

# Some Contributions of K-State Agronomists



to World  
Agriculture During  
the 20th Century

# **SOME CONTRIBUTIONS OF K-STATE AGRONOMISTS TO WORLD AGRICULTURE DURING THE 20<sup>TH</sup> CENTURY**

**Gary M Paulsen\***

## **Introduction**

Agriculture in Kansas and the world advanced rapidly during the past century. Revolutions in crops and the technology for producing them raised yields three- or four-fold or more and markedly improved the lives of billions of persons. Kansas became the "Wheat State," producing more of this major food grain in the U.S. than any other state. Feed grains produced in the state support the second-largest beef industry in the U.S. In other parts of the world, nearly three times as many persons have ample food in 2000 as in 1900 instead of suffering from the famines that were widely predicted.

Kansas State University alumni and faculty contributed significantly to many of the important advances in crops during the 20<sup>th</sup> Century. They introduced wheats that started a new grain industry in the U.S. and a Green Revolution in developing countries. They made hybrid corn a practical crop, developed sorghum into a new feed grain, created a "Miracle Rice" for Asia, and led overseas programs that became models for introducing new technology to developing countries. In one way or another, their work impacted most of the major crops grown in the U.S. and around the world.

Kansas agriculture benefitted directly from these advances along with the rest of the world. Most varieties of wheat in the state contain the semi-dwarf genes that were basic to the Green Revolution. Hybrid corn and combine-height sorghum produced in Kansas support the large livestock industry in the state. Improved livelihoods of persons overseas make them better customers for all of the state's agricultural products.

Many more K-Staters than can be described here made important contributions to world agriculture during the past century. Other persons would have different lists of distinguished achievements. This roster, which was intended to illustrate the significance and scope of contributions, is solely the responsibility of the author.

Most of the K-Staters who helped to shape crop agriculture as we know it today were faculty or students in the Department of Agronomy. Some of their important achievements were made at K-State, and others were made during their careers at other institutions. In all cases, however, their contributions were instrumental in advancing the science and technology of crops during the past century. This presentation is the story of their remarkable contributions.

## Introducing New Wheats and a New Industry



**Mark A. Carleton**  
B.S. K-State 1887  
M.S. (agriculture)  
K-State 1893  
Assistant Professor  
K-State 1893-94

Mark A. Carleton (1866-1925) shaped the hard red winter wheat industry in the Great Plains by introducing hardy varieties and developing suitable systems of dryland farming. He also introduced varieties that started the durum wheat industry in the Northern Great Plains and several important oat varieties.

Carleton was born in Ohio and raised in Cloud County, Kansas. He became a professor at Garfield University (now Friends University) in Wichita after earning the B.S. degree. After returning to K-State for an M.S. degree, he studied rust diseases of cereals. Carleton then transferred to the USDA, where he established the physiological relationship of nearly all of the cereal rusts in the U.S. and became Chief of Cereal Investigations.

The U.S. Secretary of Agriculture sent Carleton to Russia and Siberia as an agricultural explorer to collect rust-resistant and drought-resistant varieties of cereals in 1898 and 1899. He returned with 'Kharkof,' a winter-hardy type of 'Turkey' hard red winter wheat that eventually occupied half of the Kansas wheat area and dominated production in Nebraska and other states, and 'Crimean,' which became a parent of the first K-State varieties, 'Kanred' and 'Tenmarq.' He also introduced 'Kubanka' and promoted its production to start the durum wheat industry in the

northern U.S. One of the first improved varieties of durum wheat released by North Dakota State University was named after Carleton.

Research directed by Carleton for the USDA Office of Grain Investigations during 1901-18 led to many improvements in systems for producing wheat in the Great Plains. These experiments demonstrated the importance of soil moisture, methods of conserving moisture, and the relationship of gluten quality of wheat to moisture.

