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Plant Introduction Under Rusk and Morton

ELEVATION of the Commissioner of Agriculture to the position of Secretary of Agriculture with a seat in the President's Cabinet did no more than accelerate effective trends. Secretary Jeremiah M. Rusk, a Republican, and his Democratic predecessor, Commissioner Norman J. Colman, both were from western states and realized the importance of an experimental approach to the problems of Western agriculture. Colman had pointed out the needs existing in the West for specially adapted varieties of crops and had done much to introduce crops of a tropical nature for the South. Rusk continued to work on these problems. Colman had stressed the search for crops and plant varieties suited to many local needs. Rusk searched for plants for the sake of diversifying the national agricultural economy.

RUSK'S PROMOTION OF SELF-SUFFICIENCY

Rusk asserted that the main purpose of the Department was to introduce or assist in the introduction of new, useful plants. Once an introduction was successful, further propagation and distribution was left to commercial growers.

To Rusk the value of plant introduction lay in the diversification of agriculture and in national self-sufficiency. Tariffs should be used to protect crops which could be grown on our own soil. This would give the farmer the benefits of the home market, Rusk thought. He looked with satisfaction upon the McKinley tariff of 1890 which provided a bounty for the production of raw sugar at home, and had the effect of reducing agricultural imports " . . . which could be, and should be produced in this country." Agricultural experiment stations had been authorized in the Hatch Act of 1887, and within three years more than seventy were

in operation. The Department of Agriculture cooperated with the stations in the introduction and acclimatization of new economic plants. Federal expenses for these experiment stations amounted to $660,000 per year.

The work of plant introduction was organized into several divisions or agencies of the Department of Agriculture. The Division of Gardens and Grounds was responsible for the propagation and distribution of imported trees and shrubs to localities where conditions seemed favorable to their growth. This division, under William Saunders, occupied forty acres including conservatories, propagating houses, and other glass structures known as the Grounds of the Department. A Seed Division was organized in 1864. The Division of Pomology had charge of fruits, the Division of Forestry imported forest species for trial, and the Division of Agrostology, organized in 1895, concerned itself with grasses.

TABLE 4

SEED DISTRIBUTION BY THE FEDERAL GOVERNMENT 1889–97

Year	Total Distribution	Annual Appropriation
	No. of packages	
1889	4,852,512	$104,200
1890	5,605,246	104,200
1891	6,013,613	105,400
1892	5,932,989	105,400
1893	7,704,943	129,637
1894	9,555,318	135,400
1895	9,528,653	148,830
1896	12,000,000*	185,400
1897	20,368,724	150,000

* Approximate figure.

DISTRIBUTION OF SEEDS AND PLANTS

Free seed distributions during Rusk's and Morton's administrations continued to increase rapidly.

Rusk reported that recipients of these seeds felt no obligation to report their results to the Department. For this reason, he recommended that the bulk of future distributions be sent to agriculture colleges and experiment stations. The distribution of plants during this period was handled for the government by commercial firms who packed the plants in damp moss for mailing and then wrapped them in oiled paper and wrapping paper.

A special agent was appointed in 1890 to purchase seeds for distribution by the Department. Following Rusk's recommendation, the distribution that year to experiment stations and agricultural groups was increased considerably, and many seed packages were sent to foreign countries.[1] *Ladoga wheat, Bermuda grass,* and sugar beet seed were some of the more significant importations made during 1890.

The following year, the Department of Gardens and Grounds made a heavy distribution of semitropical plants to growers in the South. Figs, pineapples, olives, camphor trees, and several varieties of foreign grapes made up the list. An encouraging result of this distribution was the extension of pineapple plantations in Florida. However, the government soon realized that such large distributions of tropical fruits were expensive and impractical since many of the plants would not grow satisfactorily in the temperate climate of the United States.

The Department, in addition to its work of seed distribution, gradually assumed many new responsibilities during Rusk's term. Marketing, animal diseases, inspection of materials, standardization of varieties, food adulteration, and favorable tariff legislation were some of the more pressing problems engaging the Department's attention.

Morton's Attitude—A complete reversal in the Department's policy of free seed distribution was effected in 1893, when J. Sterling Morton became Secretary under President Cleveland's second administration. Throughout his term of office. Morton criticized the wholesale distributions. He was opposed to the expense involved in the purchase, packing, and mailing of free seeds, and took steps to reduce these expenditures in line with the economy movement of the administration. He was against the large distribution of common garden and field seeds, specifically—turnips, cabbage, and celery seeds. Morton favored confining the distributions to those seeds which might be considered new and valuable. He charged that the most common and ordinary seeds had been purchased in the years past and had been distributed without design.

