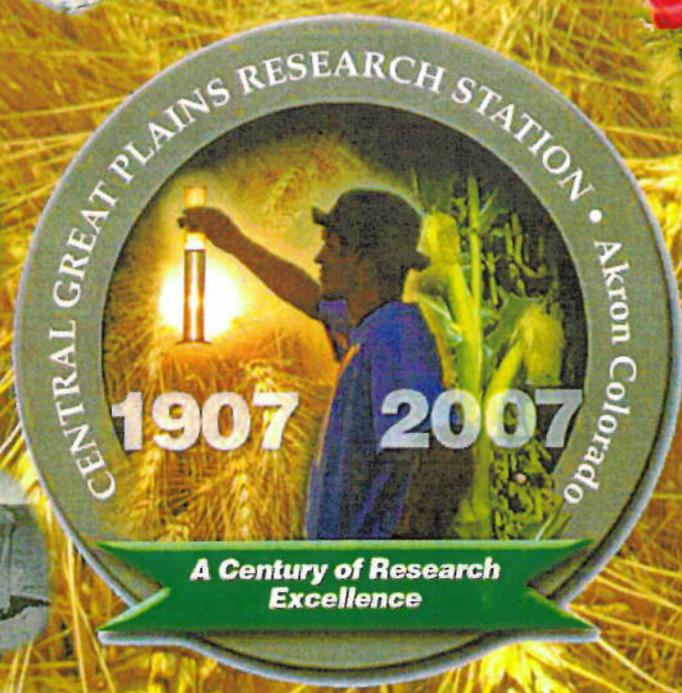


History of the Central Great Plains Research Station



includes publication list

*History
of the
Central Great Plains
Research Station*

David C. Nielsen, B.W. Greb, Merle F. Vigil, and R. Mickelson

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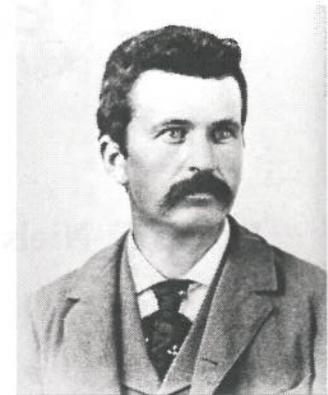
David C. Nielsen, B. W. Greb, M.F. Vigil, and R. Mickelson

The United States Department of Agriculture was established in 1862 with the Bureau of Plant Industry established in 1901. E.C. Chilcott was called to Washington D.C. by USDA Secretary James Wilson and placed in charge of the investigational work in dry land agriculture in the Great Plains on July 1, 1905. He spent most of his time during the fiscal year 1905-6 in traveling over the Great Plains and getting in touch with the investigators at the 10 State Experiment Stations of the states lying wholly or in part within that area, and in looking for locations for prospective field stations (“Agricultural Fact Finding Institutions”) that would be representative of the various sections of the Great Plains. He stated that, “I started out with and have maintained the fixed determination to do all within my power to have these field stations located where they would best serve the farmers of the region, rather than the politicians, or the land speculators.” Immediately the people in and around Akron, Colorado began work to meet the specifications for having a station located in the area, namely,

1. Provide a suitable piece of native sod, and
2. Provide \$3000 for erecting the necessary buildings

Among the chief supporters of this early action were August Muntzing (an attorney), H.G. Pickett (a newspaper editor), and James Brunker (a farmer-rancher), all of the Akron area. Washington County commissioners Louis B. Wind, Mark B. Gill, and Elmer E. Brown provided 66.7 acres of sod land that was acceptable. M.F. Vance, a local farmer-rancher, succeeded in having an adjoining 160 acres of state land set aside from homestead entry and it was added to what Washington County provided. On these 226.7 acres the station was established in 1907.

J.E. Payne, Assistant in Dry Land Agriculture, was sent from Garden City, KS in June 1907 to set up the station, officially named the Akron Sub-Experiment Station, and serve as its first superintendent. From June 19 to July 1, 1907, 47 acres of the original buffalo-grama grass sod were broken out. Mr. Payne first contracted to have a barn built, and construction began in September 1907. A well was drilled in October, with water found at 90 ft. A windmill was installed in November and a house was completed by the end of the year. The first experiments were established in 1908 and 1909. Five other wood-frame buildings were built between 1907 and 1918, including the main office building (currently referred to as Building No. 2) and the horse barn



J.E. Payne



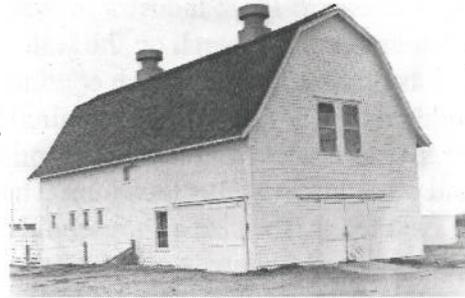
Breaking the native sod at the research station, 1907

Station buildings, 1909



(currently referred to as Building No. 3) which were constructed in 1914.

Windbreak studies were first planted in 1909-1911 and further plantings were made in 1935-1936. Six experiments were planted which included evaluations of 26 species. The Ponderosa pine windbreak running north and south along County Road GG is a remnant of the 1935-1936 planting. An extensive fruit garden planting was made from 1909 to 1914 that produced encouraging results regarding pie cherry, apple, plum, and pear production. Field shelterbelt experiments were initiated in 1946, with a shelterbelt 70' by 612 ft made up of Ponderosa pine and Rocky Mountain Juniper. Many of the orchard trees had succumbed to diseases by 1957, and most were removed at that time.



Horse Barn

The first rotation experiments were established in 1909. They were part of rotation studies conducted by the Office of Dry-Land Agriculture Investigations of the USDA's Bureau of Plant Industry at 24 Great Plains locations. Crops included in these rotation experiments at Akron were winter wheat, spring wheat, oats, barley, corn, kafir, milo, sorgo, rye, peas, sweet clover, and alfalfa.

Officially the station became the U.S. Akron Field Station and now, as the Central Great Plains Research Station, is one of only four remaining federal field research stations in the Great Plains (the other three are in Sidney, MT; Mandan, ND; and Bushland, TX).

Mr. Payne resigned in March 1910, and the superintendent duties were taken over by O.J. Grace.



O.J. Grace and "Hound Dawg", 1910

Both the Cereal and Forage Offices of the USDA maintained research personnel at the station beginning in 1908. Individuals working on those cereal and forage investigations included W.C. Shelley, A.D. Dillman, H.N. Vinall, F.E. Thompson, Charles H. Clark, George A. McMurdo, F.A. Coffman, and J.J. Curtis. The Dryland Investigations office of the Department of Agriculture also maintained a scientific researcher at the station for many years. Among those holding this position were A.E. Seamans, W.M. Osborne, N.L. Jensen, and J.F. Brandon.



F.A. Coffman, cereal nursery, 1921

In the period of 1910-1920, Drs. Lyman J. Briggs (physicist) and H. Leroy Shantz (plant physiologist), both of the Bureau of Plant Industry in Washington, D.C., did their classic research on the water requirements of plants, work which continues to receive world-wide recognition. The work required thousands of repetitive measurements on numerous replicates at Akron and other Great Plains locations. The plants were grown in lysimeters (the size of household trash cans containing about 250 lbs of soil each) allowing Briggs and Shantz to compare variables such as species, variety, climate, soil water content, soil fertility, evaporation, humidity, temperature, and cutting frequency of forages on crop productivity. Weighing of the lysimeters was done three times a week, and the water transpired by the plants was replaced after each weighing. Others participating in this research were A.P. Kidder, Homer Martin, Auguste Boncquet, A. McG. Peters, R.D. Rands, G. Crawford, A.F. Cajori, N. Peters, H.W. Marquard, J.D. Hird, R.L. Piemeisel, H. Shattyn, T.R. Henault, F.M. Eaton, and Clyde Griswold. The work of these individuals continues to be cited in scientific publications today.



L.J. Briggs



H.L. Shantz



Briggs and Shantz potometers in screen enclosure, 1911

In 1926, Dr. C.A. Lory, president of Colorado A&M College (now Colorado State University) at Fort Collins, accompanied E.J. Maynard, staff animal husbandman, to the station. Dr. Lory was shown an adjoining 160 acres of native sod located south of the station across the tracks of the Burlington Railway. He agreed to the purchase of this land by the college which raised the station area to 386 acres.

About 1930 the Colorado State Highway Department sought land along the south side of the original 66.7 acres for federal highway purposes. John M. Stephens, regional supervisor from the Mandan, ND research station met with local citizens at Akron. As a result, sufficient funds were raised to buy 20 acres adjoining the 67 acres on the west. These 20 acres were deeded to Washington County which continues to lease the land to the research station. This increased the station land acreage to 406 acres. Another 80 acres to the northeast of the original 67 acres is now leased from the Washington County Soil Conservation District, bringing the total size of the research station to 486 acres.

During the 1920's through the 1950's a variety of animal feeding and production work was



First Hampshire ram, 1921

done. O.J. Grace established a sheep grazing experiment in 1919, and studies that investigated hog and lamb fattening, and cow-calf production studies were later run. Following World War II, Lewis Kundert was employed at the research station, first working as a farm hand for Colorado A&M College managing the livestock experiments for three years, and then working for the Bureau of Plant Industry (which would become the Agricultural Research Service). The livestock experiments first involved fattening steers, and later cow/calf nutrition. Many head of cattle were lost during the New Years blizzard of 1949 that lasted three days. Many people were stranded on US Highway 34 during that blizzard and a number of families stayed at the station until the road re-opened.



Cow-Calf production study, ~1950



Pat, MaryAnn, and Tom Kundert, 1949

Many of the station employees lived on the station with their families during the first half of the station's existence. Station employees raised potatoes, carrots, squash, pinto/navy beans for their families. Some of the children that lived on the station attended the Star School, located three miles north and east of the station. Some of the families living on the station were Payne, Grace, Brandon, Johnson, Kuntz, McKie, Shook, Pixler, Hodges, Curtis, Reece, Parker, Callahan, Coffman, Greb, Kundert, and Florian. By the early 1960s there were no individuals or families residing on the station.

