History of Agricultural Engineering at Penn State 1892-1976

The Pennsylvania State University
College of Agriculture
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Introduction

Agricultural Engineering at Penn State had its origin in 1892 through the teaching of several courses — first, correspondence courses and then several courses for degree students in agriculture.

The first agricultural engineer was employed in 1913 to teach courses in the Department of Agronomy. This led to the Department of Farm Machinery in 1920 with responsibilities only for teaching agricultural students. In 1930 the Department of Agricultural Engineering was established and authorized to offer a program leading to the B.S. degree in the field. Research began in 1925 and has been a major function since then. Extension in Agricultural Engineering at Penn State originated in 1920.

Currently (June 1976), the department has a faculty of 26 engaged in teaching, research, and extension with a supporting staff of nine. The department has baccalaureate programs leading to the B.S., M.S., and Ph.D. degrees in Agricultural Engineering and the B.S. degree in Agricultural Mechanization. It also offers each year a number of service courses to hundreds of students in other majors. Since 1932 there have been 853 alumni.

In 1954 the department became an integral part of both the College of Agriculture and the College of Engineering, and since 1956 the Agricultural Engineering curriculum has been accredited by the Engineers' Council for Professional Development (ECPD), the national engineering accrediting agency.

At present the faculty members are engaged in 18 research projects, 15 of which are in cooperation with other departments. Extension programs are carried out by six full-time faculty. The department has its own well-equipped building consisting of about 60,000 square feet with additional outlying buildings on campus used for research. It has an annual budget in excess of a half million dollars to carry out the functions of teaching, research, and extension.

The purpose of this report is to show how Agricultural Engineering at Penn State evolved. Unfortunately, records covering the early stages of the program are quite limited. However, sources that provided information include: 1) the Penn State General Catalogs going back to the 1880s; 2) records of the Agricultural Experiment Station's research projects; 3) publications of faculty members; 4) file copies of reports and photographs; 5) minutes of the Board of Trustees meetings; 6) interviews with some of the people who had contacts with Penn State during the early 1920s and 1930s; and 7) recollections of present faculty members.

This provides a record of Agricultural Engineering at Penn State from its beginning to 1976. It is hoped that this record will be continued and brought up to date from time to time for future generations.

Contents

Significant Events in the History of Agricultural Engineering at Penn State

1892	First correspondence courses on Agricultural Engineering related subjects.
1904	Baccalaureate course, "Agricultural Engineering, Lectures" required of all students in the School of Agriculture.
July 1, 1913	R. U. Blasingame, first agricultural engineer, appointed as instructor in agronomy.
February 1, 1920	J. R. Haswell, first Extension agricultural engineer.
November 29, 1920	Board of Trustees approved the establishment of the Department of Farm Machinery with R. U. Blasingame as head.
1925	First research project in Agricultural Engineering — Proj. No. 705: "A Study of Power and Labor Factors Involved in Crop Production in Pennsylvania."
March 27, 1930	Curriculum in Agricultural Engineering approved. Name of the Department of Farm Machinery changed to the Department of Agricultural Engineering.
June 1932	First B.S. degrees awarded in Agricultural Engineering.
June 1933	First M.S. degree awarded in Agricultural Engineering.
November 14, 1940	Agricultural Engineering Building dedicated.
December 31, 1951	R. U. Blasingame retired as head of the Department of Agricultural Engineering. A. W. Clyde appointed as acting head.
August 1, 1954	F. W. Peikert became head of the Department of Agricultural Engineering.

September 28, 1954	Joint administration by the Colleges of Agriculture and of Engineering approved.
October 1956	Agricultural Engineering curriculum approved by the Engineers' Council for Professional Development (ECPD) for a five-year period.
October 1956	First students admitted to the Farm Equipment Service and Sales Program.
November 4, 1959	First Industrial and Professional Advisory Council (IPAC) meeting.
June 2, 1964	Agricultural Mechanization curriculum approved by the University Senate.
April 16, 1968	Ph.D. program in Agricultural Engineering approved.
April 1967	Construction began on the addition to the Agricultural Engineering Building.
September 27, 1969	Open House featuring the completion of the Agricultural Engineering Building.
August 31, 1975	F. W. Peikert retired as head of the Department of Agricultural Engineering. H. D. Bartlett appointed acting head.
January 12, 1976	Agricultural Engineering Extension Section integrated into the Department of Agricultural Engineering.
June 1, 1976	H. V. Walton became head of the Department of Agricultural Engineering.

The Formative Years
1892 to 1929

The first work at Penn State that might be considered in the agricultural engineering field dates back to 1892 through the introduction of several correspondence courses. In that year George C. Watson, professor of agriculture and superintendent of short courses, prepared a short course consisting of four lessons entitled "Tile Drainage (Farm Drainage)." This was number five in a series and with various revisions is still in use today.

In 1899 a correspondence course in heating and ventilating was prepared by L. E. Reber, professor of mechanics and mechanical engineering, for the School of Agriculture. Two years later (1901) Short Course Number 62 entitled "Farm Mowers" was prepared by W. W. Cooke and George C. Watson. There is no record of how long these two courses were in existence.

The term "Agricultural Engineering" first appeared in the 1904-05 Penn State General Catalog. At that time, all agriculture students took the same prescribed courses; there were no separate majors. Among the courses in the senior year for both first and second semester was listed "Agricultural Engineering, Lectures — 2 hours per week." There was no indication of who taught these courses. However, the catalog had the following statement as to the content:

> *"In the course of Agricultural Engineering, instruction is given in the various lines of engineering work that is usually performed on farms of the eastern states. This includes drainage, mechanics of machinery, building materials, the construction of substantial farm buildings, tools and implements, road-making, etc. The following brief description of instruction given in drainage may illustrate the methods adapted in this course:*
> *In drainage, instruction is given in theory and also in the various practical operations which may be presented to agriculturalists. Students are required to make surveys for both partial*

and complete tile drainage, and to determine the number, size, and cost of tile drains, the descent of drains, and to make a map of the same."

It is somewhat surprising that the term Agricultural Engineering appeared this early on campus, which was fully three years before the formation of the American Society of Agricultural Engineers (ASAE) in 1907.

The course "Agricultural Engineering, Lectures" was required in the four-year agricultural program through 1907. At that time the General Catalog also listed a two-year agricultural course with "Agricultural Engineering, Lectures," two hours practicum per week for the first semester of the second year and "Agricultural Engineering, Lectures," two lectures per week for the second semester."

The following year separate majors were set up in the School of Agriculture. The first two years of study were common and the last two years required specific courses for each curriculum. The course "Agricultural Engineering, Lectures" no longer appeared in the catalog. However, the following courses were shown for the Agronomy major:

Agro. 10 Rural Engineering, 3 credits, fall, senior year.

Agro. 11 Rural Engineering, 3 credits, spring, senior year.

These were the course descriptions:

Agro.10 Rural Engineering.

Barns and outbuildings, fences, gates, and bridges; farm surveying and layout are general subjects considered in this course. Recitation 2 hours, practicum 2 hours. 3 credits.

Agro. 11 Rural Engineering.

Farm machinery, drainage and irrigation, farm water supply and sanitation. Farm machinery covering first eight weeks of the semester is given in the School of Engineering. See Experimental Engineering 10. Recitation 2 hours, practicum 2 hours. 3 credits.

Experimental Engineering 10

Farm Machinery. This course consists of a laboratory and is designed to give the student experience in handling and testing machines discussed in the classroom. Taught as part of *Agro. 11 (Rural Engineering).* Practicum — 2 hours; second semester. Credits (See Agro. 11).

There was no indication in the catalog as to who taught these courses at the time. They remained as required courses for a number of years with some changes in title and description for both the baccalaureate and two-year students.

In 1911 *Agro. 11* was renamed Farm Machinery. Both *Agro. 10 and 11* were also required in the Agricultural Education curriculum as well as for Agronomy.

Agro. 11 underwent further title changes. In 1914 it became *Farm Motors and Machinery*. In the next year it appeared as: *Agro. 11 – Farm and Power Machinery and Exp. Eng. 9, Farm Motors*. 3 credits.

Descriptions of the above were as follows:

Agro. 11 Farm and Power Machinery.

A practical course covering the operation, use, and care of machines, gas engines, and farm tractors as applied to farm work. Practice with tillage, seeding, cultural, harvesting and threshing machinery and farm engines will be given. It will include practice in rope tying and splicing, belt lacing, and soldering. *(Exp. Eng. 9, Farm Motors,* ½ credit, is to be taken with this course.) Recitation — 1 hour; practicum — 4 hours; second semester. Credit — 2½.

Exp. Eng. 9 Farm Motors.

This course is especially arranged to meet the needs of students in agriculture and consists of the study of the construction, functions, methods of operation and repairing the various forms of oil, gas, and steam engines used in farming and dairying.
(*Agro. 11* — 2½ credits is to be taken with this course.) Lecture — 1 hour; practicum — 4 hours for three weeks. Second semester; Credit — ½.

Agro. 10 also was changed in 1915. It became Agro. 10, *Farm Buildings and Fences*. Its description was as follows:

Agro. 10 Farm Buildings and Fences.

A course covering the location, design and construction of various types of barns, silos, poultry houses, hog pens, storage houses, and other farm buildings; the construction of fences; and the study of farm sanitation. Recitation — 2 hours; practicum — 2 hours; first semester. Credit — 3.

For several years the two-year students took *Agro. 10 and 11* but in 1915 these were replaced with:

Agro. 210 Farm Buildings and Fences.

A study of barns, silos, poultry houses, hog pens, implement sheds, storage houses, and other farm buildings with regard to their arrangement, design, and construction. This will include some work on gates, lighting plans, drainage, water supply, and sewage disposal. Only moderate stress is laid on drafting and no previous training is required. Recitation — 2 hours; practicum — 2 hours. First semester; credit — 3.

Agro. 211 Farm and Power Machinery.

The object of this course is to teach the student the proper use of farm machinery, such as binders, mowers, plows, harrows, seeders, drills, etc. The application of power to farm machinery, including a study of gasoline and traction engines. (Exp. Eng. 9, Farm Motors, ½ credit, is to be taken with this course.) Recitation — 1 hour; practicum — 4 hours. Second semester; credit — 2½.

Two additional courses were set up which first appeared in the 1918-19 catalog. These were:

Agro. 22 Farm Sanitation

2 credits, which became an elective and

Agro. 25 Horticultural Machinery

3 credits, listed as an elective for horticultural students.

It is interesting to note that two courses were designated as *Agricultural Engineering* as early as 1904 and continued for three years before they were dropped. The name Agricultural Engineering did not appear in the catalog again until 1931-32.

Early Faculty

Agricultural Engineering at Penn State evolved out of Agronomy. This was a common pattern in various institutions throughout the country.

The first agricultural engineer on the Penn State faculty was R. U. Blasingame.* He came in 1913, with the title of instructor in agronomy, presumably to teach Agro. 10 and 11. He stayed until July 1, 1915, when he resigned to go to Alabama State College. Blasingame was replaced by R. A. Andree, also with the title of instructor in agronomy. His title was changed June 1, 1917, to assistant professor of agronomy but he resigned the following October. Blasingame returned to the Department of Agronomy October 20, 1917, but this time with the title of associate professor of farm machinery.

In September 1918 Fred W. Knipe, a graduate of the Department of Agronomy, who had taken work under Andree, was hired as an assistant to Blasingame. The following summer Knipe took a leave to study at Iowa State College for a year. From there he went to Connecticut State College as head of the agricultural engineering department instead of returning to Penn State.

The next appointment was George M. Foulkrod on July 1, 1919, with the title of instructor in farm machinery, also in the Department of Agronomy.

His title was changed to assistant professor of farm mechanics on July 1, 1922. He was at Penn State until June 30, 1931, when he resigned to go to New Hampshire.

Ralph U. Blasingame
First agricultural engineer at Penn State. Head, Department of Farm Machinery 1920-1930, and Department of Agricultural Engineering 1930-1951.

Appendix 1 lists all faculty members in Agricultural Engineering who have served Penn State from the beginning through June 30, 1976. Appendix 2 lists the technicians for the same period.

On February 1, 1920, John R. Haswell was appointed assistant professor of farm mechanics Extension, and he was on the Penn State Extension staff until his death on July 30, 1949. For a number of years he was the only Extension agricultural engineer on the faculty. His early activities dealt with land drainage, with primary emphasis on ditch blasting, soil conservation, and probably some on machinery. In June 1921 he published Extension Circular No. 89 entitled "*Septic Tanks for the Farm.*"

Since the teaching load was increasing along with some research activities during this period, E. G. Lantz was appointed instructor in farm machinery August 25, 1925, but he resigned July 13, 1927. On September 1, 1925, Helgi B. Josephson also came to Penn State as assistant professor of farm machinery. On July 1, 1930, he was granted a six month leave. He died while traveling in Germany.

Farm Machinery Department

A Department of Farm Machinery was approved by the Board of Trustees on November 29, 1920. This new department first appeared in the 1920-21 catalog and listed the faculty as Blasingame, head of the department, and Foulkrod, assistant professor of farm machinery. The courses with former Agronomy numbers were changed to the following along with changes in description:

FM 1 Farm Buildings.

The planning and location of the farmstead and various types of farm buildings and fences, including building materials and methods of constructing barns, silos, stables, and various other farm buildings; also equipment of farm buildings. Lecture — 2 hours; practicum — 2 hours. Credit — 3.

FM 2 Farm Engines.

The operation, use and care of farm tractors and farm engines, and farm tractor operation as applied to farm work; belt lacing and soldering. Lecture — 1 hour; practicum — 4 hours. Credit — 3.

FM 3 Farm Sanitation.

The farm water supply, disposal of wastes, heating, ventilation, and lighting of farm buildings. Prerequisite: FM 1 and FM 2. Lecture — 1 hour; practicum — 2 hours. Credit — 2.

FM 201 Farm Buildings.

Similar in content to FM 1 but adapted to the use of two-year students. Lecture — 2 hours; practicum — 2 hours. Credit — 3.

FM 202 Farm Engines.

Similar in content to FM 2 but adapted to the use of two-year students. Lecture — 1 hour; practicum — 4 hours. Credit — 3.