[1] Plants of warm climates received much attention and included, roughly in the order of quantities sent out: olive, tea, coffee, camphor, foreign grapes, citrus fruit varieties, date palms, figs, Japanese persimmons, currants, loquats, guavas, pineapples, black pepper, vanilla, mangoes, and bananas. The report of the Chief of Gardens and Grounds for 1890 described 431 of the more important economic plants in the Gardens.

Morton reversed previous policy so far as to suggest that the introduction of rare trees and flowers be left to large seed firms. He claimed that seed firms would get plants into the hands of the growers two or three years ahead of the government. Morton repeatedly defended the commercial seed firms from government competition. Continuance of the Seed Division, which had outlived its usefulness according to Morton, was an infringement on the rights of citizens engaged in legitimate trade pursuits. The building space given to seed distribution should be given to " . . . some useful pursuit, more in keeping with the spirit of our institutions."

TABLE 5

DISTRIBUTION OF MAJOR CROP SEEDS BY THE FEDERAL GOVERNMENT 1889–97

Year	Vegetables	Flowers	Cereals	Textiles	Tobacco	Turnips	Miscellaneous*
	No. of packages	*No. of packages*	*No. of packages*	*No. of packages*	*No. of packages*	*No. of packages*	*No. of packages*
1889.....	3,710,224	307,804	35,029	12,157	186,247	548,009	53,042
1890.....	4,719,691	632,909	80,715	14,473	65,020	55,905	36,633
1891.....	5,058,647	632,066	50,271	14,444	59,624	165,344	33,217
1892.....	5,043,694	722,732	16,143	20,761	76,235	29,994	23,440
1893.....	6,743,586	826,045	13,145	25,022	63,935	3,673	29,537
1894.....	8,127,013	802,102	23,129	34,950	67,897	452,752	47,475
1895.....	8,591,164	771,780	33,841	18,752	74,002	.....	99,114
1896.....	10,125,000	NR	NR	NR	NR	NR	NR
1897.....	19,053,839	1,022,500	NR	NR	NR	2,119,042	NR

* Includes such crops as herbs, opium poppy, tree seeds, grasses and sorghums.
NR—Not reported.

In 1894, Morton stated that the operation of experiment stations obviated the need for distribution to private individuals. In the *Annual Report* for 1894, the Special Agent for the purchase of seeds, Enos S. Harnden, had a report opposing the old system of seed distribution. He mentioned the unjust "interference" with private business, stated that the varieties distributed were not new but only had new names, and that the Department of Agriculture was only a dumping ground for bad seeds. Harnden suggested that an appropriation of $15,000 for determining the number and correct names of varieties should be made and the results published through government bulletins.

In spite of Morton's aggressive opposition, Congressmen were determined to hold on to their patronage and in 1895 appropri-

ated $130,000 for seed distribution. The figures for seed distributions during Morton's term (See Table 2, page 60) indicate that the only effect his tirade against free dissemination had was to bring about a record distribution in 1896. Morton retaliated by taking seventy-nine pages of the *Annual Report* to list the addresses of packages mailed under the congressional franking privilege.

PROMOTION OF SPECIAL CROPS

The Rusk administration regarded the annual expenditure in excess of $100 million for foreign sugar as a challenge to produce more sugar at home. In 1890, five thousand packages of sugar beet seeds, obtained by European growers mainly in France and Germany, were sent to interested growers in America. Tests of beets grown in northern and central portions of the country showed extremely favorable results. In the two-year period between 1898 and 1900 the number of sugar processing plants jumped from fifteen to thirty-seven, and sugar production was tripled.

Silk production was intermittently encouraged by the government for many years. The silkworm eggs and new varieties of mulberry and similar trees were imported for trial. Philip Walker, Chief of the Silk Section, visited Europe in 1889 to study the varieties of mulberry and osage orange used there. One hundred grafted trees of the *rosea* mulberry were purchased for experiment. Successful silk production, however, did not depend upon particular varieties of trees, but upon the invention of an automatic reel as a substitute for expensive manual labor.

