From the beginning of time tillers of the soil—farmers—have striven to improve production. Initially knowledge of improvements was spread from one farmer to another. Then, particularly in the United States, as implements and other products became available, companies carried out their “extension” activities through their marketing efforts often using demonstrations. Farmers also banded together and formed societies that provided an opportunity to come together to discuss their results and common problems. Some societies even established publications to get wider distribution of their information. Once land-grant universities were formed they assumed a role by providing unbiased sources of information and of evaluation of products.

The Mid-1800s

The mid-1800s brought many implements that started an unprecedented evolution in U.S. agriculture. Cyrus Hall McCormick had invented the reaper in 1831 and John Deere had developed the steel plow in 1837, and by 1857 Deere’s walking plow had evolved to a riding sulky plow.

Public exhibition of new machines were made on many occasions, and a statewide emphasis was given to these showings in the form of
the first state fair held October 11-14, 1853. The officials of the Illinois State Agricultural Society offered prizes to encourage the development of mechanical devices and machines to help in agricultural enterprises. A plowing match was first held at the fair in 1856 and demonstrations were conducted for reapers, mowers, headers, and grain binders. The fair association also sponsored machinery trials at other locations in the state.

The potential for mechanical power for farm operations was recognized by the fair officials in 1858 when they offered a $3,000 first prize and a $2,000 second prize for the best steam engine to pull a plow. The Fawkes steam engine (with a six-bottom plow) was the only machine demonstrated at the 1858 fair held in Centralia. Later that fall a steam engine plow-demonstration was held near Decatur. Although the equipment did not perform satisfactorily, the officials presented J. W. Fawkes $500 for his demonstration. In 1859 the steam plow was again demonstrated at the state fair held at Freeport, and after much discussion the officials presented him $1,500 for demonstrating the machine.

The Illinois Central Railroad also encouraged the development of a steam engine by providing a prize of $1,500 in 1859. Three trials had to be completed along the railroad line to qualify for the prize. Records do not indicate whether these trials were held. After the demonstration in 1860, the officials agreed that the steam engine would not be a substitute for animal power in plowing and other farm work. The trial of the steam plow, however, caught the attention of J. B. Turner, who predicted in an article on “Plowing and Drainage” that the perfection of such a machine, which cost about $2,500 to build and used coal for fuel, would benefit agriculture in Illinois.

About 1890 a number of gasoline engines were adapted to the steam engine chassis to produce a machine called a “gasoline traction engine.” This name was used until 1906 when the word tractor was used in an advertisement by the Hart-Parr Company. Later it was learned that the word had been used in a patent in 1890.

The University to 1914

Soon after the university opened, the faculty presented talks and held discussions on subjects that would help to improve farming methods. Because a considerable amount of the state was level and in need of
drainage, this subject was given considerable attention in extension meetings. S. W. Shattuck presented a talk on drainage on several occasions in 1870 and 1871. A nine-page record of his talk is given in the Third Annual Report of the Board of Trustees. Interest in drainage increased and the first meeting of the Tile Makers Association was held in Springfield on January 12, 1879. At subsequent meetings of the association the faculty presented talks on drainage. These talks included “Engineering for Drainage” by Ira O. Baker in January 1881, and “Benefits of Farm Drainage” by G. E. Morrow in January 1883. During this period there was rapid progress in draining the soil with tile and by 1881 it was estimated that there were about nineteen thousand miles of tile lines in Illinois.

The improvement of homes was discussed in a talk on “Rural Architecture” by J. M. Van Osdel in 1870. Two years later, discussions were held and a talk presented on “Our Home and Their Ornamentation” by W. C. Flagg, the superintendent of the farms. During the same period Shattuck gave a talk on “Sewerage.” These three rather lengthy talks were also printed in the Board of Trustees Reports.

An early example of a machinery extension activity was the trial of implements held June 15, 1871. The Board of Trustees Reports give the following account of the event. “At the request of Professor T. J. Burrill, a number of farmers met for the purpose of examining and testing several corn cultivators and other implements for stirring the soil.” The machines were judged on five points: capacity for working crooked rows, quality of work, adjustability, durability, and ease of management. The implements tested included walking cultivators, riding cultivators, the Thomas smoothing harrow, Bakewell's improved harrow with cultivator attachment, and Harper's harrow attachment.

Extension activities related to agricultural engineering were often initiated by faculty in other subject matter areas. For example, demonstrations on spraying to control San Jose scale on fruit trees were conducted by S. A. Forbes, an entomologist using a sprayer he, J. C. Blair and others designed and built. The sprayer was operated by a gasoline engine designed and built in the university shops. This sprayer and engine was described in Bulletin 56 of the Agricultural Experiment Station, published in 1899. Plans for beef cattle housing were released in 1906 by H. W. Mumford in Bulletin 110 and Circular 104. Descriptions and plans of silos and barns for dairy cattle were
given in Bulletins 102 and 143 prepared by W. J. Fraser. Improved lighting of the home was described in Circular 121 “Lighting Country Homes by Private Electric Plant,” which was published in 1908 and prepared by T. H. Amrine of the Department of Electrical Engineering.

In 1901 the first Farm and Home Week program was held on campus. The nature of the programs varied, but they were well attended by farmers, who obtained many new ideas from the talks, classes, and exhibits presented. These programs continued for sixty-two years, until 1962.

*From 1914 to 1921*

After the Smith-Lever Act was approved on May 8, 1914, extension work on agricultural engineering subjects was conducted as a part of the activities of extension personnel in the Department of Agronomy and by the faculty teaching agricultural engineering subjects at that time. Special emphasis was given to programs related to the war effort and the solution of labor shortage problems. More than fourteen articles were published in popular magazines by the faculty during this period. Examples included, “Machinery Preparedness for the Big Drive,” “Shall I Buy a Tractor?,” “Relation of Tractor to Horse for Farm Work,” “Multiple Horse Hitches,” and “Extension of Power Farming Education.” Circulars and bulletins published during this period included: “Washing of Soils and Methods of Prevention,” “Soil Moisture and Tillage of Corn,” “Selection and Storage of Seed Corn,” “Construction of the Dairy House,” and “Arrangement of the Rectangular Dairy Barn.”

In 1918 R. I. Shawl offered, between the first and second semester, the first on-campus winter tractor short courses. Subsequently, two one-week courses were offered each winter until about 1941.

*From 1921 to 1997*

After the Department of Farm Mechanics was approved in 1921, Frank P. Hanson was appointed in September 1922 as the first extension specialist for agricultural engineering programs. He planned and conducted all the extension programs for the department. A major effort was placed on terracing demonstrations that were held in many parts
of the state. These demonstration projects provided some of the early research data on the construction and maintenance of terraces for different soil and climatic conditions. Other early projects included developing new building plans and demonstrations using power-driven machinery. The combine was introduced in 1924 and programs were held to advise on its use, especially for harvesting soybeans in Illinois.

Extension programs were conducted by either Hanson or Earl G. Johnson until 1934, when Ralph C. Hay was employed to take charge of soil and water conservation and machinery projects, and Ralph R. Parks, who was on the teaching faculty, was given responsibility for farm electrification and farm structures programs. Frank W. Andrew, employed during summers from 1939 to 1941 to conduct horse-pulling and farm electric demonstrations, replaced Parks in 1946 and developed extension programs in farm electrification, automatic feed handling, corn drying, and many other subjects. His tenure spanned from 1946 to 1972, when he retired. Keith H. Hinchcliff joined the faculty in 1943 to work on farm housing and farm buildings.