FM 1, 2, and 3 were required courses for Agronomy and Agricultural Education majors. *FM 201* and *202* were for the two-year students. In 1923 the following three courses were added:

FM 4 General Farm Equipment.

Outline of farm mechanics for agricultural education students. Brief study of gas engines, farm buildings, farm sanitation, land drainage, and farmstead equipment, with special reference to needs of the community and use of equipment found on Pennsylvania farms. Recitation — 2 hours; practicum — 2 hours. Credit — 3.

FM 5 Horticultural Machinery.

Land drainage, overhead irrigation systems, pumps, spray machinery, gas engines, including power cultivators, tractors, trucks, and lighting. Recitation — 2 hours; practicum — 2 hours. Credit — 3.

FM 6 Creamery Equipment.

Pipe fitting, soldering, belt lacing, concrete work, installation, care and operation of creamery machinery. Water supply and disposal of creamery waste. Recitation — 1 hour; practicum — 2 hours. Credit — 2.

In 1924 the Department of Agronomy made the FM courses electives rather than required and for several years Agricultural Education, which had formerly required *FM 1, 2,* and 3 was not listed in the catalog as a major. The two-year program required *FM 201* and *202* until 1926, when these courses were no longer part of the program.

The FM courses must have been popular electives since the above continued to be offered and the following two were added between 1926 and 1928:

FM 7 Land Improvements.
Land drainage, overhead irrigation systems, soil erosion, and land clearing. Recitation — 2 hours; practicum — 2 hours. 3 credits.

FM 8 Farm Shop Work.
The selection, care, and maintenance of hand tools and construction work as carried out on successful farms. Recitation — 1 hour; practicum — 3 hours. 3 credits.

While the Department of Farm Machinery was in existence the courses offered were all for students in other departments as there was no separate major in farm machinery.

Research

Apparently the earliest activities of Blasingame and other agricultural engineers were devoted entirely to teaching. However, after the Department of Farm Machinery was set up it became involved in research.

The first formal project on record is Number 705 entitled "A Study of the Power and Labor Factors Involved in Crop Production in Pennsylvania," which was initiated in 1925 and carried on by Blasingame and Josephson. This project was active for four years and in 1925 they received a Farmall tractor for this study. This was probably one of the earliest Farmalls in existence.

The next project was Number 727 entitled "Improvement of Dairy Buildings in Pennsylvania." This was drawn up in 1926 by E. G. Lantz and was apparently terminated the following year when he left Penn State.

Project Number 728 entitled "Development and Improvement of Labor Saving Machinery for Vegetable Gardening" was in cooperation with the Department of Horticulture and Blasingame was the agricultural engineer involved. This project was started in 1927 and continued for 10 years.

Other early projects initiated during 1928-29 involving the Department of Farm Machinery were:

Project 741 – "An Investigation of the Biology and Control of the European Corn Borer." Other departments involved in this project were Agronomy, Agricultural Economics, Zoology and Entomology.

Project 764 – "Electrical Refrigeration Requirements for Pennsylvania Dairy Farms" in cooperation with Bacteriology.

Project 765 – "A Study of Small, Portable, Electric Motor Requirements for Pennsylvania Agriculture."

Project 780 – "Study of Potato Production Applying only Mechanical Power."

Project 794 – "Artificial Curing of Hay and Other Forage Crops." This was in cooperation with the Departments of Agronomy and Dairy Husbandry and was active from 1929 to 1954. During that period 10 different agricultural engineering faculty members were involved. It is interesting to note the limited resources that were available at that time. The executive committee minutes of the Board of Trustees dated May 25, 1928, showed that the sum of $75 was approved for the Department of Farm Machinery for machinery and tools in connection with the corn borer investigation. At the same meeting, the board authorized the Department of Farm Machinery to purchase a Sprague dynamometer costing $700.

Beginning the Professional Program 1930 to 1953

The period encompassing the early 1930s was very significant in the development of Agricultural Engineering at Penn State. It was during this time that the department became known as Agricultural Engineering and the professional curriculum was set up. Also, very significantly, two men joined the faculty during this time who made a great impact on the research program: John E. Nicholas and Arthur W. Clyde.

As indicated earlier, a Department of Farm Machinery was organized in 1920. Departments of Agricultural Engineering were well established at other universities in the country by the 1920s. At Penn State the Board of Trustees voted on June 12, 1926, to set up a committee of five to study the recommendation of Dean Watts of the School of Agriculture relative to the development of a program of instruction and research in Agricultural Engineering. Following the report of this committee the Board of Trustees set up a curriculum in Agricultural Engineering and changed the name of the former Department of Farm Machinery to the Department of Agricultural Engineering on March 27, 1930.

The curriculum in Agricultural Engineering first appeared in the 1931-32 general catalog of the University and is shown below along with the description of the courses in Agricultural Engineering offered at that time.

In the fall of 1931 seven students were majoring in Agricultural Engineering — one senior, two juniors, one sophomore, and three freshmen.

J. G. Huda and J. H. Walker were the first two graduates in Agricultural Engineering in 1932. The following year two more graduated.

For the next four years there were four each year. The number gradually increased until there were 15 in 1942. During the World War II years the number dropped off to none in 1946. After the war the number increased again until it reached the peak during this period of 22 in 1951.

CURRICULUM IN AGRICULTURAL ENGINEERING*

PROFESSOR R. U. BLASINGAME, *Head*

Because of an insistent demand by students and by Pennsylvania agriculture, a four-year curriculum in Agricultural Engineering has been provided. The field embraces four major branches: (1) Power and Machinery—tractor, tillage equipment, harvesting machinery, and transportation, (2) Farm Structures—dwellings, animal shelters, storage of farm produce, housing machinery, utilities, water supply, sewage disposal, and ventilation, (3) Rural Electrification—distribution lines, motor applications, refrigeration, electrically operated processing equipment, and lighting, (4) Land Reclamation—drainage, irrigation, land clearing, and soil erosion.

The following curriculum prepares students only for the power and machinery phase of agricultural engineering. Agriculture in this country employs more power than all the industries combined, ranking second to transportation, and the total value of farm machinery runs into millions of dollars. With the advent of general-purpose tractors and rural electrification, engineering talent of the highest grade is required to design, sell, and distribute farm operating equipment. Students receive a combination of general, scientific, and professional training to fit them for positions as engineers, investigators, and managers of enterprises where the sciences of agriculture and engineering are applied to the use of power and machinery in agricultural pursuits. When the demand comes for training in the other lines of agricultural engineering, courses will be arranged.

A description of the studies named in these tables may be found by using the index at the back of the catalogue. Follow the abbreviations.

FRESHMAN YEAR

First Semester	*Credits*	*Second Semester*	*Credits*
Agr. 1, Survey of Agriculture	1	Chem. 4, Inorganic Chemistry	3
Agr. Eng. 4, General Farm Equipment	3	D. H. 1, Principles of Dairying	3
Bot. 27, Principles of Botany	3	Dr. 1, Mechanical Drawing	2
Chem. 3, Inorganic Chemistry	3	Engl. Comp. 5, Exposition	3
Engl. Comp. 1, Composition	3	Math. 7, Analytical Geometry	4
Hygiene 1	1	Sur. 44, Surveying	1
Math. 5, Trigonometry	4	Physical Education 2	1
Physical Education 1	1	R. O. T. C. 2	1
R. O. T. C. 1	1		
Fees, $15.50		*Fees, $15.00*	

SOPHOMORE YEAR

First Semester	*Credits*	*Second Semester*	*Credits*
Agr. Eng. 1, Farm Utilities and Structures	3	Agr. Eng. 2, Elementary Farm Power	3
Dr. 2, Descriptive Geometry	2	Engl. Comp. 16, Technical Writing	2
Hort. 2, Commercial Fruit Growing	3	Hist. 25, Contemporary History of the U. S.	3
Engl. Comp. 7, Argumentation	2	Math. 11, Integral Calculus	4
Math. 10, Differential Calculus	4	Phys. 261, Electricity and Magnetism	2
Phys. 211, Mechanics and Heat	2	Phys. 262, Electrical Measurements	2
Phys. 212, Physical Measurements	2	Physical Education 4	1
Physical Education 3	1	R. O. T. C. 4	1
R. O. T. C. 3	1		
Fees, $11.00		*Fees, $8.00*	

JUNIOR YEAR

First Semester	*Credits*	*Second Semester*	*Credits*
Agro. 6, Soils	4	Agr. Econ. 6, Farm Management	3
Agro. 28, Introductory Course in Farm Crops	3	Agr. Eng. 3, Field Machinery	3
Mchs. 1, Elementary Mechanics	4	Hyd. 1, Hydraulics	2
M. E. 101, Elements of Power Engineering	2	Hyd. 3, Hydraulic Laboratory	1
M. E. Des. 102, Kinematics of Machinery	2	Mchs. 2, Applied Mechanics	4
Met. 59, Metallurgy of Iron and Steel	2	M. E. 104, Thermodynamics	3
		Pol. Sci. 13, Political Parties	3
Fees, $7.50		*Fees, $4.00*	

*Taken from the 1931-1932 General Catalog.

SENIOR YEAR

First Semester	*Credits*	*Second Semester*	*Credits*
Agr. Eng. 7, Drainage and Irrigation	3	E. E. 9, Industrial Electrical Applications	2
Econ. 14, Principles of Economics	3	El. Lab. 9, Electrical Engineering Laboratory	2
E. E. 8, Dynamo Machinery	2	*Electives	6
El. Lab. 8, Electrical Engineering Laboratory	2		
Mchs. 3, Engineering Materials	1		
M. E. Des. 103, Machine Elements	4		
Electives	3		

Fees, $8.00

AGRICULTURAL ENGINEERING

AGR. ENG. 1. FARM UTILITIES AND STRUCTURES (3).—Survey of the fundamentals in the application of electricity to agriculture; water supply, sewage disposal; study of the materials of construction; layout of storage houses, and animal shelters. Recitation 2 hours, practicum 2 hours; 1st semester. For agricultural students. Fee, $2.00.

AGR. ENG. 2. ELEMENTARY FARM POWER (3).—Study of gasoline and kerosene internal combustion engines, especially the fundamentals in construction of principal parts of the engine and its auxiliaries; ignition, carburetion, lubrication; transmission of power; the selection, cost, capacity, operation, adaptability, care and repair of these engines, with special reference to two, three and four-row general-purpose tractors. Recitation 2 hours, practicum 2 hours; 2nd semester. For agricultural students. Fee, $2.00.

AGR. ENG. 3. FIELD MACHINERY (3).—Study of the adaptability, selection, capacity, cost, care and operation of field machinery employed for the economic production and harvest of farm crops; with special reference to the new lines of general-purpose tractor driven equipment. Recitation and lecture 2 hours; 2nd semester. For agricultural students. Fee, $2.00.

AGR. ENG. 4. GENERAL FARM EQUIPMENT (3).—Outline of farm mechanics. Brief study of farm power, farm structures, farm sanitation, land drainage, and farmstead equipment. For Freshman agricultural students. Recitation 2 hours, practicum 2 hours; 1st and 2nd semesters. Fee, $2.00.

AGR. ENG. 6. CREAMERY EQUIPMENT (2).—Sources of heat and power for creamery requirements. Installation, care and operation of motor driven creamery machinery. Water supply and waste disposal. For Dairy Manufacturing students. Recitation 1 hour, practicum 2 hours; 1st semester. Fee, $2.50.

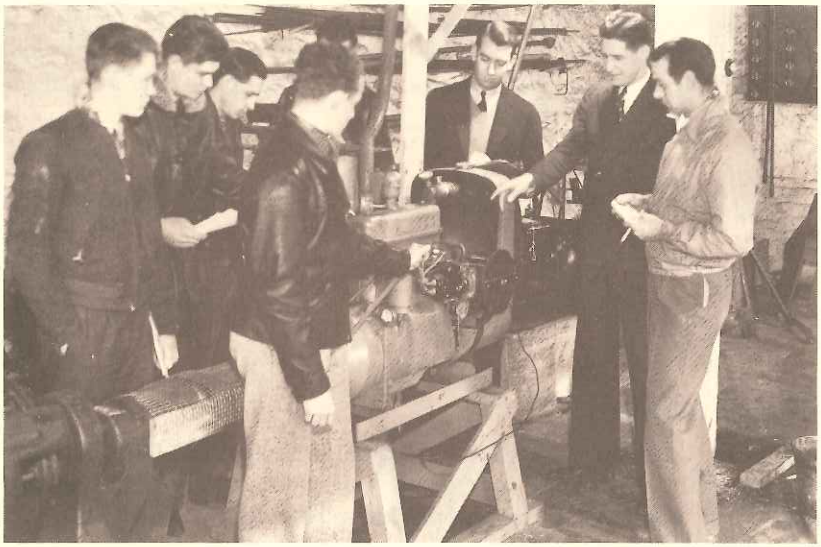
AGR. ENG. 7. LAND DRAINAGE AND IRRIGATION (3).—Design of open ditch and tile drainage systems; methods of land clearing, control of soil erosion and earth work; layout of water supply, sewage disposal, overhead irrigation systems. For Landscape Architecture students. Prerequisite: Sur. 16, 17, 57, Hwy. 7. Recitation and lecture 2 hours, practicum 2 hours; 2nd semester. Fee, $2.00.

AGR. ENG. 8. FARM SHOP WORK (3).—The selection, care, and maintenance of hand tools and construction work as carried out on successful farms. For Agricultural Education students. Recitation 1 hour, practicum 3 hours; 1st and 2nd semesters. Fee, $3.00.

AGR. ENG. 13. HOME GROUND IMPROVEMENT (3).—Layout of drainage and irrigation systems; land clearing; earthwork; mapping of areas to be improved; pumping and piping of water; disposal of waste; and equipment and materials for such work. Offered to Floriculture and Ornamental Horticulture students, alternate years, beginning 1931. Recitation 2 hours, practicum 2 hours; 2nd semester. **Fee, $2.50.**

The catalog description of Agricultural Engineering was changed from that shown above and then remained essentially the same until the early 1950s. It read as follows:

> *This curriculum trains those who intend to follow the new profession in which engineering is applied to agriculture. It gives thorough training in mathematics, physics, mechanics, and related subjects as well as the fundamentals of agriculture. This work is supplemented by applications of theory to instruction and problems in agricultural engineering under four branches: (1) power and machinery, (2) rural electrification, (3) land reclamation, and (4) farm structures.*
>
> *The curriculum prepares for the power and machinery and rural electrification phases of agricultural engineering. Students receive a combination of general, scientific, and professional training to fit them for positions as engineers, investigators, managers of enterprises where the extensive use of power and machinery is made, and for positions such as teaching, research, and Extension work in colleges.*



Ervin W. Schroeder (second from right) discussing the use of the dynamometer located in the basement of the horse barn which was the Department's power laboratory at the time.

