large shoot growing from near the base, which came from a bud of a valuable and hardy variety worked into the stock 13 months previously. The bud sticks from one of which this bud was taken were secured in Antigua, Guatemala, at an altitude of 5,000 feet. The fruit was large, round, and hard shelled, with thick, firm flesh of excellent quality, pale yellow near the seed, changing to greenish yellow near the surface. Horticulturists in southern California and southern Florida are very much interested in the Guatemalan varieties of avocados, especially those coming from the higher elevations. Our growers need hardier types and varieties, and also those that will prolong the ripening season. FIG. 2.—The Sandersha mango from Bangalore, India, bears good, regular crops of large, kidney-shaped fruit, which, when well ripened, is of very good quality. This variety, while not of as high quality or as attractive as others that have fruited at the station and at other places in Florida, fruits with more regularity than many of these and is especially valuable for canning and preserving.



FIG. 2.—AN EAST INDIAN GRAFTED MANGO IN FRUIT AT MIAMI, FLA.



FIG. 1.—VIEW OF A PORTION OF NARCISSUS PLANTINGS AT THE BELLINGHAM GARDEN.

Madamo Plemp in the foreground and Sir Watkin in the distance. This broad expanse of yellow and green was wonderfully beautiful and inspiring.



FIG. 2.—AN APPROACH TO THE MIAMI PLANT INTRODUCTION FIELD STATION.

On each side of the drive is a beautiful carissa hedge, *Carissa grandiflora*, an extremely handsome shrub bearing sweet-scented, white flowers and edible fruits. This plant is worthy of a place in the grounds of every home in southern Florida and southern California. The large trees beyond the hedge on either side are different varieties of the East Indian mango, a fruit which for quality, fragrance, and beauty has few rivals.