After World War II the extension faculty was increased with the addition of A. Richard Ayers as the power and machinery specialist. By 1963 there were five full-time extension specialists and one part-time faculty member for programs in the department. By the late 1970s, three full-time extension specialists and four part-time faculty members were assigned to department extension programs. A detailed listing of the extension staff is given toward the end of this chapter.

A Learn-by-Showing Teaching Method

Extension programs during the early 1920s were characterized by demonstrations, building plans, talks at county meetings, news articles, and personal correspondence. Many individual farmers were given special help with new programs so they would succeed with them and influence their neighbors to adopt them. In the early 1930s, the radio became a new communication tool and was used often to broadcast programs. A thirty-minute noon farm program began on WILL in April 1937 and agricultural engineering subjects were presented on Wednesdays. Television programs were first broadcast on Chicago stations around 1952. Television programming was begun in East Central Illinois about 1953 on WCIA and in 1954 on the university television station WILL-TV.
By 1963 teaching methods had been altered to reach more farmers and even urban people. Programs were planned to teach leaders who would, in turn, teach people in their area. Teaching aids for leaders were mass-produced in the form of slide sets, models, posters, and printed material. Extension programs were often integrated into those of other departments to present related information at a meeting or in a publication. The programs or displays were presented where large groups of people gathered for events such as the state fair, Prairie Farmer’s Farm Progress Show, and at plowing and corn picking contests.

New transportation methods shortened the time necessary to reach many parts of the state. Early extension trips were taken on trains, in slow-traveling cars on unimproved roads, and some even traveled by horse and buggy. Frank Andrew was the first extension specialist in Illinois to pilot his own plane to make visits to various counties in the state. He began using this method of travel about 1947 making former two-day trips into short one-day trips. Harvey Hrinin also was a pilot and often flew himself to do extension work, and Donald Day, of the teaching and research staff, frequently helped extension specialists by piloting them to special events.

POWER AND MACHINERY PROGRAMS

Before 1934 extension programs were conducted by either Frank P. Hanson or Earl G. Johnson. In 1934 Ralph C. Hay was employed and given the responsibility for soil and water conservation and machinery extension programs. Ralph R. Parks, who was already on the faculty, was given responsibility for farm electrification and farm structures. Shawl continued to offer the annual tractor short course, conducted several farm machinery schools, and added a series of meetings on lubrication. It was believed that farmers were not getting reasonable service from their machinery, largely because of a lack of knowledge of recommended maintenance and repair. To meet this need Shawl published Circular 425: “Tractor Repair and Maintenance” in 1934. The circular became very popular.

In 1936 Arthur L. Young and Edwin L. Hansen conducted a plowing contest while Hay conducted thirteen county meetings on farm machinery. At the time, Illinois was the leading state in the number of tractors, with an estimated 140,000 machines.

By 1938 applications for enrollment in the gas engine and tractor short courses taught by Shawl had more than doubled, exceeding the
number of students that could be handled. Dean H. W. Mumford noted the situation and wrote to E. W. Lehmann, “I am wondering if serious consideration should not be given to extending somewhat these short courses to meet the demand for them. What are the limitations and difficulties involved? It may not be possible to work this out during the present year, but it does seem to me that serious consideration should be given to meet so definite a demand.”

By 1939 the extension program was conducted by Hay and Parks with the assistance of resident faculty members H. P. Bateman, E. L. Hansen, E. W. Lehmann, R. I. Shawl, and A. L. Young.

During World War II, Parks was given military leave and Frank Andrew began working part time with Hay on extension programs in farm machinery. Farm power and machinery programs were most important because of farm labor shortages.

The emphasis on maintenance and operation of farm power and machinery continued to dominate extension activities until 1946. The wartime slogan was “care, share, and repair.” A tractor maintenance guide, Circular 574, “Relief from Tractor Troubles” by R. I. Shawl, became quite popular, as were clean moldboard plowing demonstrations for corn-borer control.

After the war the extension faculty was increased to four, and in 1948 a fifth member was added to the team. A. Richard Ayers, appointed as the first full-time machinery extension specialist in 1948, devoted much of his time to county meetings and covered topics such as fuel and lubricant selection and tractor maintenance. The importance of tractor care and maintenance was also indicated by interest in the 4-H Tractor Program. Statewide 4-H leader clinics were started in 1944 on the campus by Hay and Shawl. Later, these clinics were carried as area meetings at locations throughout the state first by Ayers and then by Wendell Bowers. Financial support for the yearly leader clinics, originally supplied by the Standard Oil Company, was discontinued in 1964. At that time, new literature on 4-H Tractor Programs, prepared by Bowers, was released for use on a national basis.

One outgrowth of the 4-H Tractor Program was a tractor operator’s contest that emphasized skill and safety. The first state-wide contest with twelve contestants was held at Springfield in 1950 as part of the Illinois State Fair. The number of contestants grew to an average of nearly seventy in the early 1960s. The first multi-state event, which included six Midwestern states, was held at the Prairie Farmer's Farm.
Progress Show in Armstrong, Illinois, in 1953. The contest was discontinued briefly, then started again in 1957 on a larger scale. Illinois contestants won regional events involving all states west of the Mississippi in 1957 and 1963.

Another program of great importance, "the care and adjustment of sprayers," began in the late 1940s. Chemical weed and insect control became a reality, and programs were developed to provide information to farmers through news releases and county meetings. Further emphasis on chemical weed and insect control was given by the inauguration of a training school for custom spray operators. The program was started in 1949 as a combined college event with Ayers; H. B. "Pete" Petty, agricultural entomologist; and Walter O. Scott, of the agronomy department. This event continues as a college function and attracts six hundred to eight hundred persons a year.

The European corn-borer became a menace about 1948 and created a need for emphasis on clean-plowing to accompany chemical control. Again Ayers cooperated with Petty to present many clean-plowing demonstrations.

In the early 1950s researchers tried minimum tillage, a revolutionary new approach to growing corn. One of the first researchers of this idea was Paul Bateman who tested some basic tillage systems on the Agricultural Engineering Research Field starting in 1951. Using eight field trial sites throughout the state, Samuel R. Aldrich, an extension agronomist on sabbatical leave from Cornell University in 1956, worked with Bowers and Bateman to demonstrate the potential of minimum tillage to Illinois farmers. A full-scale extension program on minimum tillage was then carried out from 1959 through 1963. Educational materials developed for this cooperative project involving the Department of Agronomy were films, slide sets, and circulars that were mass-produced and used by farm advisers, vocational agriculture teachers, and others.

Ayers was called to military service in 1951, so Wendell Bowers conducted the extension programs in power and machinery. Major activities were the annual 4-H Tractor Maintenance Leaders' Training Program, an annual corn picking contest, spray schools, farm machinery and tractor maintenance, and safety. Regular activities included plow adjustment, plowing contests, and combine adjustment. Circular 697, "Corn Picker Operation to Save Corn and Hands."
written by H. P. Bateman, G. E. Pickard, and Wendell Bowers, was published in 1952. Bowers wrote Circular 755, “Six Steps in Adjusting Moldboard Plows,” in 1956. In 1957 it was clear that minimum tillage was to become a major program for extension and teaching material was developed. Also J. A. Weber wrote a fact sheet on “Use of the PTO Shop Dynamometer” for use by machinery dealers.