The department also initiated a limited graduate program leading to the M.S. degree. The first person to receive this degree (1933) was D. C. Sprague, a member of the faculty. The next master's degree in Agricultural Engineering was not granted until 1940. This was to W. F. Ackerman, who was also on the faculty. During the 20-year period from 1933-1953 11 master's degrees were granted in Agricultural Engineering. Nine of these were to the younger faculty members who earned their degrees while on a full time assignment in the department.

The first graduate courses in Agricultural Engineering appeared in the 1940 General Catalog. These were:

Ag. Eng. 500	Advanced Electro-Agriculture (2-4 credits)
Ag. Eng. 501	Advanced Farm Machinery (2-4 credits)

The department offered various short courses and conferences during this period. The first one on record was a two-day rural electrification short course for electric power suppliers, equipment dealers, and manufacturers held during the 1946-47 academic year. The exact dates are not known. This short course was repeated each year until 1960 except from 1952 to 1954. The first year 44 people attended and the following year 76. From then on it varied from a low of 16 to a high of 62.

It is quite likely that individual faculty members in Agricultural Engineering also participated in short courses sponsored by other departments, but unfortunately such information is not available. In 1947 D. C. Sprague and A. S. Mowry prepared correspondence course Number 114 – *"Farm Refrigeration,"* which has been revised several times and is still in use.

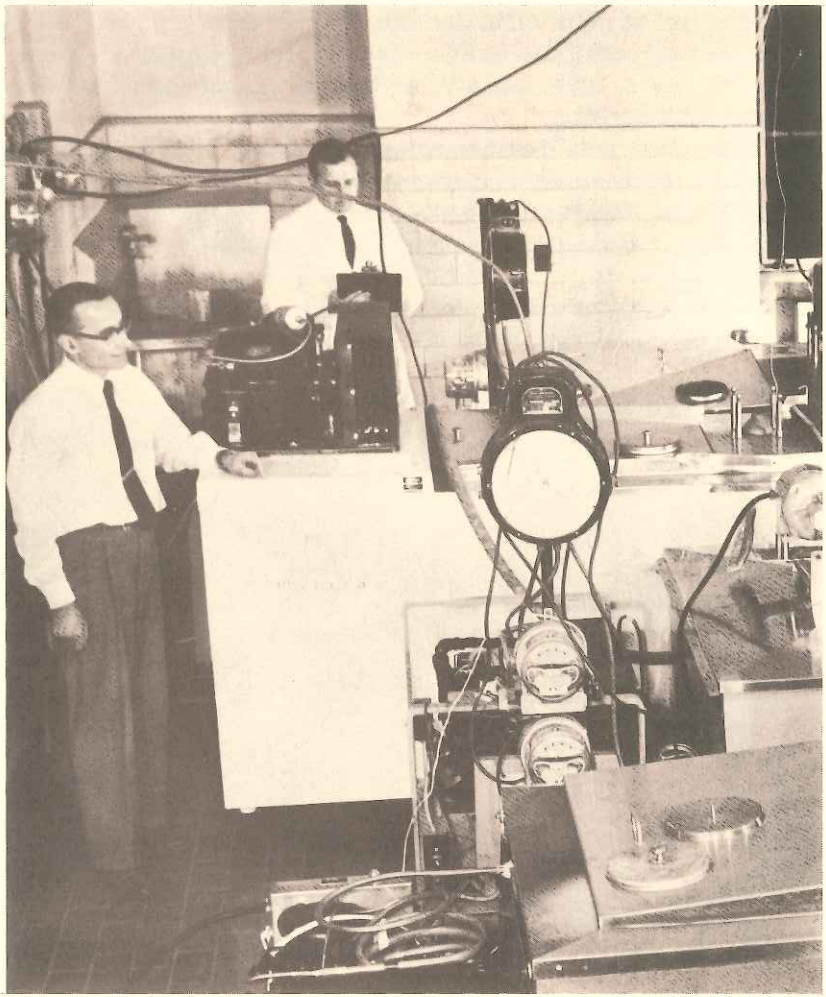
Personnel Changes

When the Department of Agricultural Engineering was first set up in March 1930, there were four faculty members: R. U. Blasingame as head, J. E. Nicholas, H. B. Josephson, and G. M. Foulkrod.

J. E. Nicholas was appointed associate professor July 1, 1929. He soon developed a very active program in research in the area then known as rural electrification. His first two projects, which were actually started by Blasingame a year before Nicholas arrived, were:

(1) "Electrical Refrigeration Requirements for Pennsylvania Dairy Farms" and (2) "A Study of Small, Portable Electric Motor Requirements for Pennsylvania Agriculture." Over the years he brought a great deal of recognition to the department through his work in research and many publications related to farm refrigeration and other aspects of the use of electricity in agriculture.

H. B. Josephson died in 1930 and G. M. Foulkrod resigned June 30, 1931. Following these vacancies three appointments were made. A. W. Clyde came as associate professor on July 1, 1931. D. C. Sprague and H. M. Stapleton were appointed instructors on September 1, 1931.



John E. Nicholas (left) conducting tests on bulk milk coolers.

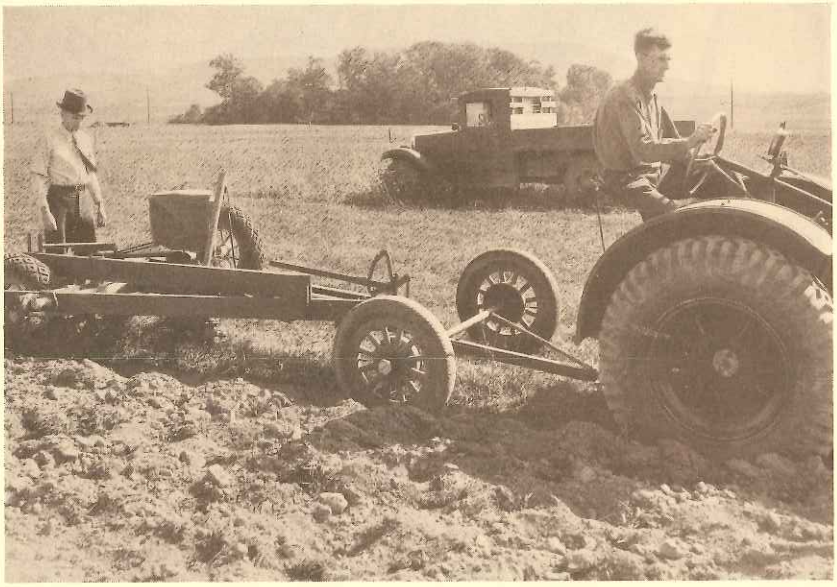
A. W. Clyde has been one of the outstanding faculty members in the department. His work on tillage forces and hitching is widely known. When he arrived in 1931, his first assignment was on hay drying. One of his dryers was a high temperature unit using fuel oil. He also tested a low temperature dryer owned by Mr. Fulmer of Narberth, Pennsylvania. Results of these studies were published in the Journal of ASAE. However, Clyde soon started research on tillage tools, which extended over a number of years, and resulted in numerous publications and papers at technical meetings. In 1935 he built the first tillage meter. This was rebuilt the following year and improved by adding force-recording apparatus and width control for tools having side forces. The work was reported in several issues of Agricultural Engineering and in Penn State Bulletin Number 465.

J. R. Haswell continued as the only agricultural engineer in Extension until July 1, 1937, when V. S. Peterson was added as assistant professor of Extension.

By 1940 six faculty members in the department were doing teaching and research and this number increased to 10 by 1953.

Two faculty members were in agricultural engineering Extension in 1940 and this number increased to four by 1953.

On December 31, 1951, R. U. Blasingame retired as head of the department and A. W. Clyde was appointed as acting head, a position that he held for the next 31 months.



Arthur W. Clyde conducting field tests on moldboard plow performance with his tillage meter. Technician Roy Johnson is driving the tractor.

Research Program

The research program during this period in the history of the department became well established. Publications were quite numerous, especially on the work done by Clyde and Nicholas. The department was involved in 24 different projects during this period. Some of these were started before 1930 and others extended beyond 1953. From the beginning, many of the projects were done in cooperation with other departments in agriculture. Some of the earlier projects ran for quite a number of years before they were terminated.

The principal areas of research and development during this time were:

1) Application of electric power on the farm.
2) Farm refrigeration.
3) Tillage tool design and performance.
4) Curing and storage of forage crops.
5) Applications of tractor power in agriculture.
6) Development of an automatic poultry feeder.
7) Equipment for poultry brooding, milk cooling, and egg cooling.

The complete list of research projects conducted by the department from its beginning until 1976 is shown in Appendix 8.

Facilities

When the Department of Agricultural Engineering was set up in 1930 the facilities were quite limited and scattered over several parts of the campus. The general office was in the Horticulture Building (now the Weaver Building). Nicholas and Clyde had offices in Patterson Building and Nicholas had his rural electrification laboratory in the basement of that building. The power and machinery laboratory was in the basement of a horse barn which stood on Shortlidge Road approximately on the site of the present Fenske Laboratory (Chemical Engineering Building). A shed adjacent to the barn also housed some machinery. The department had a shop in a small brick building, which was formerly a boiler house for Ag Hill and still stands behind Fenske Laboratory.

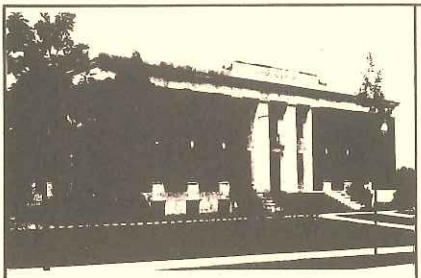
The construction of the original part of the present Agricultural Engineering Building consisting of 20,000 square feet was approved by the Board of Trustees on April 23, 1937. This building was dedicated on November 14, 1940. There is no information available on its cost. Fortunately, a copy of the dedication program was found in the files.

This building provided only limited laboratories, classrooms, and office space for the staff. There was no provision for expansion of staff or programs. However, the facilities in the new building were far better than the department had had up to that time. It was soon recognized that further space was required if the department program was to expand. Efforts to get additional space continued until 1969 when the present facilities were completed.

When the original building was first designed the plans included laboratories for both tractors and farm machinery. However, only the tractor wing was constructed. On January 26, 1944, Dean S. W. Fletcher of the School of Agriculture sent a memorandum to department heads requesting information on physical plant needs. The department requested a two story wing, 40 feet by 110 feet to be placed across the back of the existing tractor laboratory. This was never approved and the original building of 20,000 square feet was all the space the department had for a number of years.

Agricultural Engineering faculty and staff standing in front of the Agricultural Engineering Building under construction, 1938.

From left to right: Haswell, Ackerman, Hunter, Clyde, Schroeder, Nicholas, Peterson, Edwards, Blasingame, Johnson, Sprague, Droege.



Dedication Program

AGRICULTURAL ENGINEERING

Building

★

November 14, 1940
Room 103 • 1:00-2:00 p. m.

School of Agriculture
THE PENNSYLVANIA STATE COLLEGE
State College, Pennsylvania

Program

Room 103 **Ag. Eng. Bldg.** **1:00-2:00 p.m.**

★

Presiding

S. W. FLETCHER
Dean and Director, School of Agriculture

Farm Mechanization

J. W. COOPER
President, Pennsylvania Tractor and Implement Club
(10 min.)

Rural Electrification in Pennsylvania

W. H. WADE
Past President, Pennsylvania Electric Association
(20 min.)

College and Implement Industry Co-operation

GRANT WRIGHT
Publisher, "Eastern Dealer"
(20 min.)

Penn State A.S.A.E. Student Branch

A. S. MARBURGER, President
(5 min.)

Development of Agricultural Engineering at Penn State

R. U. BLASINGAME
Head of Department
(5 min.)

Facilities Provided by the Building

Tractor and Machinery Laboratory
Floor space—3000 sq. ft.

Power and Machinery Research Laboratory
Floor space—1100 sq. ft.

Rural Electrification Research Laboratories
Floor space—1200 sq. ft.

Vocational Agriculture Instruction Laboratories
Floor space—1900 sq. ft.

Classrooms: *1. Seating capacity 88*
2. Seating capacity 49
3. Seating capacity 48

Student locker and shower rooms
144 individual lockers

Two Agricultural Engineering Extension offices

Seven staff offices

Department of Agricultural Engineering

Teaching and Research Staff

R. U. BLASINGAME	*Head of Department*
A. W. CLYDE	*Professor*
J. E. NICHOLAS	*Professor*
D. C. SPRAGUE	*Assistant Professor*
E. W. SCHROEDER	*Instructor*
W. F. ACKERMAN	*Assistant*
MARIAN E. EDWARDS	*Secretary*

Agricultural Engineering Extension Staff

J. R. HASWELL	*Professor*
V. S. PETERSON	*Assistant Professor*

Technicians

R. P. HUNTER	R. B. JOHNSON
J. W. DROEGE	WILLIS WEAVER

Agricultural Engineering Building

Period of Expansion and Growth
1954 to 1976

The year 1954 was significant in the history of the department because in that year it became part of the College of Engineering as well as the College of Agriculture. Up to that time the department was administered by the College of Agriculture. It had developed a good program leading to the B.S. degree but was not accredited. It also had a good research program underway.

The agricultural engineering Extension activities were separate from the department, and joint administration did not affect this Extension group. Therefore, its activities will be covered under a separate section to follow.

F. W. Peikert became professor and head of the department August 1, 1954. The following goals were set up at that time:

1) Have the department jointly administered by the College of Agriculture and the College of Engineering;

2) Take steps to get the curriculum accredited by the Engineers' Council for Professional Development (ECPD);

3) Expand the department facilities;

4) Expand the graduate program to include granting the Ph.D. degree;

5) Increase the size of the staff to handle the anticipated added programs and activities.

