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Bonanza Years

THE CLOSE of the nineteenth century found America's agricultural frontiers spread beyond the Rocky Mountains, north to the Canadian border and south to the Rio Grande. Farmers who had overworked their land by producing the same staple crops year after year could no longer pull up stakes and seek a new homestead. Their incomes were decreasing as surpluses of the staple crops piled up. The Spanish-American war had created a wave of interest in tropical agriculture and consumers began to demand more varied diets. Millions of dollars went each year into agricultural imports. The economic development of many agricultural areas awaited the discovery of crops which could be grown successfully in a variety of climatic and soil conditions. Faced with the shortage of arable land and the food demands of an increasing population, farmers had an incentive to cultivate their soil with greater care.

GOVERNMENT ASSISTANCE

The government sought to relieve the plight of agriculture by putting crop production on a more efficient basis. One of the first steps in this work was a program making plant introductions systematic and scientific. The Department of Agriculture began to provide many new services to farmers, and a group of scientists and explorers was employed to begin the introduction of an enormous quantity of valuable plants. During the first term of James Wilson as Secretary of Agriculture, an appropriation of $20,000 was alloted for this work.[1] This federal aid in 1897 was

[1] . . . That twenty thousand dollars of the sum thus appropriated . . . may be used to collect, purchase, test, propagate, and distribute rare and valuable seeds, bulbs, trees, shrubs, vines, cuttings, and plants from foreign countries for experiments with reference to their introduction into this country; and the seeds, bulbs, trees, shrubs, vines, cuttings, and plants thus collected, purchased, tested, and propagated shall not be included in general distribution, but shall be used for experimental tests, to be carried on with the cooperation of the agricultural experiment stations.

an agricultural landmark comparable to the first appropriation of $1,000 in 1839 for agricultural work by the Patent Office.

The figures in Table 6, giving the approximate yearly value of our main agricultural imports at the close of the century, were pointed to by growers as strong arguments for producing these crops in the United States.

Plant introduction procedures put into effect by the government were much broader in scope than previous efforts. Growers were to be given full information on cultivation methods. The

TABLE 6

APPROXIMATE YEARLY VALUE OF AGRICULTURAL IMPORTS UNITED STATES—1900

Crop	Value
Sugar	$96,000,000
Rubber	32,000,000
Coffee	55,000,000
Fruits and nuts	18,500,000
Tobacco	12,000,000
Manufactured Fibers	13,000,000
Sisal Hemp	10,000,000
Manila Hemp	6,000,000
Jute	2,250,000
Cotton	10,000,000
Flax	1,000,000
Hemp	500,000
Tea	10,000,000
Wines	7,250,000
Rice	4,000,000
Seeds	1,000,000
Licorice	1,500,000
Cork	1,500,000
Macaroni	600,000

Department was to aid in creating markets and to continue to support new crop industries until they were commercially successful. Foreign plant materials would go either to reliable growers or experiment stations, and in some cases would be retained by the Department for trial. Each shipment represented a step in the solution of a special problem and not merely an unplanned broadcast of stocks.

O. F. Cook, in 1898, began the "Inventory of Plants Introduced" in which numbers were assigned to each new item and information given on its origin, nature, value, and cultivation.

Wilson issued an executive order in 1900 which further coordinated the Department's work by requiring division heads to

confer upon policy matters with the superintendent of the Experimental Gardens and Grounds. The divisions of Vegetable Physiology and Pathology, Agrostology, and Pomology also were consolidated into the Office of Plant Industry. A subsequent order included the Section of Seed and Plant Introduction, and in 1901 the Office was designated as the Bureau of Plant Industry.