Much of the correspondence that led to the organization of the American Society of Agronomy was conducted by Carleton. He was unanimously selected as the first President of the Society in 1907 and was instrumental in determining its early growth.

*Adapted from J. Amer. Soc. Agron. 17:514-516 (1925), Agron. J. 50:722-723 (1958), and Kansas History 23:12-25 (2000).*

## Leading Improvement of Barley in the U.S.



**Harry V. Harlan**  
B.S. (agriculture)  
K-State 1904  
M.S. (agronomy)  
K-State 1910

Barley is a crop with many uses, including foods, malting, and feeding livestock. Harry V. Harlan (1882-1944) directed barley research for the USDA from 1910 to 1944, developed varieties that occupied much of the U.S. barley acreage, and explored the world to assemble one of the largest barley collections.

Harlan was born in Illinois and reared in Walnut, Kansas. He directed teaching and research at agricultural colleges in the Philippines from 1905-1908 before returning to K-State for an M.S. degree. He also received a Sc.D. degree from the University of Minnesota in 1914.

In addition to developing new varieties, Harlan worked on methods of improving and producing the crop. His work greatly increased knowledge of barley's origin, genetics, and morphology and improved its quality for many uses.

Harlan traveled to Peru to advise the country on agricultural production; to Central Europe and the Balkans to survey grain supplies after World War I; and to China, North Africa, Abyssinia, and India to collect new types of barley. In addition to his scientific publications, his travels resulted in articles in *National Geographic* and other magazines.

*Adapted from J. Amer. Soc. Agron. 36: 1046-1097 (1944) and H.V. Harlan, One Man's Life with Barley (1957).*

## Making Hybrid Corn Practical



**Donald F. Jones**  
B.S. (agronomy)  
K-State 1911

“He took the corn plant, a pliable piece of clay, and he molded a new industry in America – hybrid corn industry – a new source of wealth. He was bold. He trod where the geneticists had feared to tread” (J.G. Horsfall, Director of the Connecticut Agricultural Experiment Station).

Donald F. Jones (1890-1963) was born in Hutchinson, Kansas, and operated a small farm near Wichita to finance his education at K-State. After graduating from K-State, he earned an M.S. degree from Syracuse University in 1914 and a Sc.D. degree from Harvard University in 1918. He was Chief Geneticist at the Connecticut Agricultural Experiment Station from 1914 to 1960.

The discovery of double-cross hybrid corn by Jones made the crop commercially practical. By combining two single-cross hybrids in a four-way union, he created a new, uniform, and highly productive hybrid that more than doubled corn yields. Nearly all of the corn grown in the world today is hybrid.

Jones also is co-holder of the original patent with Paul C. Mangelsdorf for using cytoplasmic male sterility and restoring fertility by blending to produce hybrid corn, thereby eliminating the costly process of field detasseling.

Jones received an honorary Sc.D. degree from K-State in 1947 for his accomplishments. In making the presentation, President Milton S. Eisenhower stated that, “As a major contributor to the development of hybrid corn and as an inventor of the specific techniques of hybrid corn production, Dr. Jones has conferred immense benefits to a hungry world.”

*Adapted from Agronomy News Sept.-Oct.:490 (1963) and Kansas Farmer Sept. 2:21 (1961).*

## Discovering the Seeds for the Green Revolution



**Samuel C. Salmon**  
M.S. (agronomy)  
K-State 1913  
Professor of Agronomy  
K-State 1913-31  
Acting Head of Agronomy  
K-State 1919

Seeds of the short, stocky wheats that became the basis of the Green Revolution were introduced to the U.S. by Samuel C. Salmon (1885-1975). These wheats are parents of the semi-dwarf varieties that greatly increased production of wheat in many developing countries. They are also in the pedigrees of most wheat varieties grown in Kansas today.

Salmon was born in South Dakota and received a B.S. degree from South Dakota State University and a Ph.D. degree from the University of Minnesota. He taught farm crops and conducted research on wheat production at K-State after receiving his M.S. degree. In 1931, he became Principal Agronomist in the USDA Office of Cereal Crops and Diseases.