DATE INTRODUCTIONS

Date culture became a profitable industry in the United States largely through the efforts of the workers in the Department of Agriculture. In 1880, 500 date "palms" were distributed by the Department, but the results were negligible. H. E. Van Deman, pomologist for the Department, ordered date palms in 1889 through American consuls at Teheran and Cairo, and from growers in Arabia and Algeria. The following year, he received three choice varieties from Algeria and eight from Egypt, a total of sixty-three trees. This shipment was claimed by the Department to be the first successful introduction of rooted date suckers in the Western Hemisphere. Growers besieged the Department

with requests for the suckers. The Southern Pacific Railroad transported a carload of the plants to Arizona and California free of charge. Recipients of the trees were to act only as trustees of the plants, to keep any one grower from cornering a superior variety.

The consul at Muscat, Arabia, sent the Department six plants of the Fard date from that region. These were planted in tubs and sent to California and Arizona. One of these plants was received by the agent of the Southern Pacific Railroad at Indio, California—the present center of the American date industry.

Successful introduction of the date palm is due largely to the work of Walter T. Swingle. Acting under instructions from the Secretary of Agriculture, Swingle visited a flourishing date orchard near the Algerian coast in 1899. He secured a few offshoots for a trial shipment and contracted for a large shipment at a later date.

The Deglet Noor—The following year, he again visited Algeria to purchase additional plants of good sorts from Biskra on the northern margin of the Sahara, and in the foothills of the Atlas Mountains. Through the cooperation of the president of a French company, Swingle was able to study the details of growing and marketing dates in a region south of Biskra. Here at Ourlana, Swingle obtained suckers of the Deglet Noor, the basic variety of the present date industry in the United States, and some other varieties unknown at Biskra. These were transported northward to the Mediterranean shores by camel. In all, twenty-three cases were shipped from Algeria to New York whence they were forwarded to New Orleans. The plants were given free shipment from New Orleans by the Southern Pacific Railroad to the palm garden at Tempe in the Salt River Valley. Some of this shipment of 447 shoots of 27 varieties were distributed at other stations in California and Arizona.

Experiments in California with the cultivation of the Deglet Noor date palm have shown this to be one of the most productive food crops in the world. One palm, as a result of long, continued experiments, can now be made to bear four hundred pounds of dates per year. The effort, patience, and investment required to adapt valuable plant introductions to a new country and the ultimate wisdom of the investment are illustrated by the history of the date palm. The Deglect Noor date required an investment of over $100,000, Swingle has estimated, and over ten years of study before it produced the first paying crop. Previous experi-

ments with many unsuccessful date introductions also helped pave the way for this crop.

THE SMYRNA FIG

Transplanting a crop industry from one environment to another is often a long and exasperating task. Many of our crops have been developed because of the persistence of men who refused to be daunted by repeated failures. Typical of this work is the fascinating story behind the struggle to introduce the Smyrna fig into the United States.

There are records of attempted introductions of figs as far back as colonial times. But our story begins in the latter part of the nineteenth century when government assistance to growers gave impetus to their efforts to adapt the fig to America.

First Shipment From Smyrna—California was the center of experimental work because its climatic conditions most nearly matched those of the original environment of the figs. Attention centered around the Smyrna fig because growers felt it had the best commercial prospects. The first shipment of 448 cuttings from the ancient region of Smyrna (in the Maeander Valley on the west coast of Asia Minor) arrived in 1880. These were procured through the American consul in Smyrna, E. J. Smithers, and brought to this country by G. P. Rixford of the *San Francisco Bulletin*. The next year, 14,000 more cuttings were distributed by the *Bulletin* with a fanfare of publicity. Praise from the growers quickly turned into blasts of criticism at the *Bulletin* when the young trees bore fruits that would not ripen and fell from the trees in shriveled bunches. The *Bulletin* retorted that the failure was due to chicanery by the natives of Smyrna who had slipped them worthless figs in order to deter competition. (1)

For the next two decades growers continued to import seeds and cuttings of the Smyrna fig, but in all cases the fruit refused to ripen on the tree.

Native gardeners of Smyrna followed the practice of suspending fruits of the wild caprifig from the branches of the Smyrna fig trees during the fruiting season. This had the earmarks of some old fertility rite to the scientific minds of American agriculturists, and they dismissed the practice as mere superstition.