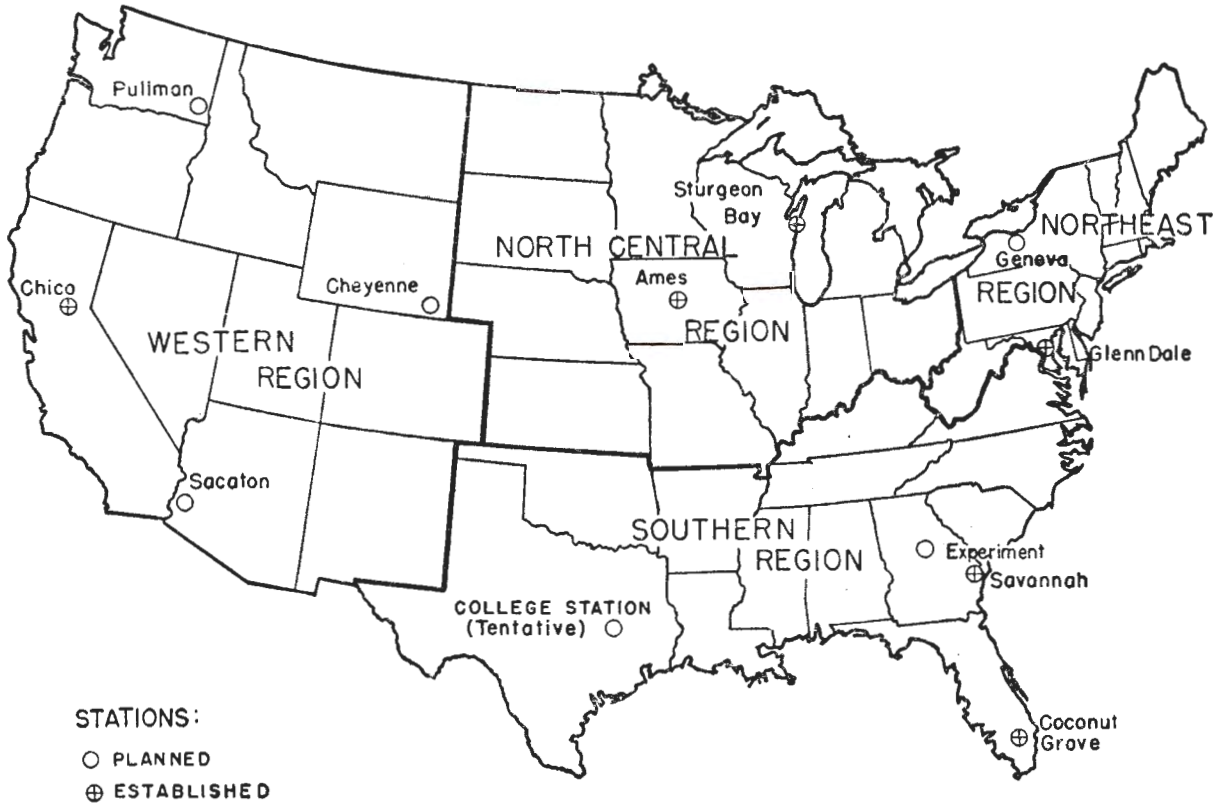
DISTRIBUTION OF SEEDS AND PLANTS

Changes in seed and plant distribution due to the reorganization became apparent in 1898. All seed distributing agencies were placed under the Assistant Secretary. The Division of Gardens and Grounds practically abandoned the testing of new plants because state experiment stations were better equipped and better located for these tests. The government discouraged attempts to grow rubber plants in Florida because the climate was not warm enough, and interest in tropical plants subsequently declined.

Wilson desired to return to the original purpose of seed distribution, that of developing new crops. Seedsmen, too, urged the discontinuance of the general seed distribution. The immediate aims were to find beet varieties sweet enough to produce sugar, drouth- and rust-resisting grains, grasses and forage plants for the West, tea plants for the South, the date palm for Arizona, and rubber plant study for the new colonies. The Division of Gardens and Grounds continued large distributions of strawberry, grape, camphor, tea, olive, privet, and fig plants. William Saunders, who died in 1900, was succeeded by B. T. Galloway as head of the plant work in the Department.