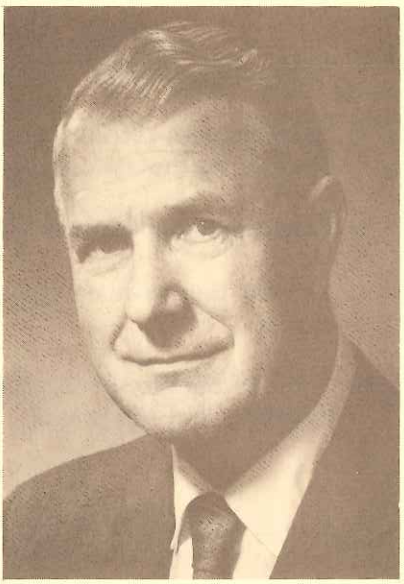
As things developed, the first two goals were accomplished rather quickly, but the others required a number of years to complete.

Joint Administration

Before the department could expect to have its curriculum accredited by ECPD, it was necessary to become part of the College of Engineering (known as the College of Engineering and Architecture at that time). The principle of joint administration was agreed upon by Dean L. E. Jackson of Agriculture and Dean E. A. Walker of Engineering as outlined by Peikert in his interview with the deans prior to accepting appointment as head of the department.

A Memorandum of Understanding as given in Appendix 3 was drawn up early in the fall of 1954 and signed by the two deans and by President Milton Eisenhower on September 28, 1954. From that time on the department was a full-fledged member of the College of Engineering as well as of the College of Agriculture.

As the document setting up joint administration was originally approved, degrees for Agricultural Engineering students were to be granted jointly by both colleges. Also, the Agricultural Engineering curriculum was to be listed in the general University catalog under both Colleges. Sometime later, one of the administrators in Old Main raised objections to these two procedures as being impractical. The objection to the latter was that it would add an extra page or two to the catalog, which was already too bulky. In a conference with the deans it was finally agreed that the degree would be granted by the College of Engineering. Only the description of the program in Agricultural Engineering, which consisted of two paragraphs, would appear in the



Frank W. Peikert, Head, Department of Agricultural Engineering 1954-1975.

catalog under Agriculture and a cross reference would be made to the complete curriculum listed under Engineering. All other conditions of the original Memorandum of Understanding remain unchanged to this day.

From here on, membership on the Engineering Student Council as well as on the Agriculture Student Council, of which they were already a part, was open to the Agricultural Engineering students. The Agricultural Engineering faculty members were also appointed to various committees in the Colllege of Engineering and some have held key positions on these committees over the years.

ECPD Accreditation

The College of Engineering was scheduled for an ECPD visitation in 1955 to reevaluate previously accredited programs and to evaluate any new programs that might be submitted for accreditation. This fit in well with the plans of the Department of Agricultural Engineering. Detailed material required by ECPD was prepared in the fall of 1954. The ECPD evaluation was made November 7 and 8, 1955, and in October 1956, the University was notified that the department had received accreditation for five years, the longest period allowable at that time before another evaluation would be required. The report was favorable from the standpoint of the curriculum and highly complimentary of the faculty's dedication to teaching, but pointed out that more space was needed, especially for laboratories. This latter statement was welcomed by the department as it supported the request for an addition to the building.

The next ECPD visitation was on May 1 and 2, 1962, and accreditation was extended for an additional five years. The following visitation on April 13 and 14, 1967, extended accreditation for six years, which had become the maximum period.

The reports at each of these accreditation reviews were most favorable in every respect, except for pointing out the need for more space.

The last time that the department was evaluated was April 8 to 10, 1973, and on September 25, 1973, notification came that accreditation had been extended for another six years, until 1979.

Agricultural Engineering Curriculum

The Agricultural Engineering curriculum developed between 1930 and 1953 was basically a sound engineering program, but in 1954 it was modified to meet ECPD requirements and to conform more closely to the basic courses required in the other engineering curricula.

According to the agreement covering joint administration, all new course offerings and curricula changes had to be approved by both Colleges. Requirements for the two Colleges as well as procedures for approval of changes in each were different. This originally created a problem for the department when a curriculum change was submitted. The department faculty decided that several additional courses were needed, bringing the total credits required to 148, which was in line with other engineering departments. In the College of Engineering, curricula changes came before the Executive Committee and the new program was approved.

The program then went to the College of Agriculture where changes in curricula were acted upon by a Course of Study Committee. For years, the College of Agriculture had an ironclad rule that each curriculum must have 140 credits — no more, no less. Consequently, this committee would not approve the 148-credit program, although the faculty believed the change was necessary to obtain the desired recognition as an engineering curriculum. This appeared to be a real dilemma for the department and was an indication of the problems that could arise from joint administration. After several lengthy sessions with data and arguments furnished by the department, the Course of Study Committee finally abandoned its 140-credit rule and approved the 148-credit Agricultural Engineering curriculum.

Other problems came up from time to time, mainly because of different policies and procedures of the two Colleges, but these have always been resolved. In retrospect, the department has gained a great deal by being a full member of both Colleges.

When the University changed from the semester to the term system in 1961, it was again necessary to review the curriculum in detail and make necessary changes to conform to the new system. At that time it also became advantageous to change the numbering of the courses and to realign them in a way that might not have been as readily approved at other times.

During the next 15 years the curriculum was reviewed every few years. Some new courses were added, including:

Ag. Eng. 403. Physical Properties of Agricultural Materials.

Ag. Eng. 408.	Instrumentation for Agricultural Production and Processing.
Ag. Eng. 409.	Agricultural Systems Engineering.
Cmp. Sc. 201.	Computer Programming for Engineers.

In the early 1970s there was quite a trend to reduce the total number of credits in all curricula, and as a result some courses were dropped. Also, the students were given somewhat more choice in selecting specific courses within certain categories, to allow those with specific career goals an opportunity to select courses to meet those goals.

The objectives which have guided the Agricultural Engineering curriculum over the years and are still in effect today are:

1) To equip the student with knowledge of the basic sciences underlying engineering and agriculture;

2) To teach the student to apply the fundamentals of engineering to agricultural problems;

3) To provide guidance and encourage personal development, good work habits, integrity, and willingness to accept responsibility and become a leader in his profession;

4) To provide the student with a sound base for beginning a professional career or for admission to Graduate School.

Up to June 1976, 437 students have received B.S. degrees in Agricultural Engineering. The names of all students who have received B.S., M.S., and Ph.D. degrees in Agricultural Engineering are listed in Appendix 4.

For years, advising students has been considered an important function within the department. At one time or another most of the faculty members have been involved. Since 1962 the Penn State University Engineering Association has given an annual award for outstanding service as a faculty adviser to a faculty member in the College of Engineering. H. D. Bartlett was the 1966 recipient of the award.

Farm Equipment Service and Sales Program

The two-year Farm Equipment Service and Sales program was established in the department in the fall of 1956, with an entering class of 18 students. A whole new series of courses was designated as the 700 series (later to become the 900 series) to serve this group. This program set the pattern for three additional Winter Course Programs in the College of Agriculture.

The program came about as a result of a committee appointed by the dean of the College of Agriculture in the fall of 1954 to consider what should be done about the two-year curriculum in General Agriculture which was very popular at one time but in recent years had declined greatly in enrollment. After much consideration without coming to an agreement, F. W. Peikert, one of the committee members, proposed that an entirely different program be designed to prepare people for the farm equipment industry, especially at the dealer level. The committee approved the idea and worked out the details of this new program. From the start the eight-week courses were designed to meet the specific needs of the students, instead of using the four-year courses. An important requirement of the program was six months of on-the-job experience. The program as approved consisted of four eight-week terms with six months' placement training with farm equipment dealerships between the second and third terms. The first term started in October and finished in December; the second term started in January and ended in March. The on-the-job training period from March to the following October coincided with the busiest time for farm equipment dealers. Students then returned to campus for their third and fourth terms, from October to the following March. At the completion of the program each student was granted an appropriate certificate.

The proposed program was brought to the attention of the Pennsylvania Farm Equipment Dealers' Association (later known as the Pennsylvania Retail Farm and Industrial Equipment Association) early in 1955. The association directors were very much interested in obtaining better trained people for their dealerships and wanted the program to start in the fall of 1955. Because the University's biennial budget had not been approved by the legislature, the program was not started until the fall of 1956.

R. O. Martin was brought into the department in 1956 to serve as coordinator of the program. He got it off to a good start but resigned in April 1957. He was succeeded by M. D. Shaw who held this position until March 1967, when he went on an assignment to India. O. A. Kimmel then took over as coordinator and directed the program until it was terminated in 1976.

Eighteen students were enrolled the first year. For a period of years it was intended to limit the incoming class to 24, the most desireable class size for a laboratory, and most courses included considerable laboratory work. However, in 1965 two sections were formed and 35 students were admitted. Farm Equipment Service and Sales enrollment stayed high for the next four years. From then on it decreased, and in February 1975, the College of Agriculture decided to drop the program; no new students were admitted after that time. Those who were already enrolled completed their work in March 1976.

Over the years a total of 480 students entered the program and 296 graduated with certificates (Appendix 5 lists the names of the graduates.) Although the program was designed primarily to prepare students for work in farm equipment dealerships, about 10 percent came to prepare themselves for a career in farming, thinking that this was the best program on campus for their needs.

Among the graduates many now either own a dealership, some in partnership with their fathers, or have a key position in an organization such as service or sales manager. Others have gone from dealerships to work for farm machinery manufacturers in field test or as company territory representatives.

During most of the years that the program was in existence, the Pennsylvania Retail Farm and Industrial Equipment Association provided an annual scholarship to an entering student which paid his tuition for the first two terms. To compete for the scholarship the student had to be sponsored by a dealer, give a talk at the regional dealers' meeting, and take a competitive examination given by the department. The one with the highest combined score was awarded the scholarship each year.

Agricultural Mechanization

In the early 1960s the department faculty decided a program in Agricultural Mechanization was needed. At that time the University was reluctant to approve any new programs, especially one in which the enrollment might be quite limited in the beginning. Therefore, the department set up a program in 1960 under the established curriculum in General Agriculture. After some students completed this

program, application was made in 1963 for a separate major in Agricultural Mechanization in the College of Agriculture. Since the anticipated number of students was still quite limited, the program could be approved only if it required no new courses, and the curriculum had to be designed using existing courses. This was not the ideal situation but it was acceptable.

From the beginning, the courses selected emphasized three areas: 1) the application of engineering principles as covered by existing courses in Agricultural Engineering; 2) through courses in the College of Business Administration; and 3) courses in agriculture. The program allowed considerable flexibility in the selection of specific courses in the latter two categories, which was worked out by the student and his adviser.

In 1974 two courses were approved specifically for these students: *Ag. Eng. 424 — Farm Machinery Management* — 3 credits and *Ag. Eng. 490 — Agricultural Mechanization Seminar* — 1 credit. For several years before this time the seminar was included under *Ag. Eng. 400*.

In recent years the number of Agricultural Mechanization majors ranged between 30 and 40, and up to 1976 there have been 86 graduates. (The names of these are in Appendix 6.) Some of the positions held include: 1) service representatives for farm equipment manufacturers; 2) field testing; and 3) employment with agricultural cooperatives. Some have gone into farming.

From the beginning, D.C. Beppler has served as coordinator for this program. Agricultural Mechanization is entirely under the jurisdiction of the College of Agriculture, which grants the degrees.

Graduate Program

One of the goals during this period was to strengthen and expand the graduate program, starting with the existing master's degree. The first step was to obtain funds for research assistantships. These came mainly through outside research grants. By 1957 there were 12 graduate students in the department working toward their M.S. degrees.

In addition to the special problem courses, which had been in existence for some time, several formal Agricultural Engineering courses were added, including *Ag. Eng. 503 — Physical Properties of Plant and Animal Products* — 3 credits (added in 1965), and *Ag. Eng. 505 — Experimental and Applied Instrumentation* — 4 credits (added

in 1967). Every student was required to write a thesis. Much emphasis was placed on the quality of the thesis, which was to become the basis for presenting a paper at a technical meeting and/or a publication. Over the years the graduate students have given a number of papers at professional meetings.

By 1964 the department was ready to offer the Ph.D. program. However, it was again a period when the University had an austerity program and new programs were not being implemented. As a start, the department of Agricultural Engineering entered into an agreement with the Department of Engineering Mechanics for a joint program. The Agricultural Engineering student would register officially in the Department of Engineering Mechanics, but his assistantship support, his research project, and his major professor were in the Department of Agricultural Engineering. His committee consisted of members from both departments. James R. Hammerle was the first student to receive his Ph.D. degree under this arrangement in 1968. He was followed by C. T. Morrow who obtained his Ph.D. degree in 1969.

The Department of Agricultural Engineering presented a formal request to the Graduate School for offering the Ph.D. degree on February 27, 1967, and it was approved by the University on April 16, 1968. By the spring of 1969 there were five Ph.D. candidates in the department.

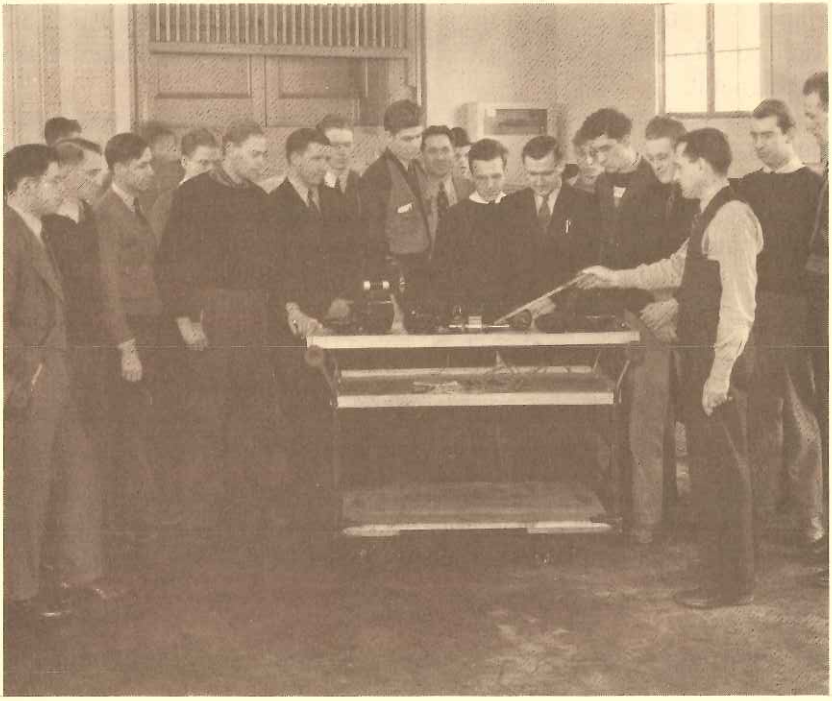
In recent years the number of graduate students in the department has ranged from 10 to 20. Peak enrollment was reached in 1972 with 29 students, 15 for the M.S. and 14 for Ph.D. degree. Up to May 1976, 126 master's degrees in Agricultural Engineering and 16 Ph.D. degrees have been granted. (The names are given in Appendix 4.)