Role of Blastophaga—A study of the fig flower in 1885 by Dr. Gustav Eisen, a Swedish scientist who had come to the United States twelve years before, indicated that fertilization of the

Smyrna fig depended upon the *Blastophaga psenes*. The female of this species of wasp somehow transferred the pollen of the wild, inedible caprifig to the blossoms of the Smyrna fig, thus bringing about fertilization and ripening of the fruit. (2)

This discovery made the agriculturists realize that there *was* some significance in the ritual associating the caprifig with the ripening of the Smyrna variety. The missing link—the wasp which acted as a fertilizing agent between the two plants—had been found. In confirmation of this discovery, George Roeding fertilized young Smyrna figs with pollen from the caprifig by transferring the pollen with a toothpick. He also tried blowing in the pollen with a small glass tube. Eisen, too, sealed pollen from caprifigs in a glass container and with it pollinated young figs 200 miles away. However, discovery of the procedure of fertilizing the Smyra figs was not enough. A quantity of the Blastophaga wasps had to be imported if fig cultivation was to succeed commercially.

Importing the Wasps—California growers made a number of unsuccessful attempts to import the live wasps by bringing in caprifigs containing the insects. They appealed to the Secretary of Agriculture, James Wilson, for assistance, suggesting that the insects be imported in figs on living branches instead of detached fruits. A young scientist connected with the Department of Agriculture, the same Walter T. Swingle mentioned previously, was studying in Naples at the time. Swingle was commissioned as an agricultural explorer and given the task of securing a supply of Blastophaga.

Swingle's second shipment of Algerian figs in 1899 was successful. He had wrapped the insect-filled figs in tinfoil, sealed them with wax, and then packed the figs in cotton.

The figs were opened upon their arrival in California and hung on two trees which were covered with tents to ward off the frost. Successful acclimatization of the wasps the following summer was assured when an employee in the orchard noticed what he thought were seeds in an unusual-looking hard, green, plump caprifig. An inspection of the figs growing on the trees showed that many of them were filled with the wasps.

How Figs Are Fertilized—Previous shipments of the Blastophaga had failed to survive because the importers did not understand the life cycle of the wasp. In order to ship the wasps successfully they had to be obtained during their hibernating stage,

which was the last of the three generations of Blastophaga produced each year.

In the spring, the wingless males of the first generation awaken from hibernation in the caprifig. They gnaw into the tiny galls or blisters in the fig to fertilize the imprisoned females. The male then dies and the female frees herself from her winter home and flies to the first fig crop of the year, the profichi. She saws her way into the fig orifice with her strong mandibles and sheds her wings at the same time. Inside the caprifig she deposits her eggs in the gall flowers and dies in her turn. From these eggs new females hatch out and in turn seek new fig homes for their eggs.

From the caprifig male flowers the wasp brings the pollen that fertilizes the female flowers of the young Smyrna figs—if by mistake she should happen to enter a Smyrna fig. And the successful cultivation of the Smyrna fig depends on the female wasp confusing the orifice of the Smyrna fig for that of the caprifig, her natural home. Once inside the Smyrna fig she finds the flowers so formed that she cannot deposit eggs with her ovipositor which nature had adapted to the caprifig flowers. In her frantic search, she thoroughly pollenizes the young Smyrna fig but dies with her own mission unaccomplished. Female wasps from succeeding generations of caprifigs keep the young Smyrnas fertilized throughout the season until the wasp again hibernates in the last caprifig crop of the year.

Once the wasps' life cycle was understood, the wasps were successfully introduced, and the fig industry flourished rapidly. Caprifigs are still suspended from the branches of the Smyrna trees in the Mediterranean area, but in America the College of Agriculture of the University of California succeeded in 1948 in producing Smyrna figs using four synthetic hormones instead of the caprifigs. Approximately 14,500 acres of Smyrna figs are now under cultivation, and the industry markets figs valued at several million dollars annually.

While the Smyrna fig came to be of the greatest commercial value to growers, a number of other fig varieties were also distributed for trial in the southern states at the close of the nineteenth century.

THE DIVISION OF POMOLOGY

A special agency to care for the interest of fruit growers—the Division of Pomology—was established in 1886. Growers had

been clamoring for many years for a share in the $20 million spent each year on imported fruits and nuts. Another important pomological problem was that of finding apple varieties capable of enduring the rigorous climate of the northwest. The Russian varieties imported two decades earlier had not proved satisfactory. H. E. Van Deman, pomologist, reported in 1889 upon the extensive introductions made by his division. He had ordered through American consuls at Bokhara, Turkestan, several bushels of stones of Asiatic peachs in a search for varieties resistant to the disease known as "peach yellows."