The need for additional personnel and funding to research agricultural production systems for the unique soils and climates of the Central Great Plains have always been priorities for the station administration. In the 1951 annual report, superintendent J.F. Brandon wrote, "Due to the findings of this station, located right in the High Plains, that the region is governed by an entirely different set of environmental conditions than maintain over the other portions of the Great Plains area, it is no less than colossal that the Bureau does not maintain more research workers here. The station enjoys good cooperation with the Cereal, Horticultural, and Forage Divisions of the U.S. Department located in Beltsville. It also has good cooperation with the Agronomy, Horticultural, Range Management, and the Animal Husbandry Departments of the State Agricultural College at Fort Collins. However, none of these provide any financial aid..."



J.F. Brandon

Research emphasis changed in 1953 with the creation of the Agricultural Research Service, a research agency within USDA. Up to this time, research emphasis had been placed on breeding of and cultural studies for cereal and forage crop production. Animal nutritional studies were no

longer part of the federal research program, while water management and soil fertility became a prime mission for the Agricultural Research Service.

On 1 July 1956 the Akron Field Station received designation as a regional experiment station for the Central Great Plains. On 20 December 1956 the name was officially changed to the USDA Central Great Plains Field Station to more clearly define the added research responsibility. The experimental program was broadened to include work on agricultural problems over a 55-million acre area in eastern Colorado, western Kansas, southwestern Nebraska, and southeastern Wyoming.

Bob Florian started work as “state-paid laborer” at the station in March 1954. B.W. Greb (Wally), a recent graduate of Colorado A&M University, reported to work as a soil scientist in December 1954, with the promise of more soil and water conservation investigations. The 1954 annual report also lists J.F. Brandon (Agronomist and Superintendent) and Lewis Kundert (Farm Hand) as station personnel. The 1956 annual report stated that Lewis Kundert had been with the station as both a state and federal employee since 1946, and that in 1956 his position changed from Farm Laborer to Agricultural Aid. Wendale Graves was hired in 1956 to fill the farm laborer position.

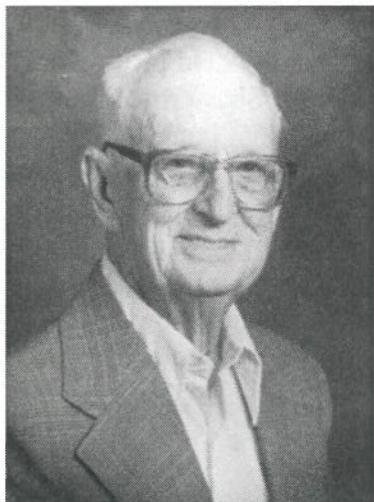
Wally Greb quickly began work on soil and water conservation. In 1955 he set up simulated erosion plots in which top soil was removed and chemical soil amendments were evaluated as to their impact on yield in replacing the natural fertility of the surface soil. In that same year he also proposed to study the effects of stubble mulch tillage and herbicides on improving precipitation storage during fallow periods, strip cropping, and runoff control by means of constructed bench terraces. A soils lab was set up in 1956. While the station had held field days for many decades, primarily related to small grain variety trials, active outreach and dissemination of current research information to agriculturalists exploded with the addition of Wally Greb to the staff. Some of the many research findings of Wally had to do with fertility requirements to minimize effects of soil erosion, fertilizer management to improve crop and grassland production, snow trapping methods to increase soil water for crop production, characterization of the snow climate of the Central Great Plains, increasing precipitation storage efficiency through effective fallow management, quantifying impacts of windbreaks on adjacent area crop production, and proso millet production methods.



B.W. Greb, 1970

An increasing awareness of the importance of public support for agricultural research, and the research station in particular, was noted on the 1958 annual report which indicated the formation of an advisory committee of farmers, ranchers, and citizens. That annual report stated, “No station such as this one can long survive without the active support of those farmers, ranchers,

and other citizens whom it is designed to serve either directly or indirectly. It must be operated on a program growing from the suggested needs of these Great Plains and not the reverse. Farmers', ranchers', and other citizens' opinions, suggestions, and agricultural needs are most valuable and if properly interpreted into research that serves these needs, this station can go forward, expand and endure."



M.B. Cox

In 1956 agricultural engineer Maurice B. Cox transferred to Akron from Guthrie, OK. In 1957 J.F. Brandon transferred to Fort Collins, and Cox was appointed acting superintendent. Brandon had been at the Akron station since 1920. A 50th anniversary celebration was held June 28, 1957, with 220 in attendance. Brandon was recognized for 40 years of service.

In 1958, Cox began construction of the five level pans used for studies in water harvesting. The size of the pans varied from 2.5 to 6.6 acres, with contributing watersheds varying from 18 to 360 acres. The pans were constructed using both wheel and track tractors and a scraper. Pans were leveled to zero grade and smoothed with a land plane. Dikes were constructed around each pan, and flumes installed at both upper and lower ends of each pan to measure inflow and outflow.

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Level basin pan and flume, 1964

In 1958 the old horse barn (Building 3) was remodeled into an exhibition hall and community meeting place. The wheat variety trials were moved to their current location south of US Highway 34. Also in 1958 C.E. Johnson took over the superintendent duties, and Wayne Shawcroft and William Fryrear joined the staff as student trainees. F.W. Frazier began duties at the station as a CSU agronomist.

The United States Senate Committee on Appropriations to the USDA requested a study of facility needs for research on soil and water problems In 1958. The Secretary of Agriculture appointed representatives of state and federal research agencies, farm organizations, lay groups, and individual farmers to a special committee to conduct this study. Their findings were published as Senate Document 59, 86th Congress, and entitled "Facility Needs – Soil and Water Conservation Research", and would later impact the development of the station.

C. Everett Johnson, a cattle rancher from Gunnison, was asked by Omer Kelly (an ARS administrator) to come and serve as station superintendent in 1958. Everett was not trained as a scientist, but had a lot of ideas, some coming from time he had served on foreign assignments in India. He started



C.E. Johnson

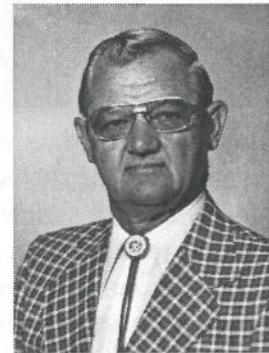
grain sorghum trials that were livestock oriented. Johnson retired in 1961. Wally Greb served as acting superintendent of the station after Johnson's retirement until 1963.



Wayne Shawcroft

R. Wayne Shawcroft began work at the station in 1958 as a summer intern while attending Colorado State University. He became a full-time employee in 1961 in charge of the forage crop water use efficiency studies. Al Black and Bill Fryrear were two other CSU students that worked at the station as student interns and eventually held professional scientific positions with the ARS at other locations. Shawcroft earned an MS degree from Colorado State University in 1965. Later in that year he departed for Cornell University in Ithaca, NY where he earned a doctorate in 1970. In April of that year he returned to the station and continued working as a soil scientist with expertise in agricultural meteorology. In 1982 Dr. Shawcroft took a position as an extension irrigation agronomist with Colorado State University, but continued to be located at the Akron station. He retired from that position on 1993, but continues to maintain the meteorological records for the station.

In 1961 Rome Mickelson (ARS, Bushland, TX) took over the agricultural engineering position that had been held for a short time by Jack Musick. Mr. Mickelson continued work on the level basin pans and water harvesting studies. Mr. Mickelson served as Acting Superintendent and Location Leader for the station from 1965 to 1979. Mr. Mickelson retired in 1986 and was replaced by Steven E. Hinkle, who had just completed his PhD in Agricultural Engineering at Colorado State University, working with the USDA-ARS Water Management Unit in Fort Collins



Rome Mickelson



Staff, Spring 1961
 Back: Wally Greb, Lew Kundert, Wayne Shawcroft, Harold Johnson, Herb Shafer, Dean Severin, Greg Hinze
 Front: Wendale Graves, Anna Serl, Maurine Lane, Jeanie Goodman, Rome Mickelson, Bob Florian

Greg Hinze began work for Colorado State University at the research station in 1961, taking over the duties of Dr. F.W. Frazier. He was assisted by technician, Rudean (Dean) Severin, and secretary Imogene (Jeanie) Goodman. While at the research station Greg worked primarily with wheat and millet. Working with CSU wheat breeders Byrd Curtis and later Jim Welsh, Greg helped evaluate selections for new varieties. Greg was a breeder of millets, working mostly with proso and foxtail, but also with some pearl millet varieties. Most of the releases he made were from material found in the world collection obtained from the US Plant Introduction stations. Technicians Dean Severin and Bob Florian were very involved in equipment construction for the breeding program, including development of their own cone planter which permitted much of the extensive plot work that Greg was involved in. Greg left the station in 1981 to pursue other interests.

Orville E. Hays became station superintendent on May 30, 1963 when he transferred from LaCrosse, WI. He thought they should have a pond on the station to supply an emergency water supply for fire fighting and for aesthetic reasons, so the employees built a dam across the area east of the current shop building where the gasoline/diesel tanks now stand. They packed the floor of the pond to limit infiltration of water. Water was pumped into the pond several times but it would always drain out. Hays retired in 1965. Frank Rauzi, a range scientist from Cheyenne, served as interim superintendent for about 7 months after Hays' retirement.



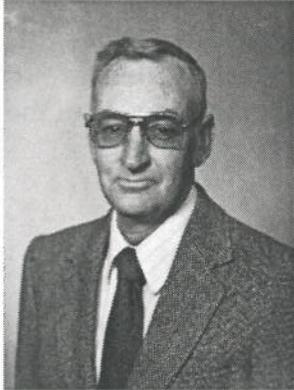
O.E. Hays

A major interdisciplinary micrometeorological study of grain sorghum was conducted in the summers of 1966 and 1967, known locally as the "Akron Safari". Harwell Allen brought a trailer from Cornell University with instrumentation to log the carbon dioxide and water use fluxes, and air temperature profiles. Lysimeters were installed to measure crop water use. John Hanks was in charge of the energy balance measurements; Arnold Klute, Herbert Gardner, and Wilford Gardner were in charge of the soil water measurements; Harwell Allen oversaw the carbon dioxide flux measurements; and others made measurements of stomatal conductance and leaf water potential. Arnold Klute and Herb Gardner were both soil physicists with the ARS in Fort Collins with John Hanks the research leader of that group. Herb built an instrument to measure the soil heat flux component of the energy balance. He also worked with Dr. Klute and Dr. Wilford Gardner in detailed soil water tension and water flux measurements.