THE WORK OF PLANT EXPLORERS

Probably the most important result of establishing the Section of Seed and Plant Introduction was the employment of "Special Agents," or agricultural explorers. The men contributed measurably to the progress of plant introduction during this period through their plant discoveries in foreign countries. They were trained to recognize plant diseases and pests and to judge the value of certain plants in solving agricultural problems. Each explorer specialized in a particular crop or agricultural area. The designation "Special Agent" was dropped by O. F. Cook, while he was head of plant introduction, because the name aroused suspicion in foreign countries.



Division of the United States Into Four Regional Sections for the Introduction and Testing of New Plants. Puerto Rico is Included in the Southern Region and Hawaii in the Western Region.

FAIRCHILD AND LATHROP

David G. Fairchild, because of his extensive explorations, his writings, and his leadership, is foremost among the American plant explorers. He began work in the Department in the early 1890's. Aboard ship en route to Europe for study, Fairchild met Barbour Lathrop, world traveler. This was the beginning of an association which proved to be of great value to Fairchild and to the Department, for Lathrop explored at his own expense for nearly six years with Fairchild as his expert. From the Malay Archipelago and China they sent hundreds of specimens to the United States for trial. Among these was the *mangosteen,* a tropical fruit which attracted much attention.

In the winter of 1898, Fairchild made his first stop to study foreign products at Kingston, Jamaica. He visited market places, tasting new fruits and vegetables to determine what should be sent to the United States. The trip continued via Panama and the west coast of South America. (1) From Peru he sent back the *Hairy Peruvian Alfalfa,* which by 1920 was recognized as the most productive variety for irrigated lands in the Southwest. Fairchild also collected fruiting cacti for the Southwest, and in La Plata found spineless cacti. A hardy variety of avocado proved to be of value in giving growers experience in avocado raising in California.

From Rio de Janeiro the party proceeded to England and the countries of Central Europe. In Austria they secured the *Maliner Kren,* a flavorful horseradish which was later grown in New Jersey. Large plantings of the "Sultania Rosea Seedless Raisin Grape" were made in California from plants procured in Padua.

Later, varieties of okra, red pepper, vegetable marrow, pumpkin, cucumber, and peanuts, of special interest to the cultivators of the new, irrigated regions of the West, were obtained from Egypt. Onion seeds of a variety grown on the islands of the Upper Nile and exported to England came to be grown extensively in Texas. Hundreds of *lebbek* trees are growing in Florida today from seeds of the trees on the boulevard between the Nile and the Great Pyramids. *Berseem clover,* also introduced for its ability to thrive in hot, alkali desert areas, is grown in limited areas of the West.

After leaving Egypt, Lathrop and Fairchild visited islands in the East Indies and traveled in the interior of China and Ceylon before returning to London. Fairchild brought home about five

hundred different plants and collected many other plant items in subsequent explorations.

HANSEN

Niels Ebbesen Hansen made his first exploration for the government in 1897 to find alfalfa and other forage plants able to thrive in cold and semiarid regions of the prairie Northwest. Stock was suffering for forage, and the winter-killing of alfalfa had cost the farmers of this region millions of dollars. (2)

Hansen discovered *crested wheat grass* during his trip through the steppes of the eastern Volga region and Siberia, when he observed camel caravans loaded with the hay en route to market. From an examination of the hay he concluded that the crop would stand the severe cold and dry weather in the Northwest. In 1944, over 23 million pounds of the seed were grown in the United States, and observers believed it would soon cover millions of acres in the Northern Great Plains.

On the same trip, Hansen secured seed of *bromegrass,* a perennial crop for nutritious pasture and hay, able to stand drouth and cold because of its underground root-stocks. Its good qualities were immediately noticed and in 1899 orders were placed abroad for more seed. The 1944 seed crop of this grass amounted to over 13 million pounds. On this and several later trips to Russia, Hansen also brought back over thirty varieties of *proso,* a grain similar to millet, grown in the drier regions of Asia and Europe.