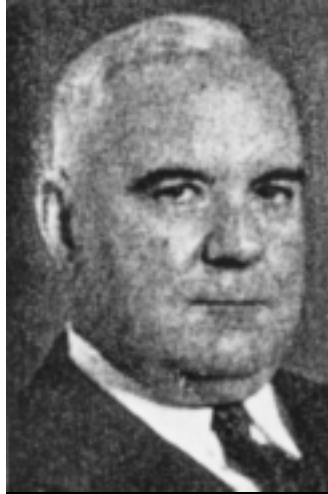
While serving as the cereal crops consultant with the U.S. Army of Occupation in Japan after World War II, Salmon noted the vigorous, productive semi-dwarf wheats grown in that country. He collected and sent seeds of the wheats, including 'Norin 10,' to the USDA Small Grains Collection. These seeds were used by Washington State University to develop the variety 'Gaines,' which holds the world record for wheat yields, and by CIMMYT in Mexico to develop the varieties that started the Green Revolution. These seeds were probably more responsible than any other factor for the large increase in wheat production

during the past century.

Salmon continued to work in international agriculture, serving two years in the Philippines to rehabilitate the University of the Philippines College of Agriculture at Los Baños (UPLB) and four tours with the U.S. Agency for International Development in developing countries. He also co-authored several books on experimental design in agricultural research.

*Adapted from J. Amer. Soc. Agron. 24:988 (1932) and Agronomy News Mar.-Apr.:25 (1976).*

## Leading Improvement of Oats in the U.S.



**Franklin A. Coffman**  
B.S.A. (agronomy)  
K-State 1914  
M.S. (agronomy)  
K-State 1922  
Assistant Professor  
K-State 1916-17

Oat is an important companion crop and grain for livestock in many regions of the U.S. and other areas of the world.

Franklin A. Coffman (1892-1976) conducted basic research on the origin, genetics, and diseases of oats and directed the USDA national oats program for many years. He was particularly recognized for helping to make oat a successful crop in the U.S.

Coffman was born in Jewell, Kansas. He served with the Agricultural Experiment Station in the Philippines during 1914-16, worked on cereal diseases at K-State for two years, and joined the USDA at Akron, Colorado in 1917. Coffman moved to USDA headquarters in Washington, D.C. in 1924, where he became Senior Agronomist and leader of the oats program until his retirement in 1962.

In addition to his research on genetics and improvement of oats, Coffman was instrumental in planning and interpreting uniform oat nursery experiments throughout the U.S. He served as Secretary of the National Oat Conference from 1950-62 and was Editor of the American Society of Agronomy monograph, "Oats and Oat Improvement."

Honors received by Coffman included the Superior Service Award from the USDA in 1962 and the Distinguished Service in Agriculture Award from K-State in 1966.

*Adapted from Agron. J. 41:591 (1949) and Agronomy News Mar-Apr:20 (1977).*

## Developing A New Crop for the Great Plains



**John B. Sieglinger**  
M.S. (agronomy)  
K-State 1915

"The Father of Combine Milo" (Maunder, 2000), John B. Sieglinger (1893-1977) adapted an obscure crop from Africa with a wide range of plant types to mechanical harvest. His creation became a major crop for the semi-arid regions of the Great Plains and the second-most-important feed grain in the U.S.

Sieglinger was born in Newton, Kansas, reared in Oklahoma, and received a B.S. degree from Oklahoma A&M University in 1913. After graduating from K-State, he began a 50-year career of sorghum improvement with the USDA at Woodward and later Stillwater, Oklahoma.