TROPICAL PLANTS

The Division introduced many tropical plants from Europe, India, Japan, and other places. From the Philippine Islands came the first named varieties of cocoanuts ever brought into the United States. Japanese walnuts were obtained for the central and southern states. Failure of the mango varieties tried earlier in the South caused the introduction of new varieties from the East and West Indies. The first East India *mulgoba mango* came to Florida in 1889.

The *citron* tree was sought through American consuls in the port cities of Italy. Rooted cuttings from Corsica sent to Florida and California established the new industry to a limited extent in southern California. *Coca* plants were distributed in the South and in California, although previous plantings had not succeeded. *Ginger* roots were also distributed again and *gum arabic* plants sent out. Other distributions of 1889 included Japanese grapes, the *guava* of Mexico, and the *granadilla* of the West Indies. Choice Italian chestnuts were procured in 1892 from Catania and sent to 150 experimenters.

Foreign Exchanges—Further arrangements were made in 1893 for exchanges with foreign nurserymen and growers. Several varieties of different fruits had been secured previously in this way. Seeds or scions of seventy different fruit varieties were obtained for 128 experiment stations and for private growers. From Brisbane, Australia, came trees of the *mandarin orange,* or tangerine, as well as other economic and ornamental plants, including cherries, plums, the *Queensland tamarind,* the *candlenut,* and the *Queensland nut.* Eight varieties of plums and five of cherries from Hungary were scattered over eight states.

Seeds of a hardy variety of avocado were brought across the

border from Mexico and directed to the Gulf States and California. The Division of Pomology hoped to expand avocado culture, which had been limited to the East Coast and adjacent keys since the great freeze of 1894–95. This division allotted 2,000 seeds of the superior variety *Persea gratissima* to eighty-six persons in the southern states and Arizona and California.

FIBER AND FORAGE CROPS

The $15 million being paid annually to foreign countries for raw and manufactured flax, and the $5 million paid to Yucatan for sisal hemp, convinced Rusk that these crops should be grown in the United States. There was much interest in these crops and their importance could not be overestimated. The Harrison administration placed tariff duties on flax to encourage its production. Ramie could become a $20 million crop if suitable machines were developed for processing it. Jute was another fiber crop to be promoted. Considerable areas of sisal hemp were being grown in Florida, and one plantation exceeded sixty acres. Rusk suggested a bounty or a tariff to promote further production.

The government imported seeds of the manila hemp plant and of the New Zealand flax for southern localities. Fiber investigations were conducted by the Department of Agriculture with flax, ramie, sisal, and bowstring hemp. The growing of sisal hemp was said to be out of the experimental stage in southern Florida. In 1891 three varieties of flax seed from Belgium and Russia were assigned to agricultural experiment stations, flax manufacturers, and growers seriously engaged in experiment. Large plantings of bowstring hemp were made in Florida in 1892. Growers reported that it was of rapid growth, produced strong fibers, and was cheaply harvested and cleaned. A few experiments were in progress with the cultivation of Italian hemp and the *sunn hemp* of India in 1894.

GRASSES

Colman, as Commissioner, had accelerated the search for grasses and forage crops for the dry regions of the West. The native grasses of South America, Siberia, and India were suggested in 1890 as possible sources of hardy grasses for the South. Experimenters realized that it might take a long time to discover suitable grasses and pointed out that England had required fifty years to develop her grass industry. Much attention was still given to

studies of native grasses in Texas, New Mexico, and Arizona.

Experiments with native and foreign grasses at Garden City, Kansas, since 1889 had made it plain that the ordinary grasses of the East would never do for subarid regions. The only imported plant which had proved thoroughly successful was the *Bromus inermis* from the arid parts of Austria. Some forage plants from Australia promised to be of value. The Secretary of Agriculture made arrangements in 1894 with the Department of State for consular agents to collect seeds of forage plants from foreign countries and forward them to the Department for experiment. An appropriation by Congress in 1895 made the organization of the Division of Agrostology possible. Prof. F. Lamson-Scribner became Chief of the Division and continued as head of grass and forage investigations.

The guiding motive for finding new crops under Rusk and Morton was to produce some of the imported staples at home and thus achieve a greater national self-sufficiency by diversification. Through Congressmen and through the Department itself, increasing quantities of plant materials were placed in the hands of persons who might adopt locally the crops being promoted. Experiments with sorghum as a source of sugar gave way to experiments with the sugar beet while other trials proved that silk could not be profitably produced. The administrations of Rusk and Morton concluded attempts to found several fiber crop industries, but marked the beginnings of much work with a variety of fruits for temperate and tropical climates.

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