Hansen tells of his connection with the wheat introductions by Carleton as follows:

> I noticed that wheat bread in European countries was not as snow-white as in the United States. It was more of a creamy tinge. Our ordinary hard spring wheats date back to Galicia in Poland. I learned that much wheat was exported from Russia, and used extensively in blending with their home wheats in France, England, Italy, and other countries in west Europe. I also remembered that German-Russian colonists in South Dakota had brought over some of it from dry regions in Russia, but that millers refused them as rejected wheats, good only for chicken feed. . . . They needed special milling owing to the hard grains. Then in Russia I collected many authentic samples of these wheats, such as Kubanka, Arnautka, Krasnoturka, Belloturka, Chernokoloska (Black beard), and many more. Also brought wheats from Turkestan and Siberia.
>
> Upon my return in the spring 1898 this material and inside report was submitted to Secretary Wilson. It was up to him as a matter of policy, and would involve a fight with the milling interests. But Secretary Wilson wanted to help the northwest farmers who could raise these wheats in dry years and they needed much less rainfall. Secretary Wilson was never afraid of a fight, so decided quickly.

M. A. Carleton, a great wheat specialist from Kansas, was sent to Russia the same spring 1898 to get larger supplies and to extend the work. Many specialists were set at work proving that good bread could be made from durum wheat. In many ways Secretary Wilson extended the work and in due time the fight for recognition was won.

From this exploration Hansen also secured the progenitors of the *Persian* and *Honey Dew* melons seen in vegetable markets today. The Persian winter melon seed were sent in 1897 to Utah and California. Other fine varieties of muskmelons from Russia succeeded in Colorado and in other Rocky Mountain states. Through plant introduction, breeding and selection, Hansen has also made important contributions to such fruits as the pear, apple, and apricot.

CARLETON AND NEW WHEAT VARIETIES

The opportunity to introduce one of our most significant grain varieties, the *Kubanka wheat,* fell to Mark Alfred Carleton, wheat specialist of the Department. This introduction resulted from the search begun by Colman and continued by Rusk to find grains, grasses, and forage plants for the West. Attention had been attracted originally to the hard red winter wheats by the Mennonite German-Russian emigrants to Kansas in 1873 who brought the seed with them. These hard wheats, frequently introduced as Turkey wheat, failed to gain popularity due to the objections of millers. The change to a dependence upon hard wheats was to a large degree a matter of convincing various interests—farmers, millers, bakers, and consumers—of their value. (3)

Carleton's eagerness to search for wheats resistant to rust and cold grew out of his background in a wheat-growing area in Kansas, and from his experiments in Maryland with more than a thousand varieties. These experiments made him realize the wide range of variation in wheats and the possibility of selecting certain varieties for specific purposes. A repetition of these experiments in Kansas in 1896-97 gave Carleton additional data and made him eager to obtain more varieties from the original sources. Paul de Kruif, in *The Hunger Fighters,* has vividly depicted Carleton as a martyr who overcame great odds. Fairchild in turn wrote that de Kruif "perhaps carried away by the drama of the situation represented Carleton as having to fight for an opportunity to visit Russia. This was not the case." Carleton went as a Special Agent of the government and his reports were published in the records of the Section of Seed and Plant Intro-

duction. (1) Carleton left for Russia in July of 1898, returned the following year, and made a second trip in 1900.

During his first exploration, Carleton obtained seed of the Kubanka spring wheat from the wheat growing in the Turghai territory of Kuban in the Kirghiz Steppes, forty miles southeast of Orenburg. He also secured several other strains of Kubanka including the *Arnautka, Gharnovka,* and *Pererodka.* Sixteen varieties of other Russian cereals and seeds of forage plants, buckwheat, melons, and garden vegetables were brought back by this exploration.