In 1967 Wally Greb and Darryl Smika (stationed at North Platte, NE) established an experiment to evaluate herbicides for no-till weed control during fallow. It was modeled after an experiment that Darryl had started in 1962 in North Platte. The Akron experiment continues today and is known as the Long-Term Tillage plots (LTT). It is one of several sites in a network across the U.S. and Canada for long-term experiments in North America. The experiment provides critical information regarding long-term changes in soil carbon, organic matter, and other soil properties as affected by tillage and no-tillage after 40 years of continuous management.

One of the priorities identified in 1958 in Senate Document 59 called for construction of a modest office and laboratory building in the west Central Great Plains area with headquarters near Akron, CO. On 1 March 1970 at the Senate Hearings before the Committee on Appropriations for USDA, Akron was in line to receive funding for planning and construction of

a new Soil and Water Research Facility. In FY-1970, \$50,000 was appropriated for planning. The contract for planning the new facility was awarded to Rodney S. David Associates, an architectural firm from Denver, CO in February 1972. The architects had 42 weeks to complete the design criteria and plans for the building complex that included an office-laboratory, headhouse-greenhouse, 4 stall garage, and an underground water storage tank for fire protection.



Darryl E. Smika

But instead of allocating funds for the construction of the new facility in 1972, the federal government threatened to close the station. Actions by concerned citizens, including Fred Fassler, Terrence Hall, Sr., and Harmond Fairchild, saved the station and were instrumental in securing the funds for the new building.

Senate Document 59 had stipulated that if funding were to proceed for a new laboratory-office complex at Akron, then the staff would need to include at least one scientist holding a Ph.D. degree. That requirement was met when Dr. Darryl E. Smika (soil scientist) transferred to the station from North Platte, NE in May 1973 and continued his work on ecofallow systems that employed chemical fallow in reduced tillage and no-till systems. Dr. Smika served as Research Leader for the station from 1979 to 1988.

In FY-1973 Congress approved \$750,000 for construction of the new soil and water conservation laboratory which also was to include a headhouse-greenhouse; 4-stall garage, and an underground water storage tank for emergency fire fighting purposes. However, the funds were withheld by the Office of Management and Budget by order of the President to curtail excessive government spending. The construction funds were finally released in 1974 and the contract was sent to prospective contractors for bidding. On 19 December 1974, the construction contract was awarded to Albrecht Construction, Inc., from Westminster, CO for the bid of \$822,000. The bid was for the 11,000 square foot office-laboratory building alone, which included 5 laboratories, 10 offices, 2 constant temperature rooms, library-conference room, photo darkroom, computer-drafting room, utility room, storage rooms, students' study, and a boiler and mechanical room. Since this amount exceeded the total appropriation for construction, an additional \$72,000 was acquired from agency reserve funds. Construction of the office/laboratory building began January 1975, but construction of the headhouse-greenhouse, garage, and underground storage tank never occurred, as funds for those items were never appropriated. Construction of the office-laboratory building was completed in early 1976, and the staff moved in on 1 April 1976. An open house/dedication was held 28 May 1976 with 575 individuals attending. With the new building came a new designation - Central Great Plains Research Station.

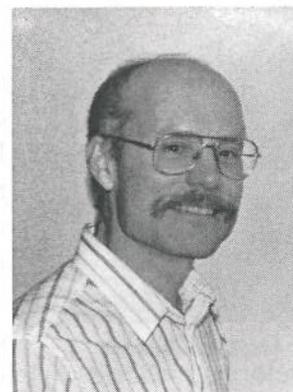


New office-laboratory building, 1976

The year 1976 also saw the installation of 20 acres of solid set irrigation on the west side of the station. This area has been used extensively to determine water use/yield production functions for many different crop species by using the solid set irrigation system to apply gradient irrigations.

To address the research question of the effect of growth stage sensitivity to water stress and effects on crop yield, a rainout shelter was constructed in August 1981. The shelter automatically moves on rails when precipitation is detected, thereby covering a 30 by 30 foot area in which various water treatments are applied. This allows for precise application of the water treatments, regarding both timing and amount of water applied. Crops that have been tested for growth stage sensitivity to water stress include winter wheat, spring wheat, mustard, canola, camelina, foxtail millet, kenaf, dry bean, and soybean.

Minutes of the station advisory committee indicate that the first discussions regarding the need for a weed scientist and a plant physiologist occurred in 1978. ARS administrators concurred with that assessment, and in 1982 weed scientist Randy Anderson joined the staff. Randy had previously been a weed scientist with Montana State University in Sidney, MT. During Randy's 18 years at the station he made significant contributions to our knowledge and understanding of the ecology of weed species, and management systems that controlled weeds, both with and without herbicide use. Much of Randy's work quantified weed seed survival in the wheat-fallow system and documented the value of rotations for controlling winter annual grasses in winter wheat. He also continued research into production systems for proso millet initiated by Wally Greb. From 1995 to 2000 Randy served as Research Leader at the station.



Randy Anderson

Bohn Dunbar was hired as a research agronomist specializing in crop physiology in 1979 with the stipulation that he would complete studies and work at CSU resulting in the Ph.D. degree. That degree was granted in 1982. Bohn developed an immunoassay for determining residual atrazine levels in the soil, and conducted studies of freezing effects on coleoptile tiller survival in winter wheat and lupine production methods. Bohn resigned in 1988.

John Shanahan joined the staff in 1982 filling the CSU research and extension position vacated the previous year by Greg Hinze. John had recently received his Ph.D. from the CSU Agronomy Department, and began work on identifying adapted varieties (wheat, corn, millet, etc.), developing more diverse cropping schemes, improving water and nutrient use efficiency, and delivering new developed practices to producers in the Great Plains environment. In February 1986 John was transferred to the CSU campus in Fort Collins but continued with collaborative research and directing graduate student research at the station until he joined the ARS in Lincoln, NE in 1998.

Another significant change in scientific staff took place in the late summer of 1983. At that time the ARS research station in Sidney, MT was threatened to be closed, and staff were being sent to other locations. Dr. Ardell Halvorson, soil scientist, and support scientist, Curtis Reule, along

with mathematician, Kirk Cummings, were transferred from Sidney to Akron. At almost the same time, David C. Nielsen (new Ph.D. in agricultural meteorology from the University of Nebraska) was hired as a research agronomist to fill the micrometeorology position vacated by Wayne Shawcroft when he transferred to Colorado State University Cooperative Extension as the Irrigation Agronomist. Dr. Shawcroft's CSU position became Extension Water Management Specialist when he retired in 1993, and was filled by Mahdi Al-Kaisi from 1994 until 2000. Dr. Al-Kaisi was instrumental in beginning the Ogallala Aquifer Symposium, held biannually. When Dr. Al-Kaisi left to take a position at Iowa State University in 2000, he was replaced by Joel Schneekloth who came from the University of Nebraska West Central Research and Extension Center in North Platte, NE.



Ardell D. Halvorson

Ardell Halvorson worked at the station from 1983 until 1994, serving as Research Leader for the last six of those years. During his time at Akron he worked on soil fertility effects on crop production in various cropping systems. David Nielsen's work has encompassed microclimate studies of the surface soil layer as influenced by residue type and orientation, infrared thermometry to quantify crop water stress, improving precipitation storage efficiency through residue management,



David C. Nielsen

developing water use/yield production functions for traditional and alternative crops, and modeling water use and yield in cropping systems. His work with water use production functions for traditional and alternative crops is foundational to our current understanding of the value of an inch of stored soil water, and is recognized in the region as a critical set of quantitative crop water response relationships.

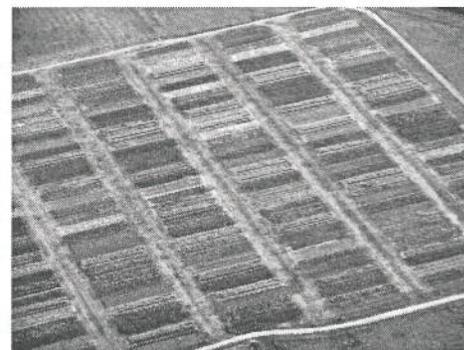
Dr. Steven E. Hinkle joined the staff as an agricultural engineer in 1986, filling the position previously held by Rome Mickelson who retired. Steve worked on projects dealing with irrigation scheduling, ridge till planting for irrigated corn production, water harvesting through controlled traffic compaction and bench terraces, wheat emergence problems associated with furrow slump following heavy rain, and tillage effects on residue loss. Steve left the station in 1996 to pursue other interests.



Scott Armstrong

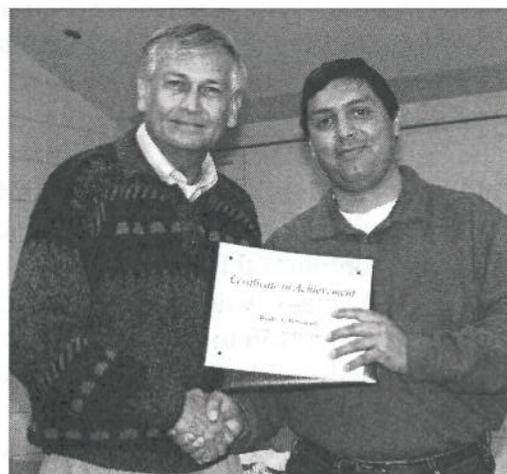
Entomology research became more prominent in 1990 when CSU created an extension/research position to study the biology of the Russian wheat aphid and methods of control. That position was filled by J. Scott Armstrong, who completed a Ph.D. in entomology while stationed at Akron. Scott left the station in 1996, but CSU continues to fund an entomological research associate position to study the effects of cropping systems and sequences on insects. That position has been filled by Mike Koch.