Sorghums grown in the Great Plains during the early 20<sup>th</sup> Century were tall, susceptible to lodging, goose-necked, and unadapted to mechanical harvest. Sieglinger introduced a number of early, short-stature varieties, including 'Beaver' and 'Wheatland,' for release when combines came into general use for wheat. The result was a row crop that was highly compatible with production of the wheat that dominated the region, and used the same equipment as wheat for harvest.

Sieglinger went on to develop 23 commercial varieties of grain sorghum. Two of the varieties, Wheatland and 'Redlan,' are still used for producing hybrid grain and forage sorghums.

He also developed pollinator lines for hybrids and researched cultural practices, grain quality traits, and insect resistance of sorghum.

*Adapted from Agronomy News Mar-Apr:21 (1978) and A.B. Maunder In Sorghum: Origin, History, Technology, and Production (2000).*



## Improving Sugarcane for Hawaii



**Albert J. Mangelsdorf**  
B.S. (agronomy)  
K-State 1916

Sugarcane is a major crop in Hawaii, and much of the success of the industry is due to Albert J. Mangelsdorf (1896-1989). He developed many of the most important varieties and pioneered in using wild relatives to improve sugarcane, a practice that is now employed with many other crops.

Mangelsdorf was born in Atchison, Kansas and returned there to work with his parents at the Mangelsdorf Seed Company after graduating from K-State. In 1922, he entered Harvard University, where he was an assistant for the famous geneticist E.M. East, and received a Sc.D. degree. His graduate research produced some of the first information on the genetics of self-incompatibility in plants.

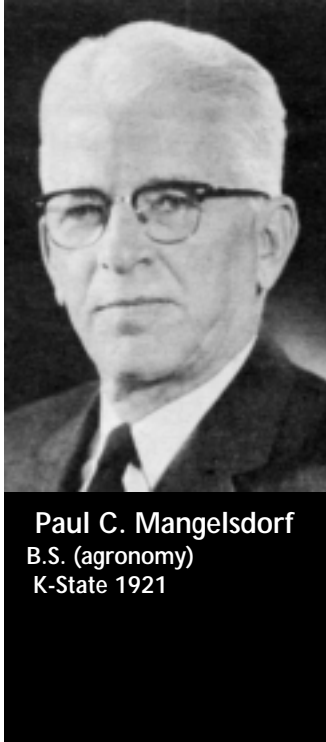
Mangelsdorf joined the Hawaiian Sugar Planters Association in 1926 and spent 35 years there as a geneticist in sugarcane breeding and Head of the Hawaii Sugarcane Experiment Station. Much of his effort to improve sugarcane emphasized resistance to the diseases that quickly destroy the crop in tropical climates. He found that wild relatives are excellent sources of genes for disease resistance, vigor, and hardiness. All the important varieties of sugarcane grown in the state eventually had one or more wild ancestors in their pedigrees. Today, wild relatives of corn, wheat, sorghum, and other crops are widely

used in their improvement.

Worldwide recognition was given to Mangelsdorf for his achievements with sugarcane and he received many honors, including an honorary Doctor's degree from the University of Hawaii in 1950.

*Adapted from Kansas Farmer Aug. 4:13(1962).*

## Discovering the Genetics and Origin of Corn



**Paul C. Mangelsdorf**  
B.S. (agronomy)  
K-State 1921

Much of our knowledge of corn – its origin, genetics, and methods of producing hybrids – was discovered by Paul C. Mangelsdorf (1899-1989). His work greatly contributed to the status of corn as the most important feed crop in the world and became a model for production of hybrids of other crops.

Mangelsdorf was born in Atchison, Kansas and “never thought about going to college anywhere except at K-State.” After graduating from K-State, he earned a Sc.D. degree from Harvard University in 1925, joined the Texas Agricultural Experiment Station, and then returned to Harvard as a Professor of Botany and eventually Director of the Harvard Botanical Museum.