By 1957 John C. Siemens began helping with the power and machinery extension programs on a part-time basis while still a graduate student. He worked in extension until 1963, when he joined the agricultural engineering faculty at Cornell University.

Charles A. Snavely replaced Harold Kreig as executive secretary of the Illinois Retail Farm Equipment Association in 1953 and immediately cemented a long-lasting relationship with the department. The two most significant developments that grew out of that relationship were the inauguration of an advisory committee by the association to work with the extension farm machinery specialist and an annual field day for implement dealers. The first field day was held in 1954, and the annual event continued until 1969. It regularly attracted more than 150 of the leading farm equipment dealers in Illinois.

In 1959 major extension programs in power and machinery were minimum tillage and band spraying of pesticides. Research had established that corn could be grown in a rough seedbed without reducing yields, and corn planting could be done directly in freshly plowed ground. By 1960 Vernon Veatch, a cooperator from Roberts, had developed a five-bottom plow with a two-row planter attached. Power was provided by two three-bottom tractors in tandem which were used to make more power available to a single operator.

Illinois farmers received their first exposure to farm machinery management and record keeping in the fall of 1961 with a limited number of exploratory meetings conducted by Wendell Bowers. On the basis of these trial meetings, all-day training sessions were developed and conducted in cooperation with the agricultural economics department and their farm and family business clinics in 1962, 1963, and 1964.

The increased demands by farmers for technical information on machines and tractors became more obvious in the early 1960s. Several short courses were developed by interdepartmental extension teams. In crop production and protection clinics, beef schools, and
swine schools farmers received as much as ten hours of instruction. The department also cooperated with the officials of many large state and national contests and field day events. Wendell Bowers and C. L. Hill, extension specialist in farm power and machinery at Purdue University, worked as a team in 1952 to develop rules for state and national corn picking contests. The national corn picking contest was held near Bloomington in 1953 and at Rockford in 1960. The national plowing contest was originally sponsored by the National Association of Soil Conservation Districts and later by the Plowman Association. The national plowing contest was held in Illinois in 1954 and again in 1963, with the department playing an important role in organizing and assisting with the judging and scoring of both contests.

Wendell Bowers resigned in 1967, and Peter D. Bloome, serving as an area agricultural engineer in Dixon, conducted the 4-H Tractor Program. John Siemens returned from Cornell University in 1968 and began working on programs dealing with pesticide application equipment and tillage systems for corn and soybean production. Ten one-day clinics were held for many years for pesticide dealers and applicators.

In 1970-71 Siemens took a year's leave of absence to work with Deere and Company and began the development of a computerized farm machinery selection program. A paper by B. Jack Butler and Siemens was presented at the twenty-fourth annual custom spray school on "Incorporation of Surface-Applied Pesticides."

Major power and machinery extension activities in the 1970s included programs on machinery management; maintenance and calibration of sprayers at county crop protection days; and clinics for pesticide dealers and applicators. These clinics had attendance of over two thousand individuals. Siemens and William R. Oschwald of the agronomy department took on a major tillage research project sponsored by Deere and Company. Results from that project were used at many agronomy field days, county crop production meetings, and other extension events.

The energy crisis and its potential effects on Illinois agriculture was given top priority in 1973. Siemens prepared five articles on energy crisis concerns that were published in Prairie Farmer magazine.

The 1972 Federal Environmental Pesticide Control Act required all users of restricted-use pesticides to be certified as competent by a
regulatory agency, and the Cooperative Extension Service was assigned the responsibility of training those desiring to become certified. At the time there were 123,000 private applicators in Illinois, with 20,000 to 40,000 requiring training to become certified to apply restricted-use pesticides. Loren E. Bode was hired in 1973 to provide leadership for the agricultural engineering portion of the training. Bode worked with an interdisciplinary team to develop the training program. The educational program included the annual custom spray clinics for pesticide dealers and applicators, clinics for urban pesticide dealers and applicators, county and multi-county agronomy days and crop protection meetings, and the *Insect, Weed, and Plant Disease Bulletin*. By 1977 more than six thousand commercial pesticide applicators and operators and more than thirty-eight thousand private applicators were being trained annually at twenty-four clinics.

During the 1980s, extension programs in power and machinery were conducted by Siemens, Bode, and Stephen Pearson. Siemens led programs related to conservation tillage for corn and soybean production and machinery management while Bode and Pearson were responsible for the programs on pesticide application equipment. Pearson covered equipment operation at the one-day training sessions held before the Illinois Department of Agriculture administered a test for licensing applicators. About 1988, Robert Wolf was hired as the pesticide applicator training specialist to coordinate this training. Included on the training team were specialists in agronomy, plant pathology, horticulture, entomology, and agricultural engineering. The sessions changed format to a two-day event that ended with the Illinois Department of Agriculture test for certification. In 1992 the presentation changed from the use of slides and overheads to on-screen computer presentations that added animation, color and other associated new technologies to improve the teaching process.

Although the concept of conservation tillage was not new to Illinois farmers, adoption was slow. By the early 1980s it was estimated that at least 90 percent of the 9.5 million acres of soybean stubble and 50 percent of the 11 million acres of corn were no longer moldboard-plowed. Chisel plowing and disk harrowing had become more common. However, in the spring, three secondary tillage operations were still commonly used. The first was to level the soil, followed by two tillage operations to incorporate herbicide. It was not until the 1990s
that the practice of no-tillage was fully adopted by many Illinois farmers. The no-tillage practice increased to about 30 percent of the acreage planted to soybeans and about 15 percent of the acreage planted to corn. These changes in farming practices provided an impetus for Siemens, with help from several graduate students, to rewrite the “Farm Machinery Selection and Management Program” that he had developed earlier.

SOIL AND WATER CONSERVATION PROGRAMS

Climatically, the state of Illinois is located where rain often falls in excess of the ability of the soil to absorb it. Originally, large areas of the state were flooded river-bottom lands, swamp, or marsh. Drainage systems had to be installed to convert these areas to productive agricultural land. Once plowing of the soil began erosion started on the slopes. This erosion subsequently silted the drains, thereby recreating flooding conditions. That cycle pointed to the need for joint erosion control and drainage developments.

From 1920 to 1930, demonstrations on farms were used to show the effect of drainage and erosion control. Extension’s emphasis was on developing drain and terrace spacing and layout criteria. Guidelines were developed and applied to both demonstration-fields and land in general.

During the 1930s classes on applying soil erosion control practices using surveying levels were started by county farm leaders and extension advisers. Demonstration terraces were constructed with farmer- or township-owned equipment, including plows, scrapers, drags, and special terracing machines. Waterway construction was necessary to make the terrace systems successful and gully shaping and contour cropping were recommended where terraces could not be constructed.