Short Courses and Conferences

Rural Electrification Short Courses sponsored by the department were held almost annually for many years. Since 1955 the department has also sponsored other short courses and conferences as shown below:

Title	*Dates*	*Attendance*
Poultry Housing and Equipment Conference (Co-sponsored with the Department of Poultry Husbandry)	Jan. 4-5, 1955	200

Title	*Dates*	*Attendance*
Rural Electrification Short Course	Jan. 24-28, 1955	70
Irrigation Conference	Feb. 23-24, 1955	75
Audio-Visual Aids Conference	Aug. 31-Sept. 1, 1955	30
Rural Electrification Short Course	Jan. 23-27, 1956	50
Rural Electrification Short Course	Jan. 21-23, 1957	90
Poultry Housing and Equipment Conference (Co-sponsored with the Department of Poultry Husbandry	Feb. 26-27, 1957	250



David C. Sprague (third from right) discusses the construction of electric motors during a Rural Electrification Short Course.

Title	Dates	Attendance
Irrigation Conference	Mar. 28-29, 1957	65
Rural Electrification Short Course	Jan. 22-24, 1958	50
Rural Electrification Short Course	Jan. 22-23, 1959	40
Rural Electrification Short Course	Jan. 21-22, 1960	50
Farm Equipment Conference	Jan. 30-31, 1961	130
Farm Equipment and Farm Electric Conference	Jan. 24-26, 1962	75
Farm Equipment Conference	Feb. 21-22, 1963	100
Irrigation Conference	Apr. 4-5, 1967	75
Short Course in Physical Characteristics and Mechanical Properties of Agricultural Products	July 13-18, 1969	30
Workshop on Physical Properties of Agricultural Materials	July 9-11, 1973	30
Design Applications of Mechanical Properties of Solid Food Materials	Aug. 7-8, 1975	25

Industrial and Professional Advisory Council

Shortly after M. A. Williamson became dean of the College of Engineering in 1956 he proposed setting up an advisory council for the College with members representing each department as a division. The stated purposes of the Industrial and Professional Advisory Council (usually referred to as IPAC) were:

1) To advise the department heads and the dean on any particular problems which are presented by them.
2) To provide advice on what is necessary to keep the College's educational and research programs attuned to the needs of industry and the professions.

3) To examine the operations of the College and the University and to assist in bringing about a better understanding of the mission of the University as it relates to industrial and professional practices.
4) To suggest methods by which the needs of the College can be met.
5) To point out problems the department may have overlooked and to help in solving them.

Each department was asked to suggest representatives, who were formally invited by the dean. The first meeting of IPAC was held on the campus on November 4, 1959. The original members of the Agricultural Engineering Division were:

R. S. Reaves	A. S. Marburger
C. M. Hench	J. R. McGraw
H. A. Wright	G. C. Connor
P. K. Girton	R. E. Hartford

In early years IPAC met as a group with the dean once a year and this was followed by a division meeting in the department. Division members were on campus two days for the annual meetings and for several years held an additional one-day meeting at another time of year. Major attention during the first years was given to the expansion of the department's facilities. IPAC can be given a good deal of credit in making the necessary contacts and showing the need for more building space, which helped to obtain state appropriations for building planning money and construction. Other items frequently considered by the division were:

1) How to make the programs in Agricultural Engineering better known to students;
2) Placement of graduates;
3) Curriculum evaluation in terms of industry's needs;
4) Research — current and future directions.

The IPAC members always meet with the students during their time on campus. In recent years they have met annually on campus for about one and one-half days; during the first evening they meet with the ASAE Student Branch and the Ag. Mech. Club. Members also schedule at least an hour's session with the deans of the Colleges of Agriculture and Engineering.

Members of IPAC are apponted by the dean of engineering for a three-year period, with possible re-appointment to a second term. Over the years a number of members have served two full terms.

Looking back over the years, the members have certainly fulfilled their mission and have been of great help to the department. (Appendix 7 lists all former and current IPAC members.)

Overseas Participation

The department first became involved in foreign development in the fall of 1966 when F. W. Peikert was asked to go to India with R. B. Dickerson, associate dean of agriculture, as a two-man team. They evaluated Penn State's participation in agricultural development programs in the states of Gujarat and Maharashtra, where requests for such assistance had come through the United States Agency for International Development (USAID). The team recommended that Penn State participate in the agricultural development program in Maharashtra, and a four-member team was sent over in 1967. M. D. Shaw was assigned as chief of party and also to work on machinery development. He served in this capacity until August 1971 when he returned to the department. W. L. Kjelgaard also went to India on the agricultural development project to advise on seed drying and handling, from August to November 1968, and January to April 1970.

A university development program was also approved for Maharashtra and the Mahatma Phule Agricultural University was established in which Agricultural Engineering was organized as one of its five colleges. For three-month periods in 1969 and again in 1971, F. W. Peikert went to India as an agricultural engineering consultant to set up the curriculum for the College of Agricultural Engineering and to plan the required facilities, including buildings and equipment.

The department became involved in a second foreign program in the Bahamas. Through USAID, a five-year livestock research and development project was set up on Andros Island. From its beginning in 1973 until February 1975, F. W. Peikert served as senior agricultural engineering adviser. After that W. R. DeTar became involved in this project. The early stages of this assignment required frequent trips to the project site, as well as many coordinating meetings on campus with other specialists. This project also provided for an agricultural engineer to be in residence on the island; Gary W. Allshouse served in this capacity from July to November 1973, followed by William J. Elliot from March 1974 to September 1975, and D. W. Johnson, beginning January 11, 1976.

Research

In recent years, the research activities in the department have used from 50 to 60 percent of the department's resources of manpower and funds. No attempt will be made to cover the details of the broad range of research past and present. The general scope of each project is covered in the annual reports submitted to the Agricultural Experiment Station. Also, many of the details of the department's research program are covered in the annual reports of the department on file since the middle 1950s. The department's Self-Evaluation Report of March 15, 1963, also discusses in considerable detail the research in progress at that time. (A listing of all previous and current research projects is given in Appendix 8.)

It should be noted, however, that the emphasis in research has shifted considerably from the earlier period. The trend in recent years has been toward more basic research. However, the department continues to be involved in considerable developmental research for which there appears to be a particular demand. In recent years, new projects are usually written for a period of three to four years and then are either revised or terminated. In earlier years, some projects continued virtually unchanged for many years.

The research work and projects during the late 1960s and early 1970s may be classified as the application of engineering principles to the following:

1) Energy in agriculture.
2) Physical properties of plant and animal materials.
3) Waste as an agricultural resource.
4) Utilization of land resources.
5) Mechanization of fruit and horticultural field crop production.
6) Plant production in a planned environment.
7) Forage production, preservation, and utilization.

The research area that has probably brought the department the greatest recognition in recent years has been the work on physical properties of agricultural products, which was started by N. N. Mohsenin in 1960 when the regional research project NE-44, "Principles of Mechanical Harvesting of Fruits and Vegetables" was initiated. This project, plus the Penn State work on NE-13 related to mechanization of forage and silage handling, have been the major contributions on the subject of physical properties research over the years. Since 1960, NE-44 has been revised several times, with the latest revision approved for the period July 1, 1974 to June 30, 1979. Although this project dealt with principles of mechanical harvesting of fruits and vegetables, the Penn State contribution has been largely in the area of physical properties of fruits and vegetables as related to harvesting, handling, and quality evaluation. Additional support was

granted by the National Science Foundation (NSF) in September 1964 for research on mechanical and rheological properties of selected plant and animal material. The project continues to receive NSF support. The work at Penn State has gained national and international recognition . Mohsenin's book,"Physical Properties of Plant and Animal Materials," published by Gordon and Breach Science Publishers in 1970, is being used in undergraduate and graduate courses at a rather large number of land grant universities.

In addition to pioneering the research on physical properties of agricultural materials, the department was responsible for developing one of the most comprehensive and usable computerized information storage and retrieval systems on this subject. By 1975 the system contained about 5,000 references.

Some of the machines and methods that have been developed and patented in recent years include:

1) Material handling device — mechanical egg packer, U.S. patent No. 3238694 by H. D. Bartlett.
2) Machine for digging balled trees and ornamental plants, U.S. patent No. 3736882 by K. Q. Stephenson.
3) Transplanter-mulcher machine, U.S. patents No. 3460493 and No. 3139847 by K. Q. Stephenson.
4) Mushroom harvester, U.S. patent No. 3635005 by S. P. E. Persson.
5) Method and apparatus for adiabatic expansion of liquid and anhydrous ammonia, U.S. patent No. 3978681 by W. L. Kjelgaard and P. M. Anderson.

Other mechanical equipment developed by the department include:

1) Mushroom spawn mixing machine.
2) Tomato harvester.
3) Over-the-tree apple harvester.
4) Orchard bin carrier.
5) Environmental controls for greenhouses.
6) Automatic controls for mushroom houses.
7) Dairy cattle feeder.
8) Methane gas production unit using farm waste.
9) Soil sterilization equipment.
10) Shoot positioning equipment for Geneva double curtain grape vines.

The names of faculty members responsible for these developments can be found in the listing of the specific research projects under which the work was done.

As an indication of the productivity of the research work in the department, from 1960 to 1976 there were 98 M.S. theses written by

graduate students working on the various projects. Faculty members had numerous publications in technical journals and other types of publications covering various phases of their research work. A total of 371 publications was produced from 1960 to 1975.

Expanded Facilities

Enlargement of the Agricultural Engineering Building as it is today was a 14-year project extending from about 1954 to 1968.

In the fall of 1954 President Milton Eisenhower outlined a long-range building plan for Penn State, but nothing was included for Agricultural Engineering. The department first had to get on the University's list for future building construction, next get planning money authorized, and finally get the necessary appropriation for construction.

It would have been desirable to plan for an entirely new building for Agricultural Engineering. Then, when completed, the original building of 20,000 square feet could be turned over to some other department. However, it appeared that the best way to obtain additional space was to request the enlargement and renovation of the existing building, which was done.

Building plans were developed in the department for a major addition during the fall of 1954 and spring of 1955. At that time the area north of the building was an open field, and the addition was planned in that direction. These plans were submitted to the dean of agriculture in August 1955. The dean did not forward these to the University's office of Physical Plant Planning and Development until June 1956. Even though the department was under joint administration, the administration of the College of Agriculture continued to consider the building as part of its own facilities.

Some time during 1956 the University began construction of the dormitories in the open space north of the Agricultural Engineering Building, blocking any future northward expansion of the building. The department again revised its plans to expand west and south of the existing building.

During the next several years the addition to the Agricultural Engineering Building was placed on the University's list of future construction. More detailed architectural plans were worked up by the University and these were submitted to the General State Authority

on November 30, 1962, with a request for planning money to be included in the 1963-65 biennial budget. The planning money was primarily to employ an outside architectural firm. The University estimated the cost of the project to be $856,000 to cover construction costs, architectural fees, and an allotment of $72,534 for equipment. The planning money was authorized in 1964. A Philadelphia architectural firm was appointed. H. D. Bartlett was the department's representative designated to work with the architects. The first meeting was held on May 6, 1964, to develop detailed requirements for the proposed construction. Final plans were approved by the Board of Trustees on December 4, 1964.

The next step was to get the appropriation from the state during the coming biennium to cover the construction cost and put the project out for bid. Construction began in April 1967, and the estimated completion date was October 1968. Actually, completion was ahead of schedule and the bid for the job was somewhat below estimate, quite unusual compared to other University construction during that period.

By March 1968 most of the construction was completed and the upper floor was released for occupancy by the department on April 5, 1968. The ground floor, which included most of the laboratories, was occupied in June 1968.

There was no formal dedication of the completed building, but an official Open House was held on September 27, 1969. This culminated the program begun in the fall,1954 to obtain adequate building space for the Department of Agricultural Engineering.

Since it was recognized that the ultimate goal of the building as it is today would not be reached for some time, the department took steps to acquire additional space wherever possible. When the new dairy barns were built on the outer campus in the early 1950s the old dairy barn across the street from the Agricultural Engineering Building stood vacant for some time. In 1955 the department of Agricultural Engineering acquired the haymow area of that barn. At first, this was used for storage. However, in 1958 a small room, 12 by 13 feet, was partitioned off and served as a temporary laboratory for some soil and water studies. In 1960, a second area 13 by 20 feet was partitioned off and served as a laboratory for work in physical properties for several years. Since the only heat available during the winter was from some space heaters, which were actually illegal to use, these laboratory facilities were far from desirable. The balance of the mow area was used for storage until a fire destroyed part of the barn in 1967, and it was finally torn down in 1968 to make way for the present Agricultural Administration Building.

In 1958 the department took the opportunity to obtain additional

space by adding a 44 by 80 feet one-story addition to the laboratory wing of the original Agricultural Engineering Building. This was financed by department funds over a three-year period. The first year the walls and roof were constructed. In the next fiscal year, the heat, water, and lights were put in, which made the area useable for a machinery laboratory. The dirt floor was paved the following year. This room was incorporated into the plans for the final building expansion and now serves primarily as a research laboratory for larger equipment.

Additional working space was gained by modifying parts of the original building between 1957 and 1958:

Room 3, consisting of 528 square feet, was originally a locker room. The metal lockers were on raised concrete bases. The lockers were taken out along with the concrete bases and the area became an office for graduate students.