During the fall of 1990 the scientific staff of the station (Ardell Halvorson, Randy Anderson, David Nielsen, and Steve Hinkle) in consultation with local area farmers (most prominently Gilbert Lindstrom) planned a new long-term alternative crop rotation experiment (ACR). The objectives were to determine optimum dryland crop sequences by monitoring yield, water use, plant growth and development, soil fertility, and soil chemical and physical properties as influenced by cropping frequency and crop order. The primary crops investigated were winter wheat, corn, proso millet, and sunflower. There were also a set of plots that looked at evaluating decision rules for flexible crop selection based on crop yield estimated from available soil water at planting and an assumed level of growing season precipitation. Twenty fixed rotational sequences and four flexible cropping systems are included in the experiment which consists of 198 plots in which every phase of every rotation is replicated three times. The crop rotation study continues today providing a wealth of information on crop responses to soil water and fertility, changes in soil physical and chemical parameters with crop sequencing, and crop phenological and biomass development. The data are valuable for verifying computer simulation models which can extend the results of the station research to other climates and soil types.



Alternative Crop Rotation Study

A reorganization of ARS units in Fort Collins occurred in 1991 in which the Hydroecosystems Research Unit was dissolved. As a result, the soil chemist from that unit, Dr. Rudy Bowman, and Support Scientist Bill Beard were transferred to Akron. Rudy brought with him expertise in the chemistry of soil phosphorus and continued that work at Akron as he looked at changes in soil quality due to crop rotational sequences. Rudy Bowman retired from the station in 2001. As part of the re-organization, a vacant position was transferred to Akron, making it possible to hire Dr. Merle Vigil as a soil scientist. Until his retirement in 1995, Bill Beard worked with Merle on experiments to evaluate dryland canola production in the region and with experiments to measure greenhouse gas fluxes in alternative no-till cropping systems. Merle came to the station from the University of Nebraska where he was employed as an assistant professor in the Agronomy Department and as an ARS postdoctoral research associate. As part of Merle's work with canola, he documented the base temperature for emergence of that crop. He then worked to establish the nitrogen requirements for various dryland crops, particularly sunflower, wheat, and corn. Together with David Nielsen, Merle has worked on legumes as an alternative crop and with several residue management issues in dryland no-till cropping systems. After serving one year as the acting research leader in 2000 following Randy Anderson's transfer to Brookings, SD, he accepted the research leader position in 2001, and currently serves the research unit in that capacity.



Rudy Bowman & Merle Vigil

As part of the reorganization of ARS units in Fort Collins in 1991, Akron became part of the newly formed Natural Resources Research Center under the directorship of James Welsh. The other units in NRRC were the Rangeland Resources Research Unit (Cheyenne, WY), and Water Management Research Unit, Great Plains Systems Research Unit, Soil-Plant-Nutrient Research Unit, and Sugarbeet Research Unit (all in Fort Collins, CO). The NRRC was formally dissolved in July 1995, but close communication continues among the research units through the Colorado-Wyoming Research Council formed subsequently.

A three-span linear move irrigation system was purchased in 1994 (\$55,000) from Valmont Industries. The system has been used for experiments to define the least limiting water concept, soil moisture effects on soil compaction formation and alleviation, limited irrigation effects on crop yield, effects of proso millet on subsequent wheat yield, and effects of starting soil water content on seed and forage yields of fallow replacement crops.

While Rob Aiken was a post-doctoral research scientist with the USDA-ARS Great Plains Systems Research Unit in Fort Collins, he began collaborative research at Akron with David Nielsen on effects of sunflower stalks on wind profile characteristics and the erosive force of wind. Field studies continued through 1998 on wheat stubble height effects on evaporation (with Nielsen, Gerald Flerchinger, Laj Ahuja and Greg McMaster), wheat stalk strength (with Merle Vigil and Nielsen), decomposition of surface wheat residues (with Vigil and Rudy Bowman), residue effects on soil crust formation and aggregate stability (with Joe Benjamin, Bowman and Ahuja), and on GIS assessment of land productivity (with Randy Anderson). This research contributed to several research and extension publications and contributed to release of RZWQM v.2 (a comprehensive cropping systems model) which quantifies surface residue effects on soil energy and water balance, including winter conditions. Nielsen continues this collaborative crop modeling work with the ARS modeling unit in Fort Collins (Ahuja, Liwang Ma, Saseendran Anapalli, and McMaster) to extend the research results generated at Akron to other soils and climates of the Great Plains. Aiken is currently a Research Crop Scientist with Kansas State University in Colby. He continues to collaborate with scientists at Akron on long-term crop sequence studies at Colby, KS, development of cold-tolerance in grain sorghum, and agronomic studies of sunflower and canola oilseed crops suitable for the central High Plains.



Rob Aiken

In 1995 the agricultural engineering position formerly held by Steve Hinkle was changed to a soil physicist position and was filled by Dr. Joseph Benjamin who had been working in a post-doctoral position with the Great Plains Systems Research Unit in Fort Collins since 1991. Joseph had received his Ph.D. from Iowa State University in 1989. Upon his arrival in Akron he immediately began work on soil physical changes that occur because of rotational sequences, implement traffic, and soil water conditions that result in compaction,



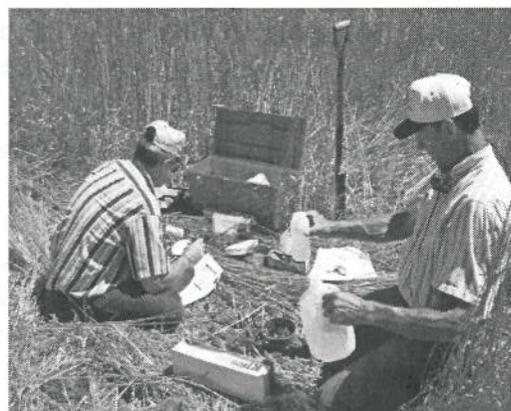
Stacey Poland & Joseph Benjamin

and methods to alleviate compaction. This has led to the development and understanding of the least limiting water concept as a method of soil physical condition scoring. Joseph also conducts research on the influence of soil physical properties on root growth and crop production and also investigates soil management methods and uses of technology to improve the soil physical environment.

The Colorado State University Crops Testing program has been ongoing since the 1950s. CSU permanently stationed a technician (Jim Hain) in Akron in 1996 to oversee, establish, and manage crops testing at a variety of locations throughout eastern Colorado. Plant breeders involved in the Crops Testing program over the years have been Byrd Curtis, James Welsh, James Quick, and Scott Haley. The Crops Testing Program is currently under the direction of Jerry Johnson.

Dennis Kaan was hired by Colorado State University in 1997. He was located at the research station as the Golden Plains Area extension agricultural economics specialist. His work centered on developing cost of production information and in analysis of enterprise budgets for the region. A few years later he accepted the position of Golden Plains Area director with his office located in the Washington County Courthouse Annex in Akron.

In 1997 the Natural Resources Conservation Service stationed a Soil Quality Team at the research station. That team was comprised of Mike Sucik (soil scientist), Josh Saunders (range scientist), and Manuel Rosales (agronomist/plant scientist). The small office building just north of the main office/laboratory building was brought in to house the team. With Akron as their base, they traveled throughout a five-state region disseminating information on practices that would enhance soil quality and minimize degradation and loss of the soil resource. The team was highly effective in transferring some of the most current research findings and technology throughout the Great Plains. A re-organization within NRCS formally ended the soil quality team in 2000, and over a period of several years all three members of the team transferred into positions at other locations.

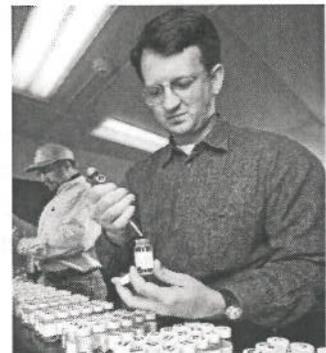


Josh Saunders demonstrating Soil Quality Kit

The Agricultural Research Service, Natural Resources Conservation Service, and Colorado State Forest Service cooperated in 1997 to establish a windbreak arboretum in the area between the shop and U.S. Highway 34. The arboretum has plantings of many different trees and shrubs to demonstrate the dryland establishment and growth of potential windbreak plantings. Species included in the demonstration planting are ponderosa pine, scotch pine, Austrian pine, piñon pine, Colorado blue spruce, white fir, Douglas fir, bristlecone pine, lacebark elm, Siberian elm, red cedar, juniper, black locust, honey locust, green ash, hackberry, burr oak, Russian olive, mulberry, Osage orange, honeysuckle, chokecherry, carogana, lilac, plum, buffaloberry, cotoneaster, golden current, Nanking cherry, sand cherry, sumac, and wood rose.

Randy Anderson accepted the position of director of the Northern Grain Insects Research Laboratory in Brookings, SD in 2000. Dr. Brien Henry, a recent graduate of Mississippi State

University was hired to fill the vacancy in weed science. Brien was involved in studies dealing with herbicide efficacy, detection of glyphosate applications through measurement of shikamate levels, production of purslane for omega-3 fatty acids, stripper header harvest for proso millet, and grain sorghum production in skip row configurations. In 2006 Brien accepted a position with the ARS in his home state of Mississippi.



Paul Campbell & W. Brien Henry

In 2003 Dr. Maysoon Mikha filled the soil chemist position that came open with the retirement of Rudy Bowman. She received her Ph.D. from Kansas State University in 2002. Maysoon continues the work of Dr. Bowman in measuring changes in soil quality as affected by rotation and tillage management. Specifically she quantified changes in soil aggregation, organic matter, and in carbon and nitrogen contents in dryland cropping systems. She has begun several new investigations to quantify carbon cycling (carbon sequestration, carbon dioxide gas flux) in soils as affected by rotation and tillage management. She is collaborating with Dr. Benjamin, Dr. Vigil and Dr. Calderon to study the remediation of degraded soils. Maysoon is also evaluating rotation sequence effects on microbial populations and is working to quantify rates of nitrogen transformations in soils.



Maysoon Mikha

Dr. Francisco Calderón, a post-doctoral scientist with the ARS Animal Manure and By-Products Lab in Beltsville, MD was hired as a microbiologist in 2004. Francisco's research emphasis has been to identify microbial, chemical, physical and management factors contributing to crop rotation yield differences and to quantify soil carbon sequestration in different soils and management types in the region. He also investigates the use of near infrared spectroscopy for the rapid analysis of soil and plant samples. In collaboration with Dr. Vigil and Dr. Nielsen he has initiated a new investigation with skip-row sunflowers. He also is collaborating with them on skip-row corn and skip-row sorghum experiments. Francisco has also initiated experiments to quantify and understand potential allelopathic effects of millet residue on winter wheat.