During the depression years, federal agency and state extension staffs cooperated in the construction of soil conservation structures on farms where farmers could not afford to do so. Civilian Conservation Corps (CCC) camps were started in 1934 and cooperation between state staffs and the new federal agency expanded. This entailed a great deal of coordination. The Vocational Agriculture Service of the College of Agriculture was initiated and leader training in erosion control work was carried out with vocational agriculture teachers. Soil conservation districts were formed and leader training was carried out to de-
velop district leaders and supervisors. All of these educational programs enhanced the camps' programs by providing more local interest in demonstration and construction activities.

A committee of extension specialists from the Departments of Agronomy, Animal Husbandry, Agricultural Economics, and Agricultural Engineering within the college was appointed to provide an integrated approach to soil erosion management. This committee worked with the U.S. Soil Conservation Service, the Vo-Ag Service, local soil conservation districts, and county extension councils to foster erosion control programs. World War II curtailed most construction activities due to shortage of equipment, personnel, and fuel. The aggressive programs of the previous decade were reduced to maintenance programs but local soil conservation districts continued to form and ultimately they covered the state.

Soil erosion control activities of the 1940s required an involvement of agricultural drainage and the interpretation of the Illinois drainage law, which to that time had consisted of a statement of philosophy and a series of court opinions. A state-wide interdisciplinary committee was formed to provide a drainage code acceptable to the state legislature, the state courts, landowners, drainage district commissioners, engineers, attorneys and the public.

At the close of the war Benjamin F. Muirheid was added to the staff. Immediately he conducted tests of drain tile quality the results of which were emphasized to both manufacturers and installers. Design aids were developed to increase technical knowledge and competence of field personnel in conservation. District and area meetings were adopted to reach wider audiences. Air tours were used to stimulate 4-Hers' interest in conservation and a program was developed for teaching practical surveying to 4-Hers in conservation camps. Muirheid also designed and supervised construction of the dams for the lakes in the State 4-H Camp located at Allerton Park near Monticello. The camp added new educational opportunities to develop future leaders.

The formation of conservation districts throughout the state was completed during the 1950s and resulted in the development of a grassroots level of education offered by conservation district personnel. This permitted extension specialists to devote more time to inter-agency cooperation. Subsequently, enhanced cooperative programs
were developed with user-contractor groups such as the Illinois Well Drillers Association, the Illinois Septic Tank Contractors Association, and the Illinois Land Improvement Contractors Association.

During the mid-1950s Ben Muirheid, with the cooperation of Illinois Soil and Water Conservation District, SCS staff and land-leveling and small earth-moving equipment manufacturers, developed educational materials and held on-farm demonstrations on the construction of surface drainage systems. The demonstrations started in the slowly permeable soils area of northeastern Illinois but soon spread to the clay-pan soils of southern Illinois. Interest in surface drainage and questions on the best depth and spacing for subsurface drains led to the development of the *Illinois Drainage Guide*. The guide was a cooperative effort of many specialists who brought together, in a comprehensive way, soils, crops, and engineering data to provide specific recommendations for draining individual soils mapped in Illinois.

Below-average rainfall in Illinois in the early and mid-1950s and the availability of light-weight aluminum pipe sparked farmer interest in sprinkler irrigation, especially in sandy-soil areas such as Mason, Whiteside, and Kankakee counties. Mason County, with its ample water supply at a shallow depth, was soon known as the county with more kinds of irrigation systems than any other county in the Midwest. Questions concerning irrigation system design led to another cooperative effort that brought together soils, crops, economic, and engineering data for the development of the *Illinois Irrigation Guide* in a format similar to the drainage guide. These two guides soon became the models for the development of such documents throughout the Midwest and still serve as basic extension resource material for educational programs.

Ralph Hay, who had been involved in almost all of the soil and water extension activities from 1934 to 1962, except for a two-year assignment in India, helped form the Illinois Land Improvement Contractors Association (ILICA). Early on he recognized that land improvement contractors had a vested interest in properly installing conservation practices and that they were receptive to educational efforts of the soil and water extension staff. One of the benefits of the cooperative relationship was that the contractors frequently came forward with ideas for new construction techniques and new design criteria. Although some of their ideas resulted in practices that were not
successful, others resulted in innovative changes that improved conservation practices and made them more appealing to farmers.

One example was the idea of constructing several small dams, each with a pipe outlet, in fields instead of installing traditional terraces. Even when carefully constructed, terraces had frequently been a headache for farmers because they often resulted in many point rows that were difficult to farm especially with multi-row equipment that began to become standard in the 1960s. To many farmers, anything that would conserve soil and not involve point rows was attractive. New approaches generated much productive discussion among farmers, conservationists, contractors, and extension and soil conservation service personnel. These groups from Illinois and other states were among the first to assess what would provide more acceptable conservation practices. In the end, the idea of parallel tile outlet (PTO) terraces, an old concept, was revived and improved upon to combine the effectiveness of terraces with farmability by multi-row equipment and drainage of low areas in a field. Today PTO terraces are a standard erosion control practice, an example of contractors’ ideas that contributed to better, more effective, soil conservation practices.

Before the 1960s, clay and concrete were the primary materials used for subsurface agricultural drains. In 1962 extruded corrugated plastic drain tubing (CPT) was introduced in California from Europe. Soon after, CPT began to be used in Illinois. Seeing the potential for this new material, Carroll Drablos, with the help of Paul Walker, developed methods for evaluating the performance of plastic drain tubing in place. In the mid-1960s Drablos succeeded Hay as educational adviser of the ILCA and in cooperation with engineers from the Soil Conservation Service began conducting workshops for drainage contractors on proper installation practices for CPT. Those workshops continued through 1996 under the leadership of Michael Hirschi, who became the extension soil and water engineer following the retirement of Drablos in 1990.

The practice of using subsurface drainage systems to control the water table and effectively sub-irrigate the soil was introduced many years ago, but the use of plastic tubing and plastic structures for water table control made the concept of sub-irrigation more appealing in the 1970s and 1980s. Drablos organized short courses on sub-irrigation and brought together those with practical experience and
research knowledge on the subject. During all of these activities the ILICA served as an effective sounding board.

Wholesale changes in animal waste management systems in the 1970s resulted in the need to control the runoff from such systems and manage the application of manure to land in such a way as to minimize air and water pollution. Dale H. Vanderholm joined the soil and water extension staff in 1973 to lead the educational effort in this area and continued until 1983. Vanderholm, with assistance from Elbert Dickey, constructed demonstrations of grass filter strips used to treat runoff from feedlot areas to acceptable standards of quality for Illinois streams. Vanderholm and Muehling, along with engineers from the Illinois Environmental Protection Agency and the Soil Conservation Service, developed extensive educational materials and conducted many large-scale meetings with farmers in Illinois who were involved with all aspects of land application of animal wastes. These efforts were supported by a number of different governmental agencies and industry groups, all interested in meeting new regulations for higher-quality water in Illinois streams.

Vanderholm, with the support of the Illinois Environmental Protection Agency and the Department of Public Health, also addressed the problem of inadequate domestic waste treatment in rural areas of Illinois. Plentiful water supplies became available in many rural areas, and community water systems replaced old, inadequate farm wells. The availability of a plentiful supply of water accentuated the problem of polluted water coming to the surface of the ground near septic tank drainage fields. Vanderholm, along with David Ralph, developed a sand filter system that could be used in rural areas to treat domestic sewage economically so that the effluent would be of a quality acceptable to streams. They constructed several demonstrations with such filter systems and conducted workshops to familiarize homeowners and developers with the technology.