An additional 488 square feet was added to the shop for teaching farm mechanics in the basement by taking out a wall between the shop and a hallway and making the hallway area part of the shop.

Room 105, which originally was a classroom with fixed seats, was converted into an electrical laboratory. There was a much greater need for laboratories than classrooms, as lecture classes could be held in other buildings, if necessary.

Room 204, which had also been a classroom with fixed seats, was partitioned and made into the general office and the adjoining department head's office. The original general office in Room 201 contained only 170 square feet of floor space and was far too small for this purpose. The room has since become one of the faculty offices.

In 1963, an additional 400 square feet of work space was acquired by constructing a balcony over part of Room 103, the power and machinery laboratory, and making it accessible from Room 105.

During the early 1960s, a rheology laboratory was set up in Room 6, which had formerly been a pump laboratory. As precision instruments were acquired for the rheology laboratory, it became necessary to have closer control of the room temperature. At that time the University had a strict policy against air conditioners except for very special purposes. Approval was obtained to install air conditioning in this room because of the precision required by some of the instruments. On the same basis, air conditioning was also approved for Room 242, which was used as an agricultural products laboratory. That was the extent of air conditioning in the building up to this writing.

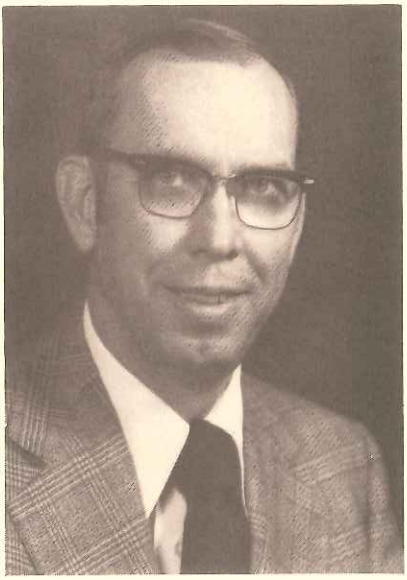
The lighting that was installed in the original building was quite inadequate by today's standards. It consisted of incandescent fixtures that provided a rather low light intensity. This situation was re-

medied during 1967-68 when fluorescent lighting was installed.

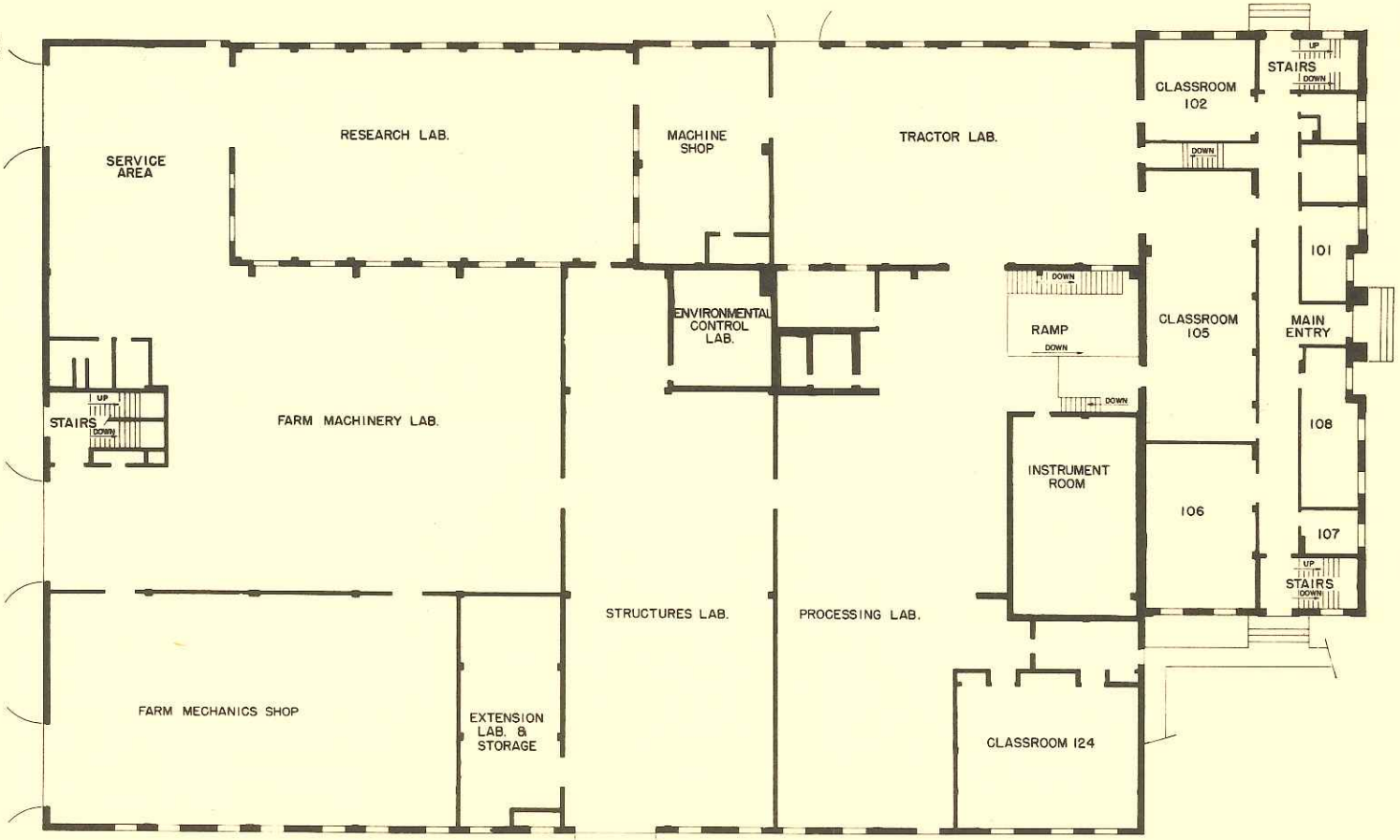
During the latter part of the 1950s the department did considerable research on various phases of hay drying. In this connection a 24 by 60 feet shed was built west of the Dairy Center for research on wagon drying of hay. In 1964 this building was moved to make space for the new maintenance building of the University. This hay drying shed was lost by fire during the summer of 1965 while being used by the Farms Department.

Since the research on hay drying had been completed, the replacement was a building 44 by 66 feet adjacent to the Farm Center. It was used to test the application methods and properties of certain insulating materials. After those tests were completed, the building served primarily for storage.

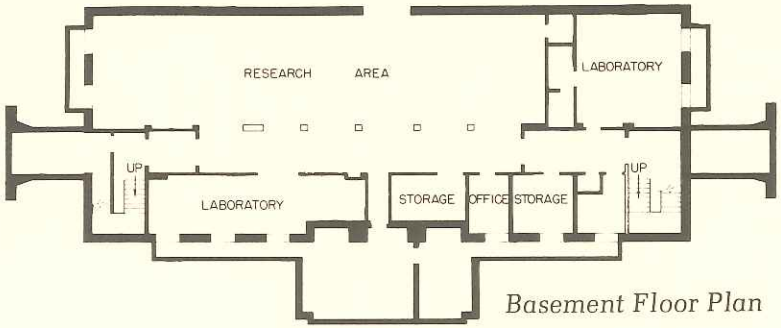
The department has two other small outlying buildings near the Farm Center. One is a Quonset 16,which was acquired in 1951 for some corn drying studies, and the other is a Butler Building, which has been used for a number of different research projects since its construction in 1950.



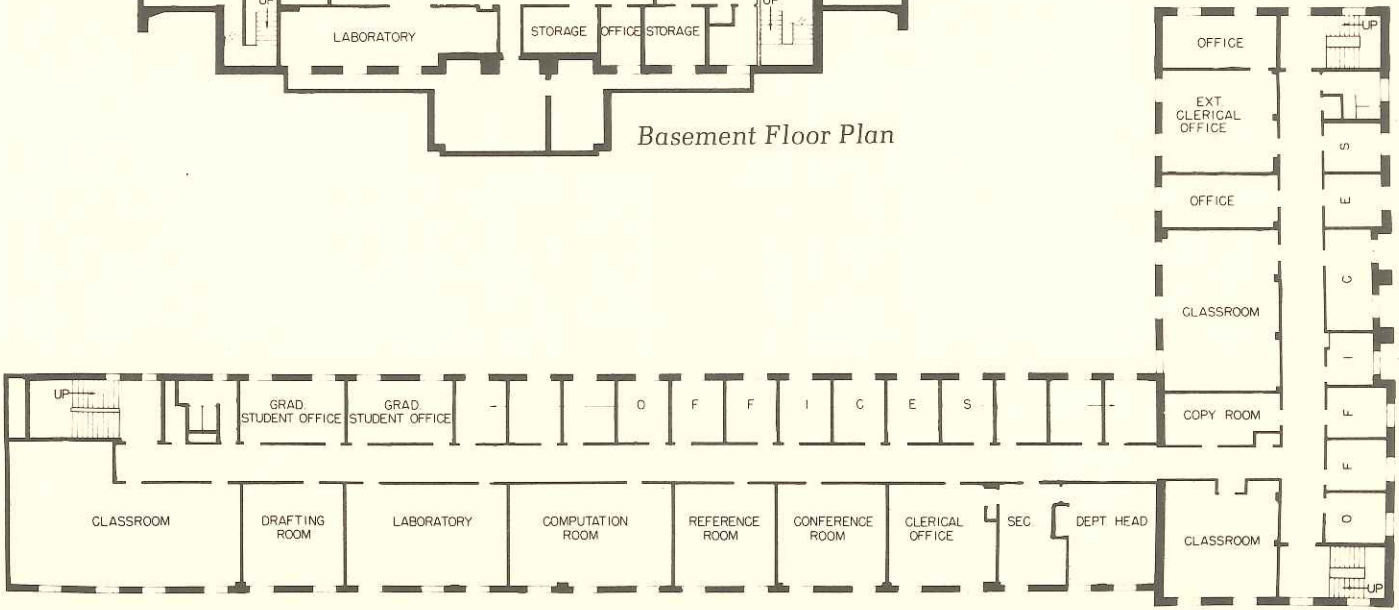
Harold V. Walton, Head, Department of Agricultural Engineering, 1976-.



Present Building: Ground Floor Plan



Basement Floor Plan



Second Floor Plan

Faculty Activities in ASAE

Many of the Penn State agricultural engineering faculty members have been active in ASAE at the national, regional, and state level. It is not possible to list all of their achievements, but the following covers those who are known to have received special recognition through awards or election to certain offices.

ASAE — National Level

R. U. Blasingame *1936-37*	President
A. W. Clyde *1956*	Recipient, the John Deere Medal "For distinguished achievement in the application of science and art to the soil."
F. W. Peikert *1975*	Recipient, the Massey-Ferguson Educational Award Medal "To honor those whose dedication to the spirit of learning and teaching in the field of Agricultural Engineering has advanced our agricultural knowledge and practice, and whose efforts serve as an inspiration to others."
J. N. Walker *1974* *(Former student and faculty member)*	Recipient, Metal Building Manufacturer's Association Award "For distinguished work in advancing the knowledge and science of farm buildings."
	Directors
1967-1969	H. V. Walton — Structures and Environment
1975-1977	R. A. Aldrich — North Atlantic Region
1975-1977	J. N. Walker* — Professional Development
1975-1977	R. O. Martin* — Structures and Environment

*After leaving Penn State

	Division Chairmen
1929-1930	R. U. Blasingame — Power and Machinery
1946-1947	A. W. Clyde — Power and Machinery
1954-1955	F. W. Peikert — Education and Research
1966-1967	R. A. Keppeler — Food Engineering
1970-1971	H. R. Wakefield* — Electric Power and Processing
1974-1975	H. V. Walton — Food Engineering
1975-1976	R. R. Yoerger* — Power and Machinery
	Elected to Grade of Fellow
1938	A. W. Clyde
1955	F. W. Peikert
1968	E. W. Schroeder*
1973	H. V. Walton
1975	R. R. Yoerger*

The national meeting was held at Penn State in 1940. Other national meetings held in Pennsylvania were: Philadelphia — 1947 and Pittsburgh — 1953.

North Atlantic Region

This was organized as the North Atlantic Section at a meeting at Cornell University on April 10-11, 1925. The name was changed to the North Atlantic Region in 1964. The first annual meeting was held at Schenectady, New York, on December 10-11, 1925.

Among the charter members who had been on the Penn State faculty either currently or previously were: R. U. Blasingame, G. M. Foulkrod, F. W. Knipe, and E. G. Lantz.

	Chairmen from Penn State
1925	R. U. Blasingame
1933	J. R. Haswell
1945	A. W. Clyde
1957	H. N. Stapleton*
1958	F. W. Peikert
1975	R. O. Martin*

	Secretary-Treasurers from Penn State
1939-1942	H. N. Stapleton*
1975	D. R. Daum

The following Regional Meetings have been held in Pennsylvania:

1926	Penn State
1927	Pittsburgh
1936	Skytop Lodge, Skytop, PA
1947	Philadelphia — in connection with annual meeting
1949	Penn State
1966	Penn State

J. R. Haswell made the first gavel used by the North Atlantic Section and it was used from 1925 to 1949.

Pennsylvania Section

The Pennsylvania Section of ASAE was organized in 1944. The first meeting was led by R. U. Blasingame.

	Chairmen from Penn State
1949	D. C. Sprague*
1951	C. G. Burress*
1954	H. V. Walton
1957	R. E. Patterson*
1959	J. A. McCurdy
1961	W. L. Kjelgaard
1963	E. A. Myers
1965	P. M. Anderson
1967	N. H. Wooding
1970	D. R. Daum
1973	M. E. Schroeder
1975	C. T. Morrow

	Secretary-Treasurers from Penn State
1945, 1946	E. W. Schroeder
1947, 1948	R. E. Patterson*
1949, 1950	E. F. Olver*

1950, 1951	H. V. Walton
1953, 1954	J. B. Kistler
1955, 1956	J. A. McCurdy
1957, 1958	W. L. Kjelgaard
1959	M. D. Shaw
1960	A. J. Swearingen*
1961	E. A. Myers
1962	P. M. Anderson
1963	N. H. Wooding
1964	H. D. Bartlett
1965	R. A. Aldrich
1966	M. E. Schroeder
1970, 1971	C. T. Morrow
1974	R. M. Butler

Student Activities

ASAE Student Branch

Steps were taken to organize a Student Branch of ASAE shortly after the Agricultrual Engineering curriculum was established. The petition to ASAE for an official branch was approved on May 5, 1932. The records show that the first president of the branch was Ray Bressler, although there is no indication that he ever graduated in Agricultural Engineering. The first faculty advisor was H. N. Stapleton.

The branch has functioned ever since, but as might be expected, it has been more active in certain periods than in others. One indication as to how it is rated with other branches throughout the country is by the ratings given by the Farm and Industrial Equipment Association (FIEI) and the awards given by this organization through the American Society of Agricultural Engineers.

Nearly every year the branch has submitted a report for the FIEI competition. For many years the branches throughout the country have been divided into two groups — A, large branches and B, small branches. The division was based on the size of the active membership. Cups are awarded annually to winners in Groups A and B, and certificates of Honorary Mention are awarded to second and third place winners in each group.

The Penn State Student Branch placed first in Group A in 1953 and first in Group B in 1954. Since then it has always qualified for Group A competition. In 1955 it again placed first in Group A. The following year it placed second and in 1958 it placed third, qualifying for Honorary Mention both years. For several years it placed between fourth and sixth each year. During the period of 1973 to 1975 the students decided not to enter the competition. They again prepared a report for the 1976 competition and placed fourth in Group A.

At least three former students have served as national officers. During his senior year (1952-53), Morris E. Schroeder served as president of the National Council of Student Branches, and in 1957 John C. Williams was elected first vice-president. Emil C. Wunz was elected

second vice-president in 1970. There were probably others who served in a national capacity but for whom the records are not available.

The American Society of Agricultural Engineers has sponsored an annual student paper competition for many years, and many Penn State students entered. These papers were usually course assignments and quite a few of those entered were required assignments in the senior seminar, Ag. Eng. 420. For a number of years the students fared very well as winners in these competitions as indicated below.

National Student Paper Award Winners

1956	Daniel VanDyne — First Place
1959	Roland Gehman — First Place
1960	Joseph Hurlburt — Second Place

North Atlantic Region Paper Award Winners

1958	James Hammerle — Second Place
1959	Roland Gehman — First Place
1960	Joseph Hurlburt — First Place
1960	Paul Seltzer — Second Place
1961	Paul Seltzer — First Place
1961	Alvin Gustofson — Second Place
1965	Glenn Hetherington — First Place

After Penn State went on the term system in 1961, the submission of papers ended rather abruptly. On the previous semester system the student had approximately 16 weeks to prepare an assigned paper. When the time was reduced to ten weeks in the term system, papers were usually not of a quality to stand up against national competition.

Student Scholarships

Since coming under joint administration by the College of Agriculture and the College of Engineering, the Agricultural Engineering students have been eligible for scholarships open to students in both of these Colleges. In 1955 the Engineering Department of Sperry New Holland established three $300 scholarships for students entering Penn State in Agricultural Engineering. At first the scholarships covered tuition for the first two years, plus the opportunity for summer employment with Sperry New Holland between high school and entrance to Penn State, and were known as New Holland Scholarships in Agricultural Engineering. In 1973 the scholarships were designated the James B. Stere Memorial Scholarships, consisting of one award each year of $500 to an Agricultural Engineering freshman.

Ag. Eng. Angles

For many years the Agricultural Engineering students put out a publication covering news items about students, the department, and alumni. It was distributed to these groups and to other student branches throughout the country.

The first issue was a four-page mimeograph which appeared in December 1942, called "Newsy Notes." This issue had brief items, mainly about students and alumni, many of whom were in the armed services since this was during World War II.

There was, however, the following concerning the department:

> *"The legislature made an extra appropriation for agricultural research which became available July 1. The Department of Agricultural Engineering fortunately received its share of this fund. With the reduction in students each member of the staff has been delegated to special research problems. Some of these are dehydration and quick freezing of fruits and vegetables; study of potato storages; tests on open formula paints; the control of excess water on farm lands; the development of brooder houses, homemade electric brooders, and poultry feeders using non-critical war materials; variable torque tractor differential which makes plow hitching to one side of a wide-tread tractor feasible; and the influence of infrared electric energy on the control of diseases in seeds such as oat smut.*
>
> *The department is devoting considerable time to civilian defense with special reference to the collection of scrap materials in cooperation with the Pennsylvania Farm Equipment Dealers Association, and the organization of home mechanics courses for women in cooperation with the chairman of the advisory committee on consumer interest."*

The final issue of Newsy Notes came out in September 1945, consisted of five pages, and still covered mainly items about individuals.

The next publication, Ag. Eng. Angles, appeared on October 2, 1950, with Cy Fahnestock as the editor. In this issue the editor appealed to faculty, students, and alumni for funds to cover the cost of preparing and mailing future issues. Apparently the appeal was successful as six issues were put out in 1951 and five issues each in 1952, 1953, and 1954. Gradually the number of issues per year was reduced,

and in the 1960s Ag. Eng. Angles usually appeared twice a year. The last issue was Vol. 17, No. 2, October 1970.

Alpha Epsilon

Alpha Epsilon, the National Agricultural Engineering Honorary Society, was founded at the University of Missouri on May 14, 1959. Its stated purpose is: to promote the high ideals of the engineering profession, to give recognition to those agricultural engineers who manifest worthy qualities, character, scholarship and professional attainment, and to encourage and support such improvements in the agricultural engineering profession to make it an instrument of greater service to mankind.

The Penn State Omicron Chapter received its charter in 1969 and the first initiation banquet was held on May 30, 1969. The following are the charter members:

Edward A. Blakeslee
Michael F. Brugger
Philip J. Ehrhart
William L. Everett
Robert M. Butler (Faculty Advisor)
Albert R. Jarrett
Barry L. Kintzer
Mahesh Kumar
William M. Miller
Frank W. Peikert (Honorary)
David S. Ross
John C. Sager
James R. Wilson

Up to 1975 the Penn State Chapter had initiated 87 members.

Two of the projects of the local chapter were setting up a file of ASAE papers in the department reference room and keeping the posted list of agricultural engineering alumni up-to-date.

Ag. Mech. Club

The Ag. Mech. Club at Penn State has been in existence since 1967. At that time the national office of ASAE did not officially recognize the agricultural mechanization student organizations that existed in various parts of the country. But since 1970 ASAE has approved a national organization called the National Council of Student Affiliate Clubs. Since the beginning our students have been active in this organization and the following have held national office:

Daniel Rohrer — President 1971-72
Dale Sones — First Vice-President 1974-75
Daniel Hammett — President 1975-76

The Ag. Mech. Club has maintained its separate identity on campus and has held mostly separate meetings, but has joined with the local ASAE Student Branch in some joint meetings. The two organizations have also carried out some cooperative projects such as purchasing and reconditioning old tractors for resale.

Agricultural Engineering Extension

The Agricultural Engineering Extension program at Penn State goes back to 1920 when J. R. Haswell was appointed. He worked alone in this area until 1937 when a second Extension agricultural engineer came on the staff. The staff was not increased again until 1950 when two more positions were filled, making a four-man section. There is relatively little information available on the Extension activities of these men prior to 1950 and only a few publications in the agricultural engineering area to indicate their activities. Apparently, the activities up to this time dealt primarily with:

1) drainage by ditch blasting
2) tile and diversion terraces,
3) farm pond construction,
4) farm machinery adjustment,
5) structures.

During the early 1950s, Extension agricultural engineers spent most of their time traveling to and from counties, making farm visits during the day and conducting meetings or being speakers at programs arranged by the county agents during the evening. The county meetings were scheduled during the late fall and early winter months. Field demonstrations and drainage work took place in the spring and summer. Extension agricultural engineers also were involved in barn ventilation, construction of farm ponds, electric wiring, hay drying, and dynamite ditching demonstrations. Each agricultural engineer was supposed to be qualified in all of these areas and he went to the county as requested by the county agent. He was expected to be able to answer any and all questions relating to problems in the engineering field. The engineer had available a tripod level for surveying and a set of punch bars and a blasting machine for dynamite ditching demonstrations.

Also, in the early 1950s the agricultural engineering Extension section was working rather closely with the electric power suppliers

of the state. Farmers were becoming quite interested in barn ventilation and hay drying through the use of electric fans. Most of the electric power suppliers had farm representatives whose primary function was to promote the use of electricity on the farm. These people worked closely with Extension. For example, during the fall and winter of 1950 each Extension agricultural engineer obtained a fan for barn ventilation demonstrations and traveled around the state conducting demonstrations in barns in the counties where ventilation seemed to be a concern of the county agent. C. G. Burress, in cooperation with D. C. Sprague, prepared in October 1950 Special Circular No. 2, "Ventilation System for Dairy Stables."

The 4-H electric program was initiated in 1952, and a 4-H leader training program under the joint supervision of Extension agricultural engineers was an annual event from 1953 to 1960.

In 1953 the farmers of Pennsylvania were becoming interested in irrigation as a means of increasing crop production. In March of that year, Henry Wooding of Extension and Earl Meyers of the resident staff collaborated in the preparation of Special Circular No. 8, "Supplemental Irrigation With Sprinklers." This proved to be a very useful publication and one in which many farmers learned the fundamental principles and techniques of irrigation. They also became familiar with components available for irrigation. As farm interest in irrigation developed during periods of dry weather, information was needed on how to select, operate, and maintain irrigation systems to achieve best results. During the summer of 1954 Extension conducted a number of evening and twilight demonstrations on the use of irrigation equipment, on farms where the owners had installed irrigation systems. From 1954 on there were years of ample rainfall with some intermittent periods of drought. When drought periods occurred Extension was again called upon to work on irrigation, but in recent years there has been rather limited activity in this area.

One of the first grassland field activities in which Extension agricultural engineers became involved was held in York County in May 1953. Part of this program was devoted to hay making, including crushing and artificial drying in the barn. The Extension agricultural engineers in cooperation with the Extension agronomists initiated a new program during the same year designed to improve forage production through a pasture renovation program. Demonstrations were conducted with local farm machinery dealers providing the equipment for tearing up the sod, tilling the old turf, and then fertilizing and reseeding to establish an improved sod.

During 1953 field days were held in about 10 counties. Some of these featured only pasture renovation. These county field days were the forerunners of the statewide field days known in recent years as

Ag. Progress Days. Each year all of the Extension agricultural engineering staff, as well as some of the teaching and research staff, have been heavily involved in Ag. Progress Days.

In the early 1950s Pennsylvania farmers became interested in a more economical method of storing corn silage as many of them were increasing the size of their dairy herds. As a result, Extension engineers began to promote trench silos. H. E. Brannaka prepared Special Circular No. 7, "Trench Silos," which was released in March 1953.

Extension had conducted plow adjustment demonstrations for many years. As a result of these and the interest in plowing contests held in the midwest, requests came in for information on how plowing contests might be conducted in Pennsylvania. These were first held at the county level with probably the first one being conducted about 1950. After Bedford County had held several county contests, the group there established itself as host for a state contest. Since this Bedford group did not actually represent the state, the Pennsylvania Secretary of Agriculture appointed a state plowing contest committee to look into the possibility of staging a truly statewide competition. The first statewide contest was held at the University farms in the vicinity of the old sawmill and the current U.S. Army Reserve Center. The farm machinery dealers and the Farm Equipment Manufacturers' Association of Pennsylvania agreed to put up money for prizes. It proved to be a rather successful event and this contest was held annually from then on.

The Extension service agreed to co-sponsor plowing contests in cooperation with the Vocational Agriculture Department and the Soil Conservation Service. Working from contest rules provided by some of the midwest states, a set of rules was established for Pennsylvania. For the next several years, plowing contests were rather popular in Pennsylvania and usually about 10 to 20 counties participated each year by holding county contests and certifiying winners to compete in the state contest. In 1958 the Cooperative Extension Service sponsored the national plowing contest in cooperation with Ag. Progress Days at the Hershey Estates, Hershey, Pennsylvania. This was one of the major activities of the Extension agricultural engineers during the year and field days with state plowing contests have continued to be a major annual event.

In the fall of 1955 Extension agricultural engineers sponsored a tractor maintenance clinic for leaders of the 4-H tractor clubs. Financial support from the American Oil Company and the American Petroleum Institute made it possible to bring many 4-H tractor club leaders to Harrisburg to the Farm Show Building in which leader training was conducted for three days during December. The leaders

were housed in dormitories at the Farm Show Building. The farm machinery dealers of Pennsylvania provided the tractors and equipment for use in these training clinics. It proved to be such a successful activity that it was repeated in 1956 and 1957.

Beginning in 1963, potato storage ventilation and construction became a major activity of agricultural engineering Extension with the design of a two-fan automatic control system. This activity continues to the present and over 125 of these units are in use in the state, primarily in new potato storages.

In recent years much of the emphasis of the Extension program has been on agricultural waste disposal, animal housing, energy conservation, and safety regulations. During 1969-70 information was requested on waste disposal methods for the food processing industry. It soon became evident that much of the service needed by this industry was beyond the scope of Extension. Special consultants were needed.

One major activity has been rural waste disposal, both for proper domestic sewage disposal and manure management from dairy, swine, and poultry. The agricultural engineers have worked closely with the Pennsylvania Department of Environmental Resources and have prepared a guide on home sewage disposal, which has been widely accepted. They have also developed guidelines for manure handling and utilization which farmers can follow to be in compliance with the regulations of the Department of Environmental Resources.

Since the size of dairy herds has increased in recent years, there has been a great deal of activity in dairy housing and environmental control. The agricultural engineers have cooperated with the Northeast Dairy Practices Council, whose purpose is to provide mutual assistance among the northeast states in adopting sound, uniform procedures concerning the production, processing, and distribution of milk and dairy products, especially as related to sanitary aspects.

Work has also been done on environmental control and soil sterilization for mushroom houses and greenhouses.

Safety regulations have become an ever increasing part of their program, and since June 1976, there has been a full-time safety specialist on the Extension staff.

The Penn State group became part of the Northeast Regional Agricultural Engineering Service when this organization was first established in 1967. This interstate cooperative effort was set up to facilitate agricultural engineering programs through the preparation and distribution of design data, publications, plans, and related educational material.

On January 12, 1976, the agricultural engineering Extension per-

sonnel came under the administration of the Department of Agricultural Engineering. Previously they had been a section, headed by a chairman who reported to the Extension director. However, over the years there had been frequent cooperation with the department in carrying out various programs and in joint authorship of publications.

Foreign Scientists in the Department

Since 1960 a number of foreign scientists have worked in the department, usually for a period of nine to 12 months. They have come here primarily to gain further experience in the research being carried on by the faculty. They have not only made a valuable contribution to the research program, but have also given the faculty an insight into the research and culture of their countries. Most of these people have kept in touch with the department since returning home.

The following are the foreign scientists who have worked in the department:

Horst Goehlich	Faculty member in the Institute of Machinery, University of Göttingen, Germany. He held a NATO Science Fellowship for the period July 1, 1960, to June 30, 1961. He worked closely with N. N. Mohsenin on some of the early work in physical properties of agricultural materials.
Anthony Arriva	Faculty member in the Institute of Mechanical Agriculture, University of Bari, Bari, Italy. He was sponsored by his Institute for nine months during 1967-1968.
P. C. Arnold	Faculty member from Wollengong University, Australia. He served as a research associate in the department from September 1, 1969 through June 1970.
Ieno Bende	Manager of a large collective farm in Romania. He was sponsored by the International Research and Exchange Board of New York and worked in the department from April to September 1973.
Jurgen Zaske	Lecturer and research associate in agricultural engineering at the Technical University of Berlin, Germany. He was here for one year beginning January 1, 1974.

P. B. McNulty	Lecturer in agricultural engineering, University College, Dublin, Ireland. He was here from June 1 to August 31, 1976.

Each year the Brethren Service Commission sponsors a group from Poland for a one-year assignment in the United States. To date there have been five of these people in the department:

Stefan Szwaj	Department of Farm Mechanization, Lublin College of Agriculture, Lublin, Poland. 1960-1961.
Wincenty Zaremba	Institute of Farm Mechanization and Rural Electrification, Warsaw, Poland. 1962-1963.
Tomasz Wiecek	Institute of Farm Mechanization and Rural Electrification, Warsaw, Poland. 1965-1966.
Boleslaw Bera	Department of Mechanization, Institute of Pomology, Skierniewice, Poland. 1967-1968.
Tomasz Karczewski	Institute of Farm Machinery, College of Agriculture, Lublin, Poland. 1974-1975.

Appendices

APPENDIX 1

Agricultural Engineering Faculty

R. U. Blasingame	Appointed (instructor in agronomy) July 1, 1913. Resigned July 1, 1915. Reappointed (associate professor of farm machinery) October 20, 1917. Retired (professor and head of agricultural engineering) December 31, 1951.
R. A. Andree	Appointed (instructor in agronomy) September 1, 1915. Resigned (assistant professor of agronomy) October 1, 1917.
F. W. Knipe	Appointed (assistant in agronomy) September 1, 1918. Resigned (assistant in agronomy) July 1, 1919.
G. M. Foulkrod	Appointed (instructor in farm mechanics) July 1, 1919. Resigned (assistant professor of farm mechanics) June 30, 1931.
J. R. Haswell	Appointed (assistant professor of farm mechanics Extension) February 1, 1920. Died (professor of agricultural engineering Extension) July 30, 1949.
E. G. Lantz	Appointed (instructor in farm machinery) August 25, 1925. Resigned (instructor in farm machinery) July 13, 1927.
H. B. Josephson	Appointed (assistant professor of farm machinery) September 1, 1925. Died while on leave sometime after July 1, 1930. (Associate professor of agricultural engineering.)
J. E. Nicholas	Appointed (associate professor of farm machinery) July 1, 1929. Retired (professor of agricultural engineering) July 1, 1958.
E. G. McKibben	Temporary appointment (associate professor of farm machinery) June 15-September 15, 1930.
A. W. Clyde	Appointed (associate professor*) July 1, 1931. Retired (professor) July 1, 1956.
D. C. Sprague	Appointed (instructor) September 15, 1931. Resigned (professor) July 31, 1951.
H. N. Stapleton	Appointed (instructor) September 15, 1931. Resigned (instructor) August 20, 1935.
M. G. Huber	Appointed (instructor) September 15, 1935. Resigned (instructor) June 23, 1936.
E. W. Schroeder	Appointed (instructor) September 1, 1936. Resigned (assistant professor) March 15, 1946.
V. S. Peterson	Appointed (assistant professor, Extension) January 1, 1937. Resigned (assistant professor, Extension) May 10, 1942.
R. I. McCall	Appointed (assistant professor, Extension) July 1, 1942. Resigned (associate professor, Extension) November 30, 1946.

**All titles from here on are in Agriculatural Engineering except where indicated otherwise.*

W. F. Ackerman	Appointed (assistant) July 1, 1940. Resigned (assistant) September 15, 1942. Appointed (instructor) October 1, 1943. Resigned (assistant professor) June 30, 1948.
R. E. Patterson	Appointed (instructor) March 18, 1946. Resigned (professor, Extension) August 31, 1963.
A. S. Mowry	Appointed (instructor) July 1, 1946. Resigned (associate professor) August 31, 1952.
H. V. Walton	Appointed (instructor) February 1, 1947. Resigned (professor) December 31, 1961. Reappointed (professor and head) June 1, 1976.
C. H. Bingham	Appointed (instructor, Extension) September 16, 1947. Resigned (assistant professor, Extension) December 31, 1951.
R. P. Hunter	Appointed (instructor) February 1, 1948. Resigned (instructor) August 31, 1948.
A. R. Grout	Appointed (assistant agricultural Extension representative) July 1, 1948. Currently on faculty (professor, Extension).
H. R. Wakefield	Appointed (instructor) August 16, 1948. Resigned (instructor) August 15, 1951.
J. S. Perry	Appointed (instructor) September 1, 1948. Resigned (instructor) March 31, 1953.
E. F. Olver	Appointed (instructor) February 1, 1949. Resigned (associate professor) September 30, 1957.
N. H. Wooding	Appointed (assistant professor, Extension) January 1, 1950. Currently on faculty (professor, Extension).
J. A. McCurdy	Appointed (instructor, Extension) April 16, 1950. Currently on faculty (professor, Extension).
B. S. Horne	Appointed (instructor) August 1, 1951. Appointed (instructor, Extension) January 1, 1952. Died (professor, Extension) January 9, 1976.
E. A. Myers	Appointed (instructor) August 16, 1951. Retired (professor) August 31, 1974.
P. M. Anderson	Appointed (instructor) November 1, 1951. Currently on faculty (associate professor).
H. Brannaka	Appointed (instructor, Extension) June 23, 1952. Resigned (instructor, Extension) March 15, 1954.
W. L. Kjelgaard	Appointed (instructor) July 1, 1952. Currently on faculty (associate professor).
R. N. Jones	Appointed (instructor) August 1, 1952. Resigned (assistant professor of farm mechanics) August 31, 1957.
F. W. Peikert	Appointed (professor and head) August 1, 1954. Retired (professor and head) August 31, 1975.
J. N. Walker	Appointed (instructor, Extension) September 1, 1954. Resigned (instructor, Extension) June 12, 1958.

M. D. Shaw	Appointed (instructor) September 16, 1954. Currently on faculty (associate professor).
R. P. Prince	Appointed (instructor) September 1, 1955. Resigned (assistant professor) June 30, 1957.
M. E. Schroeder	Appointed (instructor, Extension) October 1, 1955. Resigned (instructor, Extension) September 18, 1956. Reappointed (assistant professor) September 1, 1957. Currently on faculty (professor).
R. O. Martin	Appointed (assistant professor) July 1, 1956. Resigned (assistant professor) April 20, 1957.
W. W. Mann	Appointed (assistant in agricultural engineering) July 1, 1956. Resigned (assistant in agricultural engineering) June 30, 1958.
H. D. Bartlett	Appointed (associate professor) August 1, 1956. Currently on faculty (professor).
R. R. Yoerger	Appointed (associate professor) September 1, 1956. Resigned (associate professor) July 15, 1958.
A. J. Swearingen	Appointed (instructor, Extension) April 5, 1957. Resigned (instructor, Extension) February 7, 1961.
O. A. Kimmel	Appointed (assistant professor of farm mechanics) September 1, 1957. Currently on faculty (associate professor of farm mechanics).
D. C. Beppler	Appointed (instructor) July 1, 1958. Currently on faculty (associate professor).
J. D. Hovanesian	Appointed (assistant professor) July 1, 1958. Resigned (assistant professor) June 30, 1961.
G. R. Kann	Appointed (assistant in agricultural engineering) July 1, 1958. Died (assistant in agricultural engineering) November 28, 1971.
H. A. Peterson	Appointed (temporary instructor) July 1, 1958. Resigned (temporary instructor) August 31, 1960.
W. C. Arble	Appointed (temporary instructor) July 1, 1958. Resigned (temporary instructor) August 31, 1959.
A. R. Carlson	Appointed (instructor, Extension) September 1, 1958. Resigned (instructor, Extension) July 15, 1965.
K. Q. Stephenson	Appointed (associate professor) July 1, 1959. Currently on faculty (professor).
N. N. Mohsenin	Appointed (associate professor) January 1, 1960. Currently on faculty (professor).
L. H. Snyder	Appointed (instructor) July 1, 1960. (instructor, extension) July 1, 1961. Resigned (instructor, Extension) February 29, 1964.
R. A. Aldrich	Appointed (associate professor) July 1, 1962. Currently on faculty (professor).

R. A. Keppeler	Appointed (associate professor) August 20, 1962. Currently on faculty (associate professor).
A. L. Myers	Appointed (instructor, Extension) January 1, 1964. Resigned (assistant professor, Extension) August 31, 1966.
G. E. Mauk	Appointed (assistant in agricultural engineering) July 1, 1964. Resigned (assistant in agricultural engineering) May 31, 1966.
L. S. Click	Appointed (assistant professor, Extension) October 15, 1964. Resigned (associate professor, Extension) March 5, 1971.
J. R. Boose	Appointed (instructor) September 16, 1965. Resigned (instructor) August 31, 1967.
J. W. Chick	Appointed (assistant in agricultural engineering) June 16, 1966. Resigned (assistant in agricultural engineering) June 15, 1967.
G. R. Bodman	Appointed (instructor) October 1, 1966. Resigned (instructor) September 1, 1967. Reappointed (assistant professor, Extension) April 1, 1971. Currently on faculty (assistant professor, Extension).
D. R. Daum	Appointed (assistant professor, Extension) November 1, 1966. Currently on faculty (professor, Extension).
E. T. Engman	Appointed (adjunct assistant professor) November 1, 1966. Resigned (adjunct assistant professor) March 31, 1974.
L. H. Parmele	Appointed (adjunct assistant professor) November 1, 1966. Resigned (adjunct assistant professor) April 30, 1974.
T. M. Seltzer	Appointed (instructor) February 1, 1967. Resigned (instructor) October 31, 1968.
C. T. Morrow	Appointed (instructor) July 1, 1967. Currently on faculty (associate professor).
S. J. Sluka	Appointed (assistant professor) July 1, 1967. Resigned (assistant professor) July 31, 1968.
M. A. Wittman	Appointed (assistant in agricultural engineering) July 1, 1967. Currently on faculty (assistant in agricultural engineering).
G. W. Allshouse	Appointed (assistant professor) September 1, 1967. Resigned (assistant professor) November 23, 1973.
S. P. E. Persson	Appointed (associate professor) September 1, 1968. Currently on faculty (professor).
R. M. Butler	Appointed (instructor) October 1, 1968. Resigned (assistant professor) July 31, 1974.
D. O. Norman	Appointed (instructor) June 30, 1969. Resigned (instructor) June 15, 1970.
D. E. Horn	Appointed (assistant in agricultural engineering) July 1, 1972. Resigned (assistant in agricultural engineering) April 30, 1973.

W. K. Moyer	Appointed (assistant in agricultural engineering) July 1, 1973. Currently on faculty (assistant in agricultural engineering).
W. J. Elliot	Appointed (instructor) March 15, 1974. Resigned (instructor) September 30, 1975.
A. R. Jarrett	Appointed (instructor) September 1, 1974. Currently on faculty (assistant professor).
W. R. DeTar	Appointed (associate professor) December, 1974. Currently on faculty (associate professor).
J. R. Hoover	Appointed (adjunct assistant professor) September 1, 1975. Currently on faculty (adjunct assistant professor).
D. W. Johnson	Appointed (instructor) January 11, 1976. Currently on faculty (instructor).

APPENDIX 2

Technicians in the Department of Agricultural Engineering

Roy Johnson	Appointed January 15, 1927; retired July 1, 1956.
Willis Weaver	Date of appointment unknown; resigned May 15, 1948.
Joseph Droege	Appointed July 1, 1936; retired October 14, 1971.
Robert Hunter	Appointed September 1, 1936; resigned June 30, 1942.
John Wert	Appointed May 17, 1948; transferred to another department January 18, 1957.
Joseph DeBrasky	Appointed January 1, 1962; died December 27, 1974.
Lewis Jodon	Appointed February 11, 1957; currently on the staff.
Paul Mark	Appointed May 15, 1966; currently on the staff.
Edward Cieslar	Appointed October 1, 1966; currently on the staff.
Boyd Bright	Appointed February 12, 1968; transferred to another department June 30, 1969.
George Emerick	Appointed September 9, 1968; currently on the staff.

APPENDIX 3

September 23, 1954

Memorandum of Understanding between the College of Agriculture and College of Engineering relative to the Joint Administration of the Agricultural Engineering Department

I. Resident Instruction

A. Curriculum

1. The curriculum leading to the B.S. Degree in Agricultural Engineering shall be jointly administered by the Deans of Agriculture and Engineering.

2. The present curriculum in Agricultural Engineering and any subsequent changes in the curriculum must be jointly approved by the Course of Study Committees of the respective Colleges and processed by joint approval.

3. The Agricultural Engineering curriculum is to be listed in the General Catalogue both under Agriculture and Engineering.

B. Staff

1. The