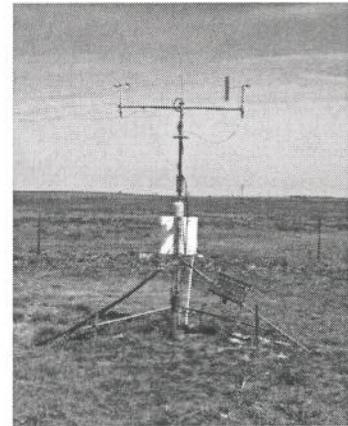
Francisco Calderón

The weather record is one of the most valuable assets of the research station. The original location of the weather station was just south and west of the old horse barn (currently designated as Building 3), and was moved only once to its current location in 1957 to get it farther away from U.S. Highway 34. Maximum and minimum temperatures and precipitation have been recorded since 1908. Pan evaporation has been recorded since 1911. Bob Florian was the long-time weather observer, making measurements every morning at 8 A.M., for over 45



Bob Florian

years until his retirement in 2001. An automated weather station was installed near the other weather instrumentation in 1983 as part of the network of automated stations accessed by the High Plains Regional Climate Center in Lincoln, NE. The automated station records air and soil temperatures, relative humidity, solar radiation, wind speed, and wind direction every minute and saves computed hourly averages. Hourly precipitation sums are also saved. The data are available on a near-real time basis via internet access through the High Plains Regional Climate Center website.



Automated Weather Station

Originally the pan evaporation data at the weather station were collected from a Bureau of Plant Industry sunken evaporation pan, but in 1967 a Class A above-ground evaporation pan was installed. Measurements were taken from both pans through 1985, and in 1986 the sunken pan measurements were discontinued.

In 1989 the National Lightning Detection Network (initially established by the State University of New York in Albany) located equipment on the station to monitor the location, intensity, and frequency of lightning strikes. This site is one of over 100 lightning monitoring locations in the United States. The data are collected continuously and downloaded via satellite to Vaisala Measurement Systems in Tucson, AZ.

A dedicated support staff has been comprised of many individuals throughout the years that included Rob Aiken, Ginger Allen, Deanna Annand, Bob Bach, Llewellyn Bass, Bill Beard, Lynn Bixler, Kendra Brandner, Carolyn Brandon, Caralee Burnett, Paul Campbell, Melissa Castillo, Jim Chum, Tim Clark, Karen Couch, Kirk Cummings, Jane Dailey, Alicia Davisson, Donna Diamond, Katie Drullinger, Ken Fetzer, Bonnie Fisher, Bob Florian, Donna Fritzler, Betty Golden, Jeanie Goodman, Wendale Graves, Rory Greenway, Jim Hain, Linda Hardesty, Cody Hardy, Michele Harms, Herb Shafer, Stephanie Hill, Butch Horner, Cory Huxoll, Rosalie Jefferson, Harold Johnson, Cindy Johnson, Eric Keane, Dave Kennedy, Delbert Koch, Marietta Koch, Mike Koch, Lew Kundert, Hubert Lagae, Maurine Lane, Tim Lindahl, Llewellyn Bass, Arnold Page, David Parker, Mike Pappas, Brandon Peterson, Linda Pieper, Matt Pieper, Bill Pixler, Stacey Poland, Dave Poss, Kurt Reule, Bruce Riggle, Cindy Roth, Anna Searl, Dean Severin, Packy Schafer, Anna Shannon, Dallas Spellman, Gene Uhler, Dee Webb, Lois West, Bridgette White, Lori Zeihr, Jim Zizz, and many, many summer students and graduate students.

Over the past 100 years the Central Great Plains Research Station has truly become the “Agricultural Fact Finding Institution” that was its original founding purpose. Studies have been conducted to provide both basic and applied research results to farmers, ranchers, extension specialists, agronomic consultants, and scientists in the Great Plains region and throughout the world where semi-arid climates exist. The entire staff continue to be anxiously engaged in learning and sharing new knowledge that will benefit the economic and environmental well-being of agriculture by development of integrated cropping systems and technologies for maximum utilization of soil and water resources.

AREAS OF INVESTIGATION

Fallow weed control methods (tillage, cultural practices, and herbicides)

Stubble mulch methods

Snow harvesting

Soil aggregation

Water harvesting through land leveling, lagoon engineering, flat channel terrace construction, level basin pans

Climate monitoring

Snow characteristics

Soil surface microclimate effects on weed emergence and evaporation as affected by tillage and crop residue type and orientation.

Deep plowing

Soil fertility and nutrient cycling (including carbon and nitrogen cycling)

Crop water use

Crop root systems

Water table monitoring

Tree species evaluations for windbreak establishment

Crop variety testing

Winter wheat, barley, oats, triticale, millet, sorghum, corn, canola, camelina

Crop cultural studies

Row spacing, row direction, plant population, seeding rate, seeding date, direct seeding,

Full and limited irrigation crop production

Soil compaction – formation and alleviation

Immunoassay for residual herbicide detection

Water stress quantification by infrared thermometry

Crop rotation and sequencing

Alternative crops evaluations

Russian wheat aphid control

Herbicide efficacy

Crop residue effects on soil surface wind speed, erosion potential, and precipitation storage

Crop residue decomposition

No-till dryland crop rotation management

Cropping system simulation modeling

Appendix 1, Letter from J.E. Payne (1st Superintendent)

Work at Akron

I left Garden City at 10:10 p.m. June 14th enroute to Akron, Colorado.

The soil at Akron Sub-station is a brown, sandy loam with a subsoil typical of thousands of square miles in eastern Colorado.

Forty –seven acres of sod were broken June 19 to July 1. Land was broken 3-5 inches deep (average of about 4 inches) with a mould board plow and thoroughly packed by a heavy steel roller which followed directly behind the plows.

Rain came during July and in the later part of August the land was disced with discs set so as to cut not quite through the sod.

During August I drew up some specifications for buildings and other permanent improvements at Akron. Contractors were asked to submit bids to be opened August 30th. When I reached Akron after a visit to Garden City I found only one bid in. Did not open it. Another bid came in the 31st and another the 2nd of September. Opened bids September 2nd.

For building dwelling, seedhouse and barn the bids were approximately as follows:

A. H. Fletcher.....	\$ 2680.00
J. E. Yeamons.....	4450.00
H. Thompson	3550.00

As a well and fencing and some other improvements had to be put on, we rejected all bids and figured with the lowest bidder on house and barn. Finally Mr. Fletcher agreed to build dwelling for \$1460 and barn for \$575. Work began September 9th. After the barn was up I planned a wagon shed 14 x 32 ft. to be built on the north side of the barn. This is now reported as finished. I also bought lumber for a seed house 18 x 40 ft. and 12 ft. high to the plate. As planned no floor is to be put in at present but either cement or lumber may be put in later. Only the shell is to be put up now and it may be used for tools until we can get up a tool shed. The inside may be finished to suit our needs as the needs are seen later. It is arranged so that a working laboratory may be fitted up in one end. One chimney is to be built now and another may be put in later if it seems desirable.

When I left Akron November 23rd the house was receiving the brown coat of plaster. Work has been progressing so that by the middle of January the buildings should be all finished as planned with the exception of the painting which should be done after the cold weather is past.

During October a well was bored. A strong flow of good, soft water was struck at ninety feet. A windmill was put up and was doing good work when I left there in November.

The fencing was only partly finished when I left, but enough was finished to keep the stock away from the crops.

Bills and contracts made amount to about \$2850, which is paid, or is to be paid out of the trustee fund. When the improvements now under way are completed and paid for so that we know how much we have left, an elevated tank may be put in and if we have enough money we wish to build a tool shed near the field so that all tools may be kept sheltered when not in use.

About November 1st I bought two five-year old horses, each weighing about 1250 lbs. They drove nicely together and promised to be a very desirable team, but November 14th they got loose in Akron with only harness and neckyoke and ran into a barb wire fence. One of them was badly hurt about the breast, and the large muscle of his right leg was severely torn. After the cut was made the horse walked from Akron to the station. He was put into a stall and taken care of. When last heard from (Dec. 8th) he was hobbling around and getting out of doors occasionally. If he continues to gain as he has during the three weeks past, he may be able to help do the spring work. The other horse escaped with a few very slight cuts. I put the uncrippled horse in a neighbor's pasture to be left until I need him again.

Seeding

Rotation plots where fall grain was planned were seeded on September 19th. Turkey wheat was sown on wheat plots and common winter rye on the rye plots.

The varieties of fall grain came from McPherson by September 10th, but a request to sown 1/10 acre of Alberta wheat at the same time the other varieties were sown came at the same time. So I waited a while and soon the ground was so dry that it seemed useless to sow wheat. Finally the Alberta wheat arrived and all varieties were seeded November 5th. The ground had some moisture at that time. Twelve varieties of winter grain were planted. Wheat was sown at the rate of $\frac{3}{4}$ bushels per acre and oats, barley, and emmer at the rate of one bushel per acre.

Appendix 2, Memories of James Brunker as published in the Akron News-Reporter, Akron, CO, Thursday, 10 March 1932

THE U.S. EXPERIMENT STATION AT AKRON

By James Brunker

As I wish to pass on to future settlers on the great plains the local history of the station while Father Time whets his sickle, I am now writing this article.

In the year 1892, October 18th, I arrived at Akron with an emigrant car, intent of making a home on the great plains. On arrival at Akron a number of wagons loaded with wheat from the Thurman section were lined up in front of Kinchloe's livery barn, waiting for the day to break and to unload. Wheat was selling at 35¢ per bushel, after this forty-five mile haul and had to be scooped onto the freight car by the farmers.