Interest and expertise in water quality grew in the department and major projects were begun with multiple sources of funding, of which the Little Vermilion River Project was one. Hirschi became water quality project coordinator in 1992 and coordinated the department's activities, which included both outreach and monitoring. The Vermilion River Project, led by researcher J. Kent Mitchell, grew to a $1.25 million project.
As Hirschi took on more teaching duties, Mitchell began to assume extension activities, especially those involved with the Illinois Land Improvement Contractors. In 1997 the ILICA will assist with the construction of ponds for the University's arboretum with Mitchell serving a major role coordinating, planning, and constructing them. In addition, Ellyn Bromberg, extension administrative staff, began working with Hirschi on coordinating educational programs on water quality and health risks.

**FARM STRUCTURES PROGRAMS**

There were no full-time extension farm buildings specialists in the 1920s and 1930s. A farm buildings plan service was available in the 1920s, however, and with the start of the Midwest Plan Service in the early 1930s the plan service grew to be—and continues—as an important phase of farm buildings extension work. Plans for many of the structures were developed from designs originating at the University of Illinois.

Depression and drought affected programs in the 1930s. Trench silos and other temporary forms of silage storage were promoted to salvage drought- and grasshopper-damaged crops. Few new farm buildings were erected because of the financial depression.

By the early 1940s, just as it appeared that a program in rural housing and farm buildings would be in demand, World War II delayed long-needed improvements on farms. Portable buildings for poultry and swine were being recommended.

After World War II, extension programs placed emphasis on family housing, partly due to the interests and talent of those on the staff and partly due to the demand of farm people to improve their living conditions after a long period of financial and wartime restrictions. The Federal Housing Act of 1949 also contributed to the emphasis on improved family housing.

The first full-time farm buildings extension specialist Jimmie C. Andros was employed in 1948, and from then until 1956 the position was filled by four different individuals. Even with the discontinuity of personnel, the extension program showed continuity in recommendations for clear-span roofs, loose housing for dairy herds, and farmstead reorganization to permit labor-saving building arrangements and mechanized choreing. Arthur J. Muchling of the teaching faculty
and Leo Fryman of the dairy science department authored the first circular on “free-stall dairy housing.” Considerable demand for information on dairy and beef housing continued through 1956. In the late 1950s and early 1960s demands for information on beef housing and grain storage continued, requests for information on dairy housing declined, and requests on confinement swine housing increased.

Sound construction and good farmstead planning underlaid the continuing extension program in farm buildings regardless of the emphasis on a particular livestock enterprise. A great deal of work was done on the remodeling of existing farm buildings with poultry buildings being converted to swine buildings, and ear-corn cribs being converted to hold shelled corn. Clear-span construction was emphasized and just adding a shed to the side of an old building was discouraged. The slogan among the staff became: “Build from a plan; build clear-span; sheds be damned.”

The structures division underwent much change in 1956. On January 1, Donald G. Jedele joined the structures faculty as extension agricultural engineer. Less than a month later, Arthur J. Muehling began his career on the staff as a researcher and teacher. Deane G. Carter left the department to lead the University’s international programs, and Edwin L. Hansen replaced him as division leader in the department. Curtis and Hinchcliff remained on the staff, but Hinchcliff devoted full time to family housing while the rest of the staff specialized in farm structures. This five-person team was together for four years until Hinchcliff died in 1960. After his death family housing continued as a major part of the extension program under the leadership of Jedele.

**Conferences** • After the nationwide depression of the thirties and the shortages during World War II, there was a great need for farmers to upgrade their farm buildings. Farm buildings were either built by the farmers themselves or by carpenters who bought their materials from a local lumber yard. Recognizing this Deane G. Carter forged a relationship between the department and the Illinois Lumber and Material Dealers Association (ILMDA) to sponsor conferences to inform lumber dealers and builders about research results and other developments in farm buildings and rural housing.

The first conference was a three-day event in December 1944 and subsequent conferences were held annually except in 1953. They were
called Lumber Dealers Farm Structures Short Course and the entire structures staff helped with the programs. In 1954 the event was changed to a one-day program called Farm Structures Day with Joe Clayton in charge, assisted by Frank Andrew.

In the fall of 1956 Jedele took over the leadership of the program and in 1973 the first Livestock Waste Management Conference was held in lieu of the Farm Structures Day. Since that time the two conferences have alternated years.

As farm building practices changed, there were fewer farmer and carpenter-built structures and more package or pole-buildings. The lumber dealers were less involved. The ILMDA was the only cooperator with the department until 1978. The National Frame Builders Association (NFBA) joined the effort in 1980.

As the ILMDA dropped out in 1988, the Illinois Department of Energy and Natural Resources became a co-sponsor with NFBA. The name of the conference was changed in 1988 to Light-Frame Buildings Conference to reflect a broader scope than farm buildings.

After Jedele retired in 1988, Muehling organized both building and waste management conferences until he retired in 1992. Ted Funk, area engineer, was employed as a state specialist in 1995 and took over the management of the conferences. These two conferences represent the longest running extension education activity in the department. The 1996 Light-Frame Builders Conference was the 39th dating back to 1944.

**Clear-Span Construction** • One of Jedele’s first extension initiatives was to teach farmers the advantages of having post-free interiors in their buildings. He also taught and demonstrated how to build trusses and how to lift them into place. Even before Jedele arrived, Joe Clayton had a truss-raising demonstration at a Farm Progress Show near Belvidere in 1955.

The common method for attaining adequate strength in the connections in trusses in the 1950s and early 1960s was to use plywood gusset plates, glue and nails, or TECO split-ring timber connectors that required a special drill bit that was expensive for individual farmers who were still their own builders to purchase for building just a few trusses.

The Midwest Plan Service published books of truss designs for glued, split-ring, and nailed trusses in 1965. Jedele and J. O. Curtis
were on the regional committee to develop those designs. Clear-span construction did not become popular until a commercial company developed the first steel-plate connectors that were pressed into the wood. That type of connector is now the standard. It is believed that the early educational programs and design standards developed by extension structures and environment agricultural engineers created farmers' acceptance of clear-span principles.

**Confinement Swine Housing** - Before 1955, most pigs were raised on pasture. It was assumed that pigs got a part of their nutrients by rooting in the soil. Animal scientists in the 1950s developed complete rations for swine that included all vitamins and minerals which made confining swine to buildings possible. This meant that many more pigs could be raised on smaller acreages.

In late 1955 Jedele designed a farrowing house and a finishing building that were published in *Successful Farming Magazine* with an article by Damon Catron, an Iowa State College animal scientist, that described what Catron called “the life-cycle nutrition program for pigs.” The article is considered by some as the beginning of confinement housing. Although there were central farrowing houses before that and some outside concrete lots for finishing, the 1955 article put a system together in a program of nutrition and housing.

Even though that first article was written by Iowa State College faculty members, Jedele moved to Illinois in January 1956, and soon Illinois swine producers led the way in developing confinement swine housing systems. Jedele, and later Muehling, helped farmers with the engineering of early slotted floors, ventilation systems, insulation of buildings, and selection of building materials.