Research by Mangelsdorf at Harvard concerned economic plants, particularly corn and species for condiments, insecticides, and medicines. He published widely on the genetics of corn and the origin of races of maize (corn) grown in Latin America and, with Donald F. Jones, another K-State Agronomy graduate, held the original patent for using genetic male sterility to produce hybrid corn seed. Resistance to stem rust in ‘Mediterranean Hope’ wheat was identified by Mangelsdorf and incorporated into several varieties of Kansas wheat in the 1960s.

Harvard University designated Mangelsdorf as one of its 12 most outstanding professors and named a distinguished professorship in his honor. He was elected to the National Academy of Sciences in 1945 and received an honorary Doctor of Laws degree from K-State in 1961 for his contributions to agriculture and society.

*Adapted from Kansas Farmer Jan. 6:31 (1962).*

## Improving the Queen of Forages



Hewitt M. Tysdal  
M.S. (agronomy)  
K-State 1925

Alfalfa is the oldest and most popular crop grown for forage in the world and the most important forage for livestock in the U.S. However, early varieties from Europe lacked hardiness and resistance to diseases for U.S. conditions. Hewitt M. Tysdal (1902-2000) developed one of the first, highly popular improved varieties of alfalfa; devised new ways of producing alfalfa seed; and led the national alfalfa improvement program in the U.S. for many years.

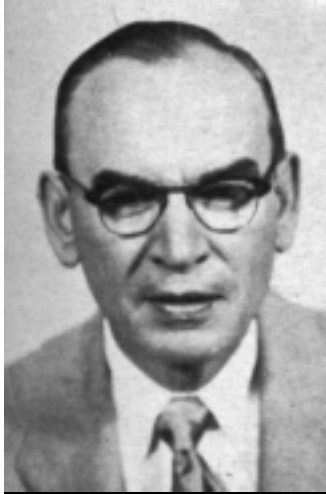
Tysdal was born in Illinois and earned his B.S. degree from the University of Saskatchewan in 1923 and a Ph.D. degree from the University of Minnesota in 1931. He joined the USDA and was stationed at Lincoln, Nebraska until 1943, when he became Principal Agronomist in charge of the alfalfa program for the USDA in Washington, D.C.

While at Nebraska, Tysdal released 'Ranger' alfalfa in 1940. This new alfalfa was highly productive, hardy, and resistant to diseases and became the most popular variety in the U.S. Tysdal also developed a method of producing  $F_1$  hybrid alfalfa on a field scale that could be used by seed producers.

Ranger alfalfa marked the beginning of a new method for producing alfalfa seed. Prior to Ranger, most alfalfa seed was produced in areas where the crop was grown for forage, but seed yields were low and uncertain. Most seed of Ranger, in contrast, was produced in the southwestern U.S., where it was not adapted for forage but yields of seed were higher and conditions assured a steady supply.

*Adapted from Agron. J. 40:1117 (1948) and D. Smith. Forage Management (1960).*

## Leading Improvement of Wheat in the U.S.



**Louis P. Reitz**  
B.S. (agronomy)  
K-State 1930  
Professor of Agronomy  
K-State 1939-46

Wheat is the major crop in Kansas and the most important food grain in the U.S. Louis P. Reitz (1907- ) led both the wheat improvement program at K-State and the national wheat program for the USDA during his career. He developed a number of outstanding wheat varieties for Kansas and contributed greatly to knowledge of the genetics, production, and ecology of wheat.

Reitz was born near Belle Plaine, Kansas. In addition to his degree from K-State, he also earned an M.S. degree from the University of Nebraska in 1937 and a Ph.D. degree from the University of Minnesota in 1955. Reitz conducted research and taught at Montana State University from 1930 to 1935, when he joined the USDA. In 1939, he became leader of the wheat improvement project at K-State, where he was involved with release of 'Comanche', 'Pawnee', and 'Wichita' varieties. Reitz re-joined the USDA in 1946 and was stationed at Lincoln, Nebraska as coordinator of the wheat improvement programs in the 11 southern Great Plains states. He became leader of the USDA national wheat program at Beltsville, Maryland in 1955. At the USDA, he directed agronomists, geneticists, pathologists, cereal chemists, and other scientists involved in the federal wheat program.