I asked if the crop was very good, the answer was "no." Wheat only made 20 bushels this year; oats 25 bushels and barley forty. As I came from Eastern Nebraska, I said that is considered a good crop with us, to which they answered, last year (1891) was good, we got 40 bushel wheat; 50 bushel oats and 60 of barley. I said that was wonderful, but alas, how deceitful this country acted. 1893 drought coupled with a financial panic, crops a total failure, no returns from one hundred and thirty acres, mostly plowed and seeded. 1894, drought again, with a grasshopper invasion, following in 1895, this year being very favorable up to a few days before harvest. As the wheat was commencing to turn, at noon one day, as I about to enter the house for dinner, I looked at a new board horse barn I built and behold, it was the color of a sod building. Upon investigation I found that the cause was a complete stucco formation of grasshopper, that had descended for their dinner. Yes, my new set of harness seemed to be their choice dessert. I had to remove them to the house and put them under the bed. Yes, the wheat would have made 25 bushels at noon, was reduced to three bushels per acre, half of which was given for the seed used, this being my argument with Goerge Kenny, who ran the flour and food store.

It is getting too far from my subject so I must return. About this time Hon. Lafe Pance, member of Congress for Colorado, sent some agricultural year books for the year 1890, which was also a dry year, giving results of an experiment conducted at Garden City, Kans., giving details of the method of dust mulching to hold moisture. The results were remarkable. I then became a student of dry land agriculture and read everything within my reach on this subject.

I saw the results of former droughts where homes had been abandoned some with improvements costing three thousand dollars, I could say with the poet change and decay in all around that I see.

I learned from the settlers that this was the third attempt at settling the plains, therefore I reasoned is it fair for the government to permit this ground to be homesteaded for agricultural purposes, if it is not adapted for such purpose, about this time 1905, I received a year book from the Hon. Robert E. Bonyng, our representative in Congress, in which the Honorable Secretary of Agriculture advocated the establishment of Experiment Stations at various points throughout the semi-arid belt. I concluded therefore to ask for such a station at Akron, as it was centrally located east and west and also north and south, of the great plains and east of the Rocky Mountains. I wrote to the Honorable Robert Bonyng to take the matter up with the Secretary of Agriculture. His reply was, you fellows have made no provisions by appropriations for such purpose, but if you will see Hon. E. C. Chilcott, of the Bureau of Plant Industry, you may find a way out. Mr. Chilcott replied, yes, we have a small amount of money available for experiments under the Hatch Act, for experimental purposes and improvements, but none for the purchase of site, fences or new buildings, so Mr. Chilcott and Mr. Bonyng wrote me of the conditions. I answered we could likely secure the site and that it would cost about \$3,000 to put necessary improvements. Mr. Chilcott wrote to Mr. Brunker, "It is up to you people to raise the \$3,000 if you want that station." I showed this letter to August Muntzing, who became interested at this time. He answered, impossible, why we have only 300 voters (men) in this county, we cannot make it. I suggested as he was Railroad Attorney for the C. B. & Q., that we write the General Manager Mr. Holdredge and ask for one thousand dollars. Upon writing Mr. Holdredge, he answered if the station is established on our lines we will give \$1000 to this project.

We then asked the Empire Ranch and Cattle Company who were interested in two hundred quarter sections of land here and in Yuma county, that was purchased by then for 50 percent of the taxes due on them, around \$25 dollars per quarter section, upon being shown this was a good investment for them they responded with a pledge of \$500.

We then called a meeting to arrange for future pledges at which the business men and banks pledged their support. Mr. Art Mitchell, securing the amount in pledges I notified E. C. Chilcott that we were ready, we called another meeting which he attended. We showed him our pledges. He said that all looks very well, but remember

Uncle Sam is not doing a credit business and cannot act until he has the money. To which I replied, "If our local banks examine these pledges and OK their customers, will you not accept this." His reply was "Yes."

The banks then became anxious as to who should handle the funds, they finally agreed each to handle the funds subscribed by their patrons.

During our correspondence with the department an attorney by the name of Von Schram of Yuma, tried to get the station located there. His letter which stated that Yuma was more favorable for farming, having produced more crops and getting more rainfall it would be the logical point for the station. This letter was sent to me for rebuttal, I answered, I agreed with Von Schram, except in his concluding statement, that if Yuma was a definite success as an agricultural community, there was no necessity for experiment. But at Akron the settlers had been driven out so often it was an absolute necessity or the Federal Government might lose its reputation for fair dealing. Are we adapted to agriculture or not, was the great question. Mr. Chilcott wrote, "I agree with you."

I am glad to note this question has been fully answered, after 24 years, each year adding additional proof. If we do not profit by these thousands of tests we are to blame.

Appendix 3, Letter from F.A. Coffman, Bureau of Plant Industry, Office of Cereal Investigations

BRIEF RÉSUMÉ OF THE 10 YEARS OF CEREAL EXPERIMENTATION AT AKRON FIELD STATION

The past season completed a period of ten years during which investigation with cereal crops have been carried on at Akron Field Station, Akron, Colorado. It is, therefore, thought well to submit at this time a brief review of the results secured during this period. Ten years of experimentation are usually considered to constitute a period of sufficient length from which to draw conclusions of a fair degree of accuracy.

The development of the Akron Field Station, has indeed been marked. In 1907, there were but three buildings on the station farm and the amount of machinery and other equipment was very limited. Today there are eight buildings which are occupied by the personnel and equipment of the Offices of Dry-land Agriculture and Cereal Investigations, and there are two other buildings belonging to the Office of Alkali and Drought Resistance. The increased number of buildings but gives an idea of the station's growth. Only one building built prior to 1907 still remains standing. This building has been considerably improved. Besides the increase in number and size of buildings on the station, there have been numerous other improvements which greatly add to the convenience and pleasantness of the surroundings. A few of these are: the installation of water, sewage and electric lighting systems; the growing of shade-trees, orchards and shrubs; the laying of concrete walks and the construction of graveled drives. The increase in the character and amount of machinery, and kindred equipment for experimental purposes, has in every particular kept pace with the general improvement of the station. With this increase in room, machinery and other equipment, together with the improved surroundings, the investigations with cereal crops can now be conducted much more easily, and pleasantly than it would have been possible to do ten years ago.

The Akron Field Station is operated by the Office of Dry-Land Agriculture. The cereal experiments are conducted by the Office of Cereal Investigations in cooperation with the controlling office. Prior to 1910, Mr. J. E. Payne was superintendent of the station. He resigned, and in March 1910, Mr. O. J. Grace became superintendent. Mr. Grace has been superintendent of the station for practically eight years and the growth and improvement of the station are much to his credit.

Four different men had been in charge of the Cereal Office experiments prior to February, 1917. Mr. Wilson G. Shelley, who started the work, was in charge from March 1906, until the end of February, 1911. Mr. Clyde McKee was then appointed Scientific Assistant and placed in charge. He retained the position until February 15, 1913. He then was succeeded by Mr. Charles H. Clark, who remained until transferred July 1, 1913, at which time Mr. George A. McMurdo was placed in charge. Mr. McMurdo left the service during the past February, and from then until July 12, the Cereal Office experiments were conducted by the Office of Dry-Land Agriculture. The writer arrived at Akron July 12, 1917 to take over the cereal experiments.

The objects with which the cereal experiments are being conducted at Akron are:

1. To determine the best crops, varieties and varietal strains for this section of Colorado;
2. To improve these varieties by selection and breeding, and;
3. To determine the best cultural methods for cereal production in eastern Colorado.

With these objects in view, varietal seeding-rate and seeding-date tests have been conducted in field plats, and selection and breeding experiments have been carried out in the nursery each year. Experiments have been conducted annually with nearly all classes of cereal crops. A total of between 12,000 and 15,000 tests have been made during the past ten years by the Cereal Office at Akron. The number of tests has varied from year to year, but the number of field plats has gradually increased from 80 in 1908 to 315 in 1915. The past year but 293 field plats were sown. The smaller number was due to the absence of a cereal man during the planting season.

U.S Department of Agriculture Bulletin No. 402, gives a complete general description and history of the experimental work with cereals at the Akron Field Station up to and including the crop season of 1915. This résumé will simply present totals and averages for the ten-year experiments. Experiments conducted for periods of less than ten years have not been included in this review. Tables giving the climatological data of the Akron Field Station for the past ten years will be found in this report under the heading, "General Seasonal Conditions."

During the past ten years at Akron, the winter wheat has out-yielded the spring wheat by an average of over two bushels per acre annually. The average for the ten-year period, of five varieties of winter wheat was 20.8 bushels per acre. The average of seven varieties of spring wheat during the same period was 17.6 bushels. The difference is 2.2 bushels per acre in favor of the winter wheat. The highest yielding variety of winter wheat grown at Akron for the past ten years, has been Kharkov, C. I. No. 1583. This variety has surpassed the other winter wheats by an average of over one bushel to the acre.

In the spring wheat class the durum variety, Pelissier, C. I. No. 1584 is easily the best yielding variety. The ten-year average of this variety exceeds that of any other spring wheat by one and one-half bushels to the acre. The average of this variety is but 1.5 bushels lower than that of the winter wheat Kharkov, C. I. No. 1583.

In the experiments with spring oats, Kherson, C. I. No. 459, has given the highest ten-year average. This variety shows an average of 38.9 bushels to the acre, which is more than 3.25 bushels more than any of the other varieties of oats which have been grown for a similar period. In 1915 the yield of this variety was exceptionally high being 85 bushels to the acre. Such a yield would have been considered "good" in Iowa or Illinois, let alone a country as dry as eastern Colorado. Four varieties of oats have been grown at Akron for ten years. The average for the four varieties is 36.0 bushels.

Among the spring barley varieties, grown for ten years at Akron, the varieties Hannchen, C. I. No. 602, and Coast (California Feed), C. I. No. 690, have given the best averages. The ten-year average of the former was 35.2 and that of the latter 34.3. The difference in yields of the two varieties is hardly enough to make a statement in favor of either variety. Hannchen, C. I. No. 602, out yielded Nepal, C. I. No. 595, naked barley, by an average of nearly 14 bushels per acre. This is computing the bushel weight of the naked barley as 48 pounds. The deduction of from 10 to 12 percent for hulls in the hulled variety would still give it a decided advantage over the naked barley.

The variety, White Spring, C. I. No. 1524, is the only emmer variety which has been grown for ten-years at Akron. This variety has produced a ten-year average of 27 bushels per acre. This is computing the bushel weight of the emmer as being 32 pounds. The average yield of emmer for the past ten years has been 9 bushels per acre less than oats and 3 less than barley, (48 pounds per bushel).

Nursery breeding and selection work during the past decade has developed some very promising varietal strains among the different classes of grain. Varieties grown at Akron for less than ten years are, in some cases, outyielding our standard varieties, but thorough trials will be necessary to confirm their superiority.

Appendix 4, Letter from E.C. Chilcott, Bureau of Plant Industry

September 23, 1926.

Professor Alvin Kezer,
Fort Collins, Colorado.

My dear Kezer:

Replying to yours of the 16th inst., I submit the following concerning my personal relations to the establishment of the Akron Field Station.

I was called to Washington by Secretary Wilson and placed in charge of the investigational work in dry land agriculture in the Great Plains on July 1, 1905. I spent most of my time during the fiscal year 1905-6 in traveling over the Great Plains and getting in touch with the investigators at the 10 State Experiment Stations of the States lying wholly or in part within that area, and in looking for locations for prospective field stations that would be representative of the various sections of the Great Plains. I started out with and have maintained the fixed determination to do all within my power to have these field stations located where they would best serve the farmers of the region, rather than the politicians, or the land speculators. I met with a most hearty response from the Experiment Station men, who nearly all expressed a desire to cooperate. In many instances, however, they did not have the necessary funds or the authority from their governing boards to make any financial contribution to such cooperative work. It, therefore, became necessary in such instances to establish, what became known as independent field stations; that is stations maintained and managed by the U. S. Department of Agriculture, independently of the State Experiment Stations, so far as fiscal relations were concerned. This did not, however, prevent most cordial support and scientific cooperation in planning and developing investigational work of these stations; and later on actual financial cooperation. Such was the case of the Akron Field Station.

About February 10, 1907, I received from Dr. B. T. Galloway, then Chief of the Bureau of Plant Industry, a copy of a letter from the Honorable Robert W. Bonyng, Representative in Congress from the State of Colorado, enclosing Dr. Galloway's reply to the same; and, also a copy of a letter from Mr. James Bruner, a farmer living at Bruner, about 10 miles southwest of Akron, Colorado, accompanied by a petition from 67 residents of Washington County Colorado, copies of which are enclosed herewith. A copy of Dr. Galloway's letter of February 21, 1907, to the Honorable Robert W. Bonyng, together with Mr. Bruner's letter to Dr. Galloway of February 19 and my reply to it are also enclosed. Thus began a correspondence between Mr. Bruner and myself that extended over some 12 years or more.

During the calendar year 1907, I was in the field most of the time, and often visited Denver, Fort Collins, and Akron. I had several interviews with Director Carpenter and Professors Carlisle, and Olin, but was unable to perfect any satisfactory plans for cooperative work at Akron. I, therefore, decided that if a field station was to be established in northeastern Colorado, it must be an independent station under the control of the U. S. Department of Agriculture. Our funds were limited, and we had no authority to use any of them for the purchase of land. I, therefore made a proposition to the residents of Washington County, that, if they would purchase and deed to the Government a suitable tract of land, which I should select and furnish \$3000 for buildings and other equipment, the Department of Agriculture would establish and operate a field station near Akron, Colorado. James Bruner and August Muntzing, then attorney for the C B & Q railroad, were the leaders in this movement with whom I came most closely in contact, but there were other citizens of Akron and other parts of Washington County who rendered valuable service in making the establishment of the Akron Field Station possible.

As a result of the activities of these men, the County Commissioners of Washington County, Colorado, deeded to the United States of America, on the 3rd day of May 1906, a tract of land containing 66 acres, more or less, described as follows: All that part of SE ¼ Sec. 12, Township 2, north of range 52 west, 6th PM, lying north of the B and M railroad right of way.

The NE ¼ of this Sec. 12, was Government land withdrawn from entry and assigned to the Agricultural College of Colorado for forestry experiments, and it has been used as a part of the Akron Field station through cooperative arrangements with the College.

J. E. Payne was appointed Superintendent of the Station July 1, 1907, and assisted in the selection and development of the station until he resigned April, 1, 1910, and O. J. Grace was appointed as his successor and served until June 8, 1920, when J. F. Brandon, the present superintendent was appointed.

The following list shows the names of scientific workers who have conducted investigations, in their several lines, and the years during which the investigations were conducted by them:

Water Requirement Investigations

Dr. L. J. Briggs, 1910-1916
Dr. H. L. Shants, 1910-1916
A. F. Kidder, 1910
Homer Martin, 1910-1912
Auguste Boncquet, 1911
A. McG. Peter, 1911, 1912, 1913, 1915
R. D. Rands, 1912-1914
G. Crawford, 1912-1916
A. F. Cajori, 1913-1916
N. Peter, 1913-1916
H. W. Marquard, 1914
J. D. Hird, 1914, 1915
R. L. Piemeisel, 1914-1916
H. Shattyn, 1915, 1916
T. R. Renault, 1915, 1916
F. M. Eaton, 1916
Clyde Griswold, 1916, 1917

Office of Forage Crops

G. E. Thompson, 1910-1911
George W. Morgan, 1912

Drought and Alkali Resistant Plant Breeding

A. C. Dillman, 1910-1917

Assistant in Dry Land Agriculture

W. M. Osborn, 1911-1912
L. N. Jensen, 1913
A. E. Seamans, 1914-1915
W. E. Lyness, 1916
J. F. Brandon, 1917
A. Osenbrug, April and May 1919

Cereal Crops and Diseases

Wilson G. Shellay, 1908-1911
Clyde McKee, 1911-1913
Charles H. Clark, 1913
George McMurdo, 1914-1917
Franklin A. Coffman, 1917-1923

In the 19 years of its existence, the Akron Field Station has determined the relative values of all available crops for the section it represents. It has also determined the best cultural methods, the best varieties, the best dates of seeding, and the best rates of seeding for the several crops. Progress has been made in breeding new and better varieties, marked success having attended this work with oats, corn, and grain sorghums.

The trees best adapted for wind breaks and shelterbelts, and the fruits best adapted to the farm orchard have been determined.

The use of sheep for the utilization of crop residues on the dry farm has been investigated. The water requirement of plants in a dry climate has been determined.

I have not included the cooperative work with the Colorado State Experiment Station, nor the acquisition of the additional land provided by it, as you can supply this better than I can.

I consider that the fact that the Akron Field Station is one of the 24 field stations conducted by the Office of Dry Land Agriculture adds very greatly to the value of the investigations carried on there. It participates in the benefits derived from the comparisons of the results obtained from all these stations.

The manuscript of a bulletin entitled "The Relations between Crop Yields and Precipitation in the Great Plains," is now in the Government Printing Office, and will soon be issued. I believe that it is by far the most valuable contribution yet made by this office to the fundamental facts concerning the agricultural possibilities of the Great Plains.

I am sending you some bulletins which you undoubtedly have, but which may not be available for your use for this purpose.

I wish to call to your attention particularly, to the two illustrations which occur on pages 3 and 4 of the Bulletin No. 1287. Figure 1 shows the buildings constructed from the \$3000 raised by the citizens of Washington County.

Very truly yours,

E.C. Chilcott

Senior Agriculturist in Charge

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Appendix 5, Letter from J.F. Brandon to C.E. Johnson (1958)

USDA-ARS-SWC-W. Soil & Water Mgmt. Res. Br.

June 11, 1958

TO: C.E. Johnson, Superintendent, USDA Central Great Plains
Field Station, Box K, Akron, Colorado

FROM: J. F. Brandon, Research Agronomist (General), Fort Collins, Colorado

REGARDING: Land and Physical Property History of the USDA Central Great Plains Field Station

To try to apprise you of the history of the land acquisition at the Akron agricultural research institution and to some of the physical changes.

Acreage? One guess is about as good as another without access to the deeds. The only deed at the Station is the one covering the original 66-2/3 acres, more or less, composing the building site and the old cultural study block of plots. Wally was there and knows the location of these cultural study block of plots. In fact, the roadway north of the building site, extended on west is the north boundary of this original 66-2/3 acres, more or less. The strip is 1/4 mile long, east and west. It is wider at the east end, due to the gradual bearing north line at the railroad. This land was purchased by the Commissioners of the County and deeded to the federal government for agricultural and climatic research work. At that same time, 1906 or 1907, local citizens of this then sparsely populated area raised \$3000 with which the original buildings were erected. August Muntzing, then a lawyer at Akron and legal representative of the then B & M (Burlington and Missouri) railroad, prevailed on the railroad to start the \$3000 fund by contributing \$1000. Just how the other \$2000 was raised is not too clearly known at this day. However, Art Mitchell, a very excellent Mason and gentleman, was a young man and present when all this occurred. He told me he had \$100 actual money interest in the well being of this agricultural research institution. James Brunker, an original homesteader and a writer for whatever publications he could induce to purchase his perambulations, was very active in raising \$1, \$2, and up to \$100 from hither and yon. Anyway, this community went to town and we, even today, cannot let them down in our effort to turn out concrete and money-inducing research results. If you have not, I suggest you get acquainted with Mr. Art Mitchell and good Harry Vanderhoff who had early real estate experience at the town of Otis.

Until 1931 or 1931 when the 20 acres of county-owned land to the west of the 66-2/3 acres were acquired, there was a fence line along this west side of the 66-2/3 acres. The west forestry quarter fenceline, visually extended onto the railroad, shows the location of this original west line of the 66-2/3 acres, more or less.

When the Station was established, Mr. M. F. Vance, who then lived where Eugene "Gene" Vance now domiciles, succeeded in getting the north, or forestry quarter, withdrawn from homestead entry and added to the Station acreage. This then gave us 226-2/3 acres, more or less. I came there in 1920, more or less new, and in 1922 or 1923 Professor Kezer came down and said the research requirement of the land had been fulfilled and that a deed could be secured. This he proceeded to do, but instead of getting the deed for the federal government, he proceeded to get it made out to the State Experiment Station, thus giving them some interest in their Eastern Plains agricultural research efforts. They immediately leased the land to the government for research purposed which filled our needs nicely. Then, about 1923, Dr. Robertson became cognizant of the fact that they had an Eastern Plains section. Then began the rather congenial association with Dr. Robertson and Mr. Hous and other Agronomy, Forestry, Animal Husbandry, Range Management, and Noxious Weed Control officials. However, none of these, except the Animal Husbandry, even offered to finance the research work in which they were interested.

It was due to O. J. Grace that the Animal Husbandry Department became interested in their Eastern Plains, and at Akron, right in this region. I fell heir to the sheep grazing experiment which was set up in 1919 while Grace was still superintendent.

During the period between 1910 and 1920 Drs. Briggs and Shantz did their then classic work with the water requirement of the principal crops growing or likely to be grown in the High Plains environment. Also, there were personnel at the Station connected with other research offices of the then Department of Agriculture. It also was a building and modernization period. The office building, as modernized at present, was erected. The old barn was raised and the presently standing barn was erected. The lower machine and implement shed was erected.

The south residence building was the old Briggs and Shantz laboratory. There was the Office of Dry Land Agriculture, then they were called offices, which was the operating office of the Akron Station. The Cereal Office was the most consistent in their cooperative effort. Mr. Coffman was Cereal Representative when I arrived in 1920. He had taken over the Cereal Office cooperative work in 1918 or 1919. He was the keen-eyed researcher who saw Brunner and Trojan oats in the old Burt 916 oats and isolated and purified them. He saw the white heads in Blackhull 878 and started several head rows that in 1938 was isolated and named, the white seeded, Munsing. He saw the wonderful possibilities of the very susceptible kernel smut susceptible White Smyrna 2642 and saved several smut-escaping heads. This line produced the kernel smut-escaping line of Vance, about 1935.

This Coffman and his wife had living quarters in the upstairs of the office building. In 1921 he succeeded in getting his office to allot some \$2000 for remodeling, and making livable, the south residence which, as stated, was the old shell of the Briggs and Shantz laboratory. The inside walls had never been covered, and the top eaves line had sagged down in the middle.

The old superintendent's house where Grace had lived and where my wife and I moved in was so badly used by the then years of service, so when Coffman was transferred in 1924 off the station to Office headquarters in Washington, my wife and I moved in, as the much more livable quarters on the Station.

Mr. Grace had moved the old Shantz and Briggs bunk house to the spot where the present laboratory is situated, just west of the superintendent's residence. This was useful as a laborer quarters during the early horse and buggy days.

Mr. E. J. Maynard was the active Animal Husbandry representative in supervising the sheep grazing experiment. He found the State Representative body sympathetic toward research out on the Eastern Plains and obtained considerable money for such work. Between 1928 and 1932 they did considerable work on fattening hogs and lambs on typically grown Plains feeds. We fattened lambs satisfactorily and cheaper than they could be fattened on irrigated land feeds. Lamb fattening on the Plains feeds has continued, but on a minor scale. Chief endeavor now is fattening them on winter wheat pastures, and a research problem developed as protein poisoning. The hog fattening study proved Proso, or Hershey, a superior hog fattening ration, and yet the Hershey, or Proso, feed price still logs below barley as a rule.

This work proved so popular and grazing land so scarce that in 1926, Mr. Maynard brought Mr. Charles H. Lory, President of Colorado A & M College, down and showed him the 160 acres of sod land across the railroad. Dr. Lory then said he would recommend to his board the purchase of the land. This was truly and rightly a deed to the State Agricultural Experiment Station. This too was leased to the government and increased the Station's land holdings to 386-2/3 acres, more or less.

When I came to the Station in 1920, there was no modern water or sewage disposal system. This problem was taken up with the Washington Office of Dryland Agriculture and money was allotted for this project which was started in 1921 and completed in 1922. By that time, it was evident that the south well was the only reliable one of the three wells on the Station. Tests showed that this well capable of producing 280 gallons per hour for 10-hour periods. There was one Kewaunee 1,000gallon pneumatic tank present, and I prevailed on securing another. It was then buried in the ground and hooked to the wind mill deep well pump. This well soon pumped dry of water so that an excessive amount of air was pumped into the tank. By the time the pressure was built up to shut the pump off, the tank pressure was terrific. It was not unusual for a cup to be blown out of hand in attempting to collect a drink from one of the spigots. This new tank was also buried into the ground by the south well, where it stands now. At that time, the cement pump house was established and the first pump there was a Kewaunee gas engine pumping unit. This would cut out when the pressure was up, but one had to watch and when the pressure was low, go over and start the gas engine pumping unit. A Kewaunee equipped septic tank and distributing system was established in 1922, the sewer lines of 4-inch tile layed in the same trenches with the water lines. Excessive water line knocking was still experienced and the same excessive water pressure was present at the spigots. Soon thereafter, the wind mill was

cut off from the system and its presence available in any emergency. Then the south well furnished plenty of water for domestic and stock needs. About 1930, the Commonwealth Electric Utility Company bought the Akron electric rights and built a line to Otis, branching off one mile south to extend to the Station. Then a Dempster deep well electric pumping unit was installed in place of the Kewaunee gas engine pumping unit, which was much the worse for its 7 to 8 years of service. This water and sewage disposal system is on a chart, and Lou or Bob knows where it is.

The old Golden Rod Highway ran on the road just north of the Station north forestry quarter. By the way, this north quarter has all the early survival of the fittest forest and shrub plantings and rather naturally was dubbed the forestry quarter. A U. S. highway took over the Golden Rod Highway and had a nicely improved highway clear into Chicago. When Colorado took over the improvement of their end of highway 34, they sought to straighten it. At Akron they sought to extend eastward along the railway right-of-way. They sought roadway right along the south side of the Station's 66-2/3 acres, more or less. This was given up with reluctance and a compromise was agreed to. Here again, local citizens of Akron came to our assistance by raising some \$600 of money to buy 20 acres from Conrad Heer to extend right west of the 66-2/3 acres as a compensation for the land the highway would take off the south side of the 66-2/3 acres. This land was presented to the County Commissioners who leased it to the government for research purposes. This raised our acreage to 406-2/3 acres, more or less.

However, the railroad right-of-way takes 200 feet of land along its existence through the Station leased and owned land. This railroad takes out 24 acres for every mile of its extension. I do not know how this land is handled, but presume that where it extends between two different farms, one-half comes from one and one-half from the other. I presume this is why the government deeded land is listed as 66-2/3 acres. It is actually 66-2/3 acres, depending on how much the railroad right-of-way takes off, and now there is the highway right-of-way to be taken off. I presume that we loose something like 15 to 20 acres by way of both railroad right-of-way and the highway right-of-way. Thus the Station has from 388 to 391 acres.

When Mr. Coffman left in 1924 until 1931, there was no resident representative of any federal office at the Station. In 1931 Mr. J. J. Curtis arrived to resume Cereal Office cooperation. By about that time the federal Offices became Divisions. I then was occupying the Cereal Office modernized residence and the old original superintendent's residence had deteriorated until it was no longer habitable. Mr. Curtis and his mother lived temporarily in the revised bunk house, just west across the green from the north superintendent's residence. In 1930 some funds were provided for modernizing the superintendent's residence with promise of funds to complete the project next fiscal year. A full basement was provided with drain extended to low-lying lands to the north. The basement floor was too deep to get into the Station sewage system. The 1,000 gallon pneumatic water tank was dug out and placed in a cement walled room in one section of the basement. Both tanks were cut into the electrically operated pumping system and so hooked that no water logging occurred in either of the tanks for some 20 years. The superintendent's residence was completed as now stands by mid-1932 and Mr. Curtis and his mother moved into the south residence and J. F. Brandon, his wife and two children began residence where they remained until 1957 when they transferred to Western Branch headquarters at Fort Collins.

This superintendent's residence improvement was engineered, too, much from Division headquarters in Washington, and the tenure of the writer hung in balance from the satellite head at the Mandan Northern Great Plains Field Station, for some time. Funds were by then extremely scarce and no one satellite station could show physical improvements that no other could duplicate. Mr. Stephen's position at Mandan was fully appreciated, but at Akron we had to provide suitable living quarters for federal cooperative workers, and the superintendent should not move into a hog pen to provide such necessary living quarters. Those were first sketchily constructed and 23 years was about the natural life span of such houses. The government spent about \$3,200 on this residence and when finished, it compared very favorably with \$4,000 and \$5,000 houses in the commercial world. It was modern only as modern facilities were available at the time.

One other house, the old mess house, was used as a temporary office while the other office building was being modernized. We carried on a mess over there until 1924 when such facilities seemed no longer necessary. Then it was used as a laborer's cottage. This too is one of the old, early constructed buildings and has had periodic refurbishings.

During the thirties, the Station had good cooperation with the W.P.A. setup. The south house was then jacked up and solid and permanent foundations constructed. It was only incidental that a full basement was also constructed. The buried pneumatic water tank was dug out and a cement wall and cover placed over the tank. Both pneumatic water tanks are now where they can be painted and protected from outside rust depredations. The bunk house was gone over and inside entrance to the basement provided. The station bought half the material and the W.P.A. the other half and they built the garage. Then, the government would not build garages and it was constructed as an implement shed and later just incidentally used as a garage. The north or mess house was next in line to receive said permanent foundation, but the W.P.A. was disbanded before this could be done.

In order to get the garage, we had to provide so much work for the W.P.A. groups. Three cess pools were built and the chart and the boys, Bob and Lou, know how to find them. They were constructed to furnish drainage disposal to basement floor drains. These may occasionally need to be pumped out and the one taking care of the office and the south house may need to be enlarged.

The new or enlarged septic tank should be pumped out about every three years. Bob and Lou know where this is and perhaps this year the sludge needs to be removed. Proper removal of the sludge prevents clogging up the siphon chamber of the septic tank and causing trouble. These septic tanks work like a charm, but they do need occasional removal of accumulated sludge. No permanent residences now render these periodic cleanings less frequently. This, however, might be a good year to see how much sludge has accumulated. Carryover of sludge not only clogs the siphon chamber but going into the distribution systems soon fills the soil. Clear water is all that should go into the distribution system. Morrie Cox knows all this and maybe he has already seen about the cleaning out.

Under separate cover, a survey map is being sent pertaining to the whole of Akron Station particularly in connection with the purchase of the land across the tracks.

JFB:CH

Research Publications

By the Staff Associated with the
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Years 1900 thru 2007

United States Department of Agriculture,
Agricultural Research Service
and
Colorado Agricultural Experiment Station
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