TABLE 7

DISTRIBUTION OF PLANT STOCKS BY THE FEDERAL GOVERNMENT 1863–97

Year	Total Distribution	Year	Total Distribution
	No. of plants and cuttings		*No. of plants and cuttings*
1863	25,750	1882	70,000
1864	30,000	1884	100,000
1865	35,000	1885	74,000
1866	34,000	1889	45,000
1867	42,123	1890	80,000
1868	30,000	1891	117,000
1869	31,700	1892	66,000
1878	57,155	1893	60,000
1879	36,673	1894	75,000
1880	156,862	1895	73,485
1881	100,000	1897	56,100

Success of Carleton's Introductions—Carleton returned to Russia to secure larger quantities of wheats and to search for more varieties. This time he obtained the *Kharkov wheat,* a standard hard red winter variety which came to occupy the greater part of 21 million acres of hard red winter wheats in 1921. (4) From an introduction of a very hard red winter wheat made in 1900 from the Crimea, the *Kanred* was selected in 1906 and occupied 1,538,573 acres in 1939. In 1898 and 1900 Carleton also obtained seeds of the *Ghirka,* now known as the Alton and planted to 140,000 acres in 1939.

The justly famous wheat introductions of Carleton had significant results not only in changing the character of the American wheat industry but in winning public appreciation of plant introduction by the government. Two years after the introduction of

the Russian wheats, 60,000 bushels were produced, while only five years later 20 million bushels were grown. The United States has progressed nationally from the production of only soft wheats to the production of three different classes of hard wheats as the basis of milling and export wheats. The resulting interest in the study of wheats ushered in a period of research and of the application of the laws of Mendelian inheritance which led to significant results from 1901 to 1930.

The acreage in Turkey wheat, a term applied to Kharkov and many other synonyms, in 1939 amounted to 12,637,403 acres, or 19.77 per cent of the total national wheat acreage. However, these figures include neither related wheats, nor selections developed from this class of wheats, nor the durum wheats. Probably a third of the wheat acreage in 1939 was sown to varieties traceable to Carleton's introductions.

The estimated durum wheat acreage in 1939 was 3,372,405 acres, mainly in North Dakota, South Dakota, and western Minnesota. The Kubanka estimated acreage in 1929 was 724,864 acres and in 1939, 431,630 acres. The acreage of durum varieties is expanded in dry years. About one-third of this wheat is used in macaroni and related products and some is exported.

Other Wheat Introductions—New wheat varieties have been brought to the farmer in various ways, and it would be a mistake to leave the impression that wheat improvement was due almost entirely to introductions by the Department of Agriculture. Experiments in Canada paralleled those in the United States. Dr. William Saunders and his sons, Drs. A. P. and Charles E. Saunders, working at the Central (Dominion) station and at several substations, began crossing wheats in 1888. They developed the *Huron, Preston,* and *Stanley* varieties, and in 1892, the famous *Marquis* hard red spring wheat. All of these came to be grown commercially in the United States. The seed filtered across the border or came in as commercial shipments of grain.

William J. Farrer, in New South Wales, Australia, worked to breed varieties from 1886 to 1906, and many of his varieties now are grown commercially in America. The various Federal and state experiment stations worked at hybridizing wheat varieties. Consular officials continued to bring in plants from abroad. Immigrants brought their favorite plants from the Old World, and individual farmers and seedsmen were breeding and selecting varieties. Frequently, varieties have humble beginnings without

historical records. Whatever the source, the tendancy for the old varieties to be replaced by new hybrids was accelerated after 1900.

At the turn of the century, the Department of Agriculture was giving attention to the improvement of the soft white wheats preferred in the Pacific Coast states. The best of these varieties were introduced from Australia, Japan, China, and Europe to replace the old varieties which were deteriorating. The variety *Baart,* originally from South Africa and imported to Australia in 1880, was introduced by the Department in 1900. Baart wheat was first distributed by the Arizona Agricultural Experiment Station in 1910. After becoming well established in Arizona, its cultivation spread to the Pacific Coast states. In 1939, 890,000 acres were grown on the dry and irrigated lands of the West.

KNAPP

Seaman A. Knapp, while working with a land development company in Louisiana, became interested in rice production and gained much experience in cultivation of the crop. Knapp made two trips to Japan to secure rice varieties with milling qualities superior to those commonly grown in the South during the 1890's. The *Kiushu rice* he brought from Japan is the basis of the present rice industry in Louisiana and Texas.