Among the honors received by Reitz for his contributions to improvement of wheat and leadership of wheat programs was the K-State Distinguished Service in Agriculture Award in 1979.

*Adapted from Agron. J. 52:723-724 (1960) and Kansas Farmer Nov. 5:17 (1961).*

## Revolutionizing Rice in Asia



**Henry M. Beachell**  
M.S. (agronomy)  
K-State 1933

Much of the world's population eats rice for its daily food. Henry M. Beachell (1906- ) developed IR-8 "Miracle Rice" and other improved varieties that began the Green Revolution in rice production throughout Asia. This achievement doubled production of rice in the world and averted famine for the millions of persons who depend on the crop for their food.

Beachell was born in Nebraska and received a B.S. degree from the University of Nebraska in 1930. He began his career as a rice breeder for the USDA after graduating from K-State. The varieties developed by him eventually occupied over 90% of the long-grain rice acreage and most of the total rice acreage in the U.S.

After retiring from the USDA in 1963, Beachell joined the Rockefeller Foundation and was stationed at the International Rice Research Institute in the Philippines to improve rice for developing countries. The "Miracle Rice" and its successors that were developed by Beachell and his colleagues revolutionized rice production in Asia. These varieties account for over 80% of world rice production and feed an estimated 700 million more people than the old, traditional varieties they replaced. Beachell retired from the Rockefeller Foundation in 1972 and then worked for IRRI as a rice breeder in Indonesia until 1982, when he retired to become a consultant for a hybrid rice company in Texas.

Beachell received many awards for his achievements, including the Japan Prize in 1987 and the World Food Prize in 1996. K-State presented him with its highest honors, the Distinguished Service in Agriculture Award in 1974 and the Alumni Medallion Award in 1998.

*Adapted from the World Food Prize – Presentation of Laureates (1996).*

## Building Institutions in Developing Countries



**Leland E. Call**  
Professor of Agronomy  
K-State 1907-45  
Head of Agronomy  
K-State 1913-25  
Dean of Agriculture  
K-State 1925-45

The international agriculture dimension of Land Grant universities and the first overseas project of its type are in a large part due to Leland E. Call (1881-1969). These U.S. programs developed institutions overseas and trained students to return to their homelands. The institutions and former students are now important centers of instruction, research, and extension that contribute greatly to production of food in developing countries.

Call was born in Ohio and earned B.S. and M.S. degrees from Ohio State University. He was associated with K-State for more than 50 years.

The USDA Office of Foreign Agriculture in 1946 appointed Call as Chief of Party of a mission to advise the U.S. Government on restoring agriculture in the Philippines after World War II. The situation was particularly desperate in that country, a U.S. commonwealth until 1946. The University of the Philippines College of Agriculture at Los Baños (UPLB) was an internment camp for American civilians during the war and was largely destroyed. A major recommendation of the mission's report was to rehabilitate facilities and train personnel at UPLB, a project that was eventually undertaken by Cornell University. Call advised the Cornell faculty on the project and was offered the position of project leader by Cornell University. He instead

became Research Advisor and Director of the Cornell/UPLB Project for the U.S. Agricultural Mission in the Philippines, a position that he held until 1956.

The Cornell/UPLB project became a model for similar projects in developing countries by other Land Grant universities and was the stimulus for establishing their international agricultural programs. K-State, like many Land Grant universities, was involved in several international agricultural projects that involved building institutions, training students, and providing advisors. The first K-State major project, with Andhra Pradesh Agricultural University in India, began in the late 1950s. This was followed by similar projects with Ahmadu Bello University in Nigeria in the 1960s and Central Luzon State University in the Philippines in the 1970s.

*Adapted from L.E. Call. An Autobiography (1967).*

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