**Livestock Waste Management** - In 1958 Jedele gave what is thought to be the first ASAE paper on liquid manure handling for swine. It was based on what Illinois producers were already doing, not research. The paper called for a research program and such a program did develop. Waste management research at Illinois led by Donald L. Day was an outgrowth of the need of swine producers. The Department of Agricultural Engineering became a leader in all of the developments in confinement housing, although many other states had parallel research programs.

Muehling changed from research and teaching to extension in 1961. While in his research position he visited the first “swine lagoon” in
Sangamon County in 1958 and began helping operators with design and management practices. With the development of slotted floors, he simultaneously began working with swine producers to use liquid manure safely. Realizing the importance of providing the latest information to Illinois producers, Muehling's extension programs dealing with livestock housing added the latest developments in waste management. He developed a series of ten highly regarded and well-attended Illinois Livestock Waste Conferences, first held in 1972.

Recognized as an authority in Illinois, Muehling was asked by the State of Illinois to be an adviser to the Illinois Environmental Protection Agency and the Illinois Institute for Environmental Quality in drafting proposed Illinois livestock waste regulations to be considered by the Illinois Pollution Control Board in 1978. Between 1978 and his retirement in 1992 he testified at numerous hearings as regulations were modified.

Muehling is perhaps the best known swine systems agricultural engineer in the world through his many international activities. In 1966 he made his first study tour to Europe with a group of Midwestern pork producers visiting farms and research institutes in England, Germany, Norway, Denmark, and Sweden. During a sabbatical leave in 1969-70 he studied different types of slotted flooring for farrowing in Germany, Czechoslovakia, and Hungary. Since then, he has organized and lead three different swine-producer study tours to the Netherlands, Germany, Russia, Austria, Sweden, Finland, Norway, Poland, Denmark, China, and Hong Kong.

In 1982 he was the only agricultural engineer to serve on a team that developed a swine repopulation plan for Haiti after the swine there were killed to eradicate an infection of African swine fever. In 1991 he lead a MUCIA project in the Dominican Republic to study conditions and make recommendations to solve livestock waste management problems.

**Farm Housing** • Illinois took the lead in a study to evaluate the potential for farm housing research in the North Central Region. The circular that resulted was entitled “Development of Cooperative Farm Housing Research in the North Central Region.” Extensive regional research began about 1950, and the result was the 1952 Flexi-Plan Series prepared by Robert C. Cohlmeyer and Merlin R. Hodgell under the direction of Keith Hinchcliff. The flexi-plan procedure offered
six to thirteen variations for each of three basic farmhouse designs. To illustrate the new designs, an extension circular was published and released as a North Central Region publication.

After Hinchcliff’s death in 1960 the Department of Home Economics appointed Glenda Pifer as housing specialist and Jedele cooperated with her on engineering aspects of housing. Pifer left in 1971 and the School of Human Resources and Family Studies reduced their emphasis on housing. Jedele contracted with the Illinois Department of Energy and Natural Resources to conduct residential energy conservation education programs from 1978 to 1985.

By 1985 extension budgets were in decline, so when Jedele retired in 1988 he was not replaced. The family housing component of extension essentially ended and Muehling handled all of the farm structures extension work. When Muehling retired in 1992 he was not replaced. Structures extension was handled by four area extension engineers with Ted Funk of the Effingham office spending part time in Urbana to coordinate statewide activities. The research staff supported the extension program ably by answering mail and telephone questions from farmers. Not until Peterson retired in 1995 as extension agricultural engineer from the food and bioprocess engineering division did the college administration allow the department to fill an extension position. Funk then became a state extension specialist full-time in Urbana. His current work is primarily in the structures and environment division.

**Farm Electrification Programs**

In the early 1930s the program in rural electrification was practically nonexistent. There were only a few farm customers in the Public Service Company area of northern Illinois. Considerable interest, however, was shown by many people in generating some electricity by means of a small, engine-driven generator. But an engine that would burn kerosene and drive a generator to make electricity for light was about the extent of rural electrification during the depression years of the early 1930s although some manufacturers and many ingenious individuals tried to build wind-driven units that would charge batteries at no cost for power. However, distribution lines from central station service had been built experimentally in 1924 and kilowatt-hour consumption for several farm jobs, such as pumping water, incubating eggs, and grinding feed, had been determined.
The establishment of the federal Rural Electrification Administration (REA) made low-cost loans available for utilities and for cooperatives to build electric lines in rural communities. Much of the effort of the first full-time extension specialist from 1936 to 1941 was spent with local groups working out the problems of how to organize themselves to make use of this new federal program. In addition questions of cost, how to use electricity, and the hazards of fire and shock were answered at every turn by lectures, tours, and demonstrations.

In the late 1930s the extension specialist often cooperated with the "electric fair" or "electric circus," an event sponsored nationally as a tour that stopped at several places in Illinois. The extension specialist furnished demonstration materials and lectures that applied particularly to Illinois conditions. He also arranged for participation by local farmers who had developed good equipment and procedures for using their new electric power. During the early 1940s and the beginning of World War II, labor-saving shows were conducted in many counties. Great interest and ingenuity was shown by farmers who made their own equipment to solve equipment shortage problems.

Ralph Parks held the extension specialist position during World War II but during a portion of that period was in the military. Upon his return the extension program emphasized safety, hay-drying, and water systems. Water system and septic tank demonstrations were held in practically every county in the state in cooperation with Claude Kincaid, the field engineer with the Portland Cement Association. The meetings demonstrated that electricity could raise the standard of living in homes by making running water and other conveniences possible. At the same time, water under pressure could boost livestock production and output more than enough to pay for the investment in equipment.

During the 1950s extension programs for mechanical feeding and grain drying applications were developed and the Illinois Farm Electrification Council (IFEC) was organized. The financial and manpower support provided by the utilities and cooperatives was the backbone of the extension service's program in the then-new 4-H Electric Project. In 1960 Harold H. Beaty became the executive secretary of the IFEC as part of his duties as a faculty member. He held that position until he retired. Subsequently the position has been held by Elwood F. Oliver and Paul W. Benson.
In cooperation with the IFEC the first of five workshops on electric controls for materials handling systems was held in 1959. The conference became the Materials Handling and Grain Drying Workshop in 1965 with emphasis on grain drying systems and their integration into materials handling systems for farmsteads. In 1967 the workshop became the Grain Conditioning Conference and was held nearly every year thereafter through 1996. Program emphasis was placed on grain drying procedures, storage practices, quality characteristics, and processing methods.

The 1959 workshop was planned to acquaint power-use advisers with the basic function of control elements and how they are used to produce an automatic electric power controller. That workshop proved that it can be disastrous to try to teach simple principles with too many different types of equipment at hand. Too much time was spent looking at equipment and too little learning principles. However, out of that conference, cooperation developed between the Vocational Agriculture Service and IFEC to supply vocational agriculture teachers with control kits for use in their classrooms. Another outcome of that conference was the development of “Controls for Farmstead Automation,” a laboratory manual written by Beaty, Herum, Olver, Peart, and Puckett.

FARM AND HOME SAFETY PROGRAMS

The department’s extension programs have always emphasized safety as a component of the subject matter. Lehmann was an ardent supporter of farm and home safety and devoted many years of service to the National Farm Safety Council. Lehmann advocated the appointment of a full-time safety specialist in the department but his desires were never fulfilled. From about 1956 until 1984 the safety specialist for the Extension Service was at the college level. However, when the safety specialist for the college Ordie Hogsett retired the position was transferred to the department. Robert E. Aherin was employed even while he was still working on his Ph.D. at the University of Minnesota. He completed his degree and became an assistant professor with a full-time appointment in extension education. Aherin brought new approaches to farm safety. He designed his program based on his research in behavior modification to bring about change in unsafe behaviors. For example, his research had shown that a farmer’s children
and spouse were the most influential in modifying his behavior; thus, unsafe farmer behavior was best approached by convincing the children and spouse of the need for change.

Aherin launched a farm accident reporting system to obtain a clearer picture of farm accidents. A survey instrument was sent to farmers selected through a stratification process that included geographic location and farm size and type. The results identified demographic characteristics of those involved in farm accidents, including an in-depth analysis of tractor accidents.

Aherin received a grant from the Kellogg Foundation in 1991 to develop a model program for community empowerment to deal with agricultural health and safety issues. Robert E. (Chip) Petrea joined him as an academic professional to assist in the safety program. In the model community empowerment plan, a major medical center was identified as the regional project sponsor, and state and private agencies with interests in agricultural safety and health were enlisted to join the coalition. Two regional coalitions were functioning by 1995.

Aherin and Petrea also initiated a disabled farmers program. The objective was to develop a model program for providing comprehensive assistance to meet the needs of those who are disabled and want to farm.

ENERGY PROGRAMS

In the late 1970s and early 1980s, as a result of the Arab oil boycott, gasoline shortages, and long lines at gasoline service stations, there was a considerable increase in interest in energy conservation. Extension engineers began conducting programs that were funded through contracts with the state energy office, a part of the Illinois Department of Energy and Natural Resources. These contracts provided funds for salaries, travel expenses, local meetings, and the publication of literature. Thirty to fifty educational meetings were conducted each year throughout the state. The two main thrusts of these meetings were home energy conservation, under the direction of Don Jedele, and farm energy conservation, under the direction of Bill Peterson.

Suella Hill, a home economist, was employed for five years to work in the home energy conservation area, and David Morrison and Jon Carson, both agricultural engineers, were hired to assist with agricultural conservation programs.
One project consisted of selecting several Illinois homeowners with whom to work intensively to demonstrate the results of adding energy conservation features to their operations and keeping records of energy use. In addition, twenty-one counties were designated as pilot counties and selected advisers were designated as energy advisers to receive special training and conduct energy programs in those pilot counties. Among the topics covered in the programs were window construction and treatments and labeling of energy efficiency of home appliances.

The USDA also became interested in funding on-farm demonstration projects. One project involved ten farms that were modified to use solar energy for heating livestock shelters. This program was conducted by Chris Rahn and coordinated by Art Muehling.

Another USDA demonstration project was devoted to the use of solar energy for drying crops. Bill Peterson coordinated that project. With the help of David Morrison seven farms were used as models. Illinois was also one of nine states successful in securing funding in a competitive proposal process. As a result farmers were assisted financially for about half the cost of adding solar features to their systems. Funding for those projects began in 1987 and continued for nearly five years. Then interest in energy as a topic for an entire meeting program began to wane, funds for home energy education were reduced, and changes were made to integrate farm energy information into more ongoing educational programs such as crop-drying and tillage. The name of the state energy office was changed to the Office of Energy and Recycling in the Department of Commerce and Community Affairs. Funding for energy information programs as part of the ongoing extension education program continues.

**State Extension Staff**

**Faculty Responsible for All Subject Matter Programs (1922-35)**
Frank P. Hanson, 1922-26; Israel P. Blauser, 1926-27; Glenn F. Hoover, 1927-28; Earl G. Johnson, 1929-34; and Ralph C. Hay, 1934-35.

**Soil and Water and Power and Machinery (1936-45)**
Ralph C. Hay, 1934-45; and A. Stephen Paydon, 1941-42 (machinery)
Rural Electrification and Farm Structures (1936-45)
Ralph R. Parks, 1936-46 (military 1941-45); and Keith H. Hinchcliff, 1944-45.

Electric Power and Processing (1946-96)

Farm Structures (1946-96)

Power and Machinery (1948-96)

Soil and Water Conservation (1934-96)

Farm and Home Safety
Robert A. Aherin, 1984-present.

Special Programs

*Part-time extension faculty.
Area Extension Specialists

The Cooperative Extension Service instituted area specialists in 1962. These individuals were not staff members of the Department of Agricultural Engineering, but the department was influential in getting acceptance of the criteria of requiring graduate agricultural engineers for the “engineering” positions. Marvin Hall, the first area engineer, was located in Macomb. Peter Bloome accepted a similar position in 1964 and was located in Dixon. When Bloome returned to campus in 1967 to pursue advanced degrees, Marvin Hall remained the only area engineer for many years. In 1980 three area engineers were hired, Ted Funk for the Effingham office, Warren Goetsch for Springfield, and Donald “Tad” Kerr for Dixon. Hall retired and Goetsch resigned in 1989 and Kerr left in 1991. In 1993 extension replaced the three area engineers with William P. Campbell in Springfield, Wayne P. Block in Moline, and Lester O. Pordesimo in DeKalb. Funk moved to Urbana as state extension specialist in 1995; Pordesimo and Block left the University in 1996.


Looking Back

The following incidents, as recalled by Frank Andrew, represent efforts to improve the lives of farm families by taking information to them.

As a summer employee, I ran horse-pulling demonstrations at fairs. E. V. Collins, professor of agricultural engineering at Iowa State College, designed and built a horse-pulling dynamometer which was on loan to us. A. L. Young checked me out on the use of it at Ashley, Illinois (Washington County Fair). E. T. Robbins of the animal science department set up the schedule for the fair circuit. Robbins drilled into me that contestants should drive with a tight line and should not abuse the horses. The sure winner at one contest let his line slip on the back of the team and I threw him out, much to his displeasure. There was also a woman spectator who came running out shaking her fist at me and yelling, “You SOB, you just lost me a lot of money.” I was an
innocent country boy and didn’t realize people were betting on the teams.

I helped Ralph Hay with tractor clinics during World War II. These included clean-plowing demonstrations which were quite a contrast to present trash farming and minimum tillage.

Hundreds of pig heat lamps were made by 4-H members as a 4-H electricity project using a one-gallon bucket as the shield.

Most of the agricultural engineering specialists had the experience of flying to extension events with me in my Ercoupe two-seat private plane. I used to shave with an electric shaver en route and often did dictation on an Ediphone and Voicewriter, which I powered through a converter from the plane’s electrical system.

A reciprocating “electric engine” model made from a solenoid, a micro-switch and spool timer created lots of attention at exhibits.

I conducted sewing machine maintenance clinics with home economics advisers for groups of fifteen to twenty-five women. The principle taught was that the eye must be on the point of the needle.

Agricultural engineering extension specialists cooperated with other departments of the college on a legume-grass caravan in the late 1940s or early 1950s. Dick Ayers and I designed a fold-up display case from a 4’ x 8’ sheet of plywood. Ten of these were built for table-top displays.

Hoyle Puckett, USDA engineer, helped with many ideas on exhibits and models for pneumatic conveying, feed handling, and automatic feeding of livestock.

Agricultural Engineering Days were held in many counties, and the department usually took two station-wagons full of exhibits and five or six specialists. Two exhibits were called “Homer” and “Jethro.” Keith Hinchliff had designed and built “Homer” to feature some of his home designs, especially the Flexi-Plans, and “Jethro” was Frank Andrews’ exhibit of cascading augers for moving grain and feed around the farmstead, an exhibit developed from a Puckett idea.

The first “Walkie-Talkie” communication was used by Wendell Bowers and me for transmitting scoring results at ear corn harvesting contests. Bowers and I also put on safety demonstrations. Bowers demonstrated hydrogen explosions with storage batteries and I put guppies in a petri dish and electrocuted them with a hot wire dipped into the water. The guppies were resuscitated by blowing oxygen into the water. The whole procedure was shown to an audience by setting the clear petri dish on an overhead projector.

In the late 1950s I was tired of talking about shelled corn drying at a time when only 5 percent of corn was harvested in the shelled form. I
was advocating drying when all the department had was a design for a home-built batch dryer.

“Old Rube” was an animated exhibit to get attention for automatic feed preparation. It was a series of wooden gears that activated a mallet that came down on an ear of corn. There was a cutout of a cow’s head with a moving tongue that reached for the ear of corn. Bill Schwiesow timed the descending mallet to just miss the cow’s tongue. Kids and adults both loved this exhibit.

Another exhibit was a standpipe with several faucets to demonstrate the need for pipes and pumps of the correct size. This was used when farmers were just starting to install private water systems on farms. Along with water systems came the need for sewage disposal. Claude Kincaid of the Portland Cement Association and I demonstrated installation of septic tanks and tile effluent disposal fields on farms.

I took many aerial photos of farmsteads over the years and started using them for farmstead planning with Joe Clayton and continued with Don Jedele and Art Muehling. My slides were used at many meetings and several prints showed up in extension publications and farm magazines. I also gave air tours of conservation farms.

A dangerous practice was to use a tractor to pack grass silage in stacks and bunkers. Wendell Bowers and Ordie Hogsett put on several demonstrations of overturning tractors.

I often demonstrated the principle of split-phase electric motors with a tin can on an axle with copper wire wound around it to create a field. The can would rotate when the field winding was energized. I used this technique to play a joke on one of my colleagues who was teaching an agricultural engineering class on electric motors. I wrapped a cardboard oatmeal box with aluminum and hid the foil by replacing the paper label. I then put a couple of pencil marks across the box and told him that the pencil marks conducted enough electricity to make magnetism and cause the box to rotate like a tin can. He was impressed and showed it to his class, not realizing that it was the aluminum foil wrap that made it turn. I apologized to him for letting him get up before his class before I could explain that the pencil mark theory was a hoax.

Wendell Bowers and Don Hunt were into machinery management programs long before personal computers came along. It may even have been before computers or calculators of any kind. But many in the department remember punch cards and card-sorting machines under the stairwell in the old building.
From a different perspective some of the emeriti in the soil and water area made these observations primarily about extension.

It is always risky to attempt to assess the impact of the contributions of a program over time because new knowledge and its application is built incrementally on small element after another. What appears to be insignificant at one time may be of greater significance at another. Further, the real reason for developing new knowledge is to help citizens solve real problems. Thus there must be a continuum from research to application if the work of the faculty is to benefit the state and federal taxpayers that support it. It is this continuum that we attempt to address remembering all the time that the intervening work makes a contribution to the next finding that has direct application.

The first major impact in soil and water management was the application of broad-based terrace systems on sloping land throughout the state to assist in the control of erosion. The early studies, begun in 1922 by Lehmann, provided the design criteria and the practical knowledge for building the systems. Extension agricultural engineers, particularly Ralph Hay, over a period of years went into almost all counties in the state to organize demonstrations to show farmers how they could build terraces on their own land. In those days the highway system was in its infancy so many, many demonstrations had to be held near enough to farmers to get them to participate. These demonstrations took Hay into all parts of the state where he got to know almost all of the little towns. After joining the teaching faculty, he surprised the students each fall with his knowledge of the state by his ability to pinpoint their home towns on a map after they had introduced themselves at the first student meeting of the year. Students will remember Hay for his knowledge of the state while farmers and landowners will remember him for his hands-on demonstration of terrace systems many of which were still working to control erosion when land improvement contractors appeared on the scene after World War II and began rebuilding them to fit new and larger field machines.

The next major impact occurred in the early and mid 1950s. After the subsurface drainage studies of Kidder and Lytle showed that it was not economical to subsurface drain the slowly permeable soils of the state, Ben Muirhead, in cooperation with local soil conservation districts, the U.S. Soil Conservation Service, and land leveling equipment manufacturers, developed and led surface drainage demonstrations. These demonstrations continued for a number of years in northeastern and southern Illinois and led to wide-scale adoption of
surface drainage. The demonstrations did for surface drainage what the terrace demonstrations did for erosion control. Today surface drainage is a common practice but it developed from an educational program led by the department.

The third major contribution took place in the 1950s also. This was the development of an irrigation guide and a drainage guide for system design in Illinois. These guides were extension initiatives that involved the expertise of research faculty from agricultural engineering, crops and soils, and specialists from the Soil Conservation Service and equipment manufacturers. The guides brought all of the pertinent information together into one source and led to common recommendations by all on what was needed in system design, a major consideration for farmers and landowners. Although Illinois was not the first state to release such documents, its guides, with major refinements on earlier ones, soon became the models for other states. These guides, in updated form, are still used today by the industries.

A pioneering step was taken by the department in the late 1940s when the decision was made to initiate rainfall–runoff studies on the Allerton Trust farms near Monticello. Watershed studies of that size in central Illinois had not been conducted prior to that time and the watersheds provided an opportunity that the department seized. In spite of all the challenges of managing data over a twenty-five year period, the data were useful to test many of the models developed in recent years.

A fifth major impact was the activities associated with the study of highway and agricultural drainage and engineering practices. These studies and the ensuing policy statement and highway manual opened a dialogue between highway authorities and the agricultural community that resulted in the development of cooperative relationships that enhanced the entire process of highway locations, design, and construction. In today’s language, it became a win-win approach with many winners.

A sixth impact is one that started in the 1970s and continues today—the application of new knowledge to improve the quality of water in rural areas and to improve the design of production systems that reduce sediment movement. The development of design criteria for vegetative filters was a major step forward. Then all of the field, laboratory, and modeling studies that provided data and insight into the erosion process made a significant contribution to knowledge that led to the revision of the Universal Soil Loss Equation. The revised equation will have a major effect on the design of future production systems. Finally,
the studies enhanced the scientific understanding of the nature of agricultural chemicals in surface waters.

One of the responsibilities of a Land-Grant university is to take education to the people so they get a direct return from the investment of their tax dollars. The knowledge generated by applying engineering to agriculture has been taken to the people by the extension staff and the teaching and research faculty and that knowledge has had a major impact on the development of agriculture in Illinois, the Midwest, and the nation.