The chief difficulty with the common Honduras or South Carolina rice at this time was its poor milling qualities which caused excessive losses to the growers. Knapp selected ten tons of seed from the varieties grown on Kiushu. These seed were allotted to selected rice farmers in Louisiana for trial. The Kiushu rice was found to be 25 per cent more productive than the Honduras, and milling losses were cut in half.

This introduction was a brilliant piece of pioneering, for it opened up extensive regions in Louisiana and Texas to rice cultivation—land that formerly could be used only for grazing. Texas increased its rice plantings from 8,711 acres in 1899 to 376,500 in 1904. The production of rice in Louisiana soon was increased by more than $1 million a year. During the three years from 1899 to 1902, America's rice imports declined to less than half their previous figures, and today the United States exports rice.

While in Japan, Knapp also procured five varieties of the Japanese persimmon, and varieties of alfalfa, plums, pears, oranges, and rare lily bulbs. On his second trip in 1901, Knapp obtained

seed of fifteen kinds of rice for trial in Louisiana, and sorghums and vetches for the West.

MINOR INTRODUCTIONS

From 1897 to 1901 the Department secured other plants of value. Tests of forage plants and grasses included the *March rape* from France, which proved valuable for the Sierra foothills, and the *Goat's rue* from the same country. Common, scarlet, purple, and hedge vetches, European lupines, and many forms of field peas were procured. The sources of new forage plants—New South Wales, Victoria, Algeria, Cape Colony, Natal, northwest India, the Royal Botanical Gardens at Kew, and Switzerland—indicate comparable climates in the United States for which the plants were being sought.

The Department also introduced seed of the *Swedish oat* from Russia in 1899 and distributed them to the Federal experiment stations for trial. This new variety was an established crop by 1904, and twenty-five years later 5 million acres per year were being sown to the *Swedish Select* or selections from it. *Bavarian hops* introduced in 1900 promised to be superior to the ordinary varieties. Soybeans then received the attention which led to their cultivation and utilization by American agriculture and industry. Three varieties brought from Japan in 1900 began a series of introductions leading to the establishment of a major farm crop.

BIBLIOGRAPHY

1. Fairchild, David G., *The World Was My Garden; Travels of a Plant Explorer.* New York: Scribners, 1928.
2. Taylor, H. J., *To Plant the Prairies and the Plains: The Life and Work of Niels Ebbesen Hansen.* Mt. Vernon, Iowa: Bios, 1941.
3. Carleton, M. A., "Russian Cereals Adapted for Cultivation in the United States," USDA Division of Botany, *Bulletin No. 23,* 1900.
4. Clark, J. A. and Bayles, B. B., "Classification of Wheat Varieties Grown in the United States in 1939," USDA *Technical Bulletin 795,* 1942.

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Introductions of the Twentieth Century

DAVID G. FAIRCHILD took charge of the Office of Foreign Seed and Plant Introduction in 1897, and held that post, except for tours of exploration, for twenty-seven years. Under his leadership the Office set up an efficient system for disseminating plants, and experts in different parts of the country were employed to locate new plant materials. In 1902 Fairchild's division came under the jurisdiction of the new Bureau of Plant Industry. Three other divisions—the Arlington experimental fram, Congressional seed distributions, and tea investigations—were established at the same time.

When the Bureau of Plant Industry was organized in 1900, is was the first official agricultural organization of its kind devoted exclusively to plant introduction. In addition to the four branches listed above, there were divisions concerned with physiology and pathology, botany, grass and forage plants, pomology, and the experimental gardens and grounds. Under Beverly T. Galloway, the Department's leading plant pathologist, more than two hundred employees were engaged in plant work. The Bureau had several gardens and farms at its disposal, and experiment and field stations were established as they were needed for plant experiments. The Arlington Farms and Potomac Flats were located in Washington, D. C., and an eighty-acre garden at Chico, California. The South Texas Garden, established at Brownsville in 1907, contributed much to the development of the Winter Garden district in the Rio Grande Valley of South Texas.

THE SEARCH FOR NEW CROPS

At the turn of the century, the Department of Agriculture accelerated its search for new and better crop varieties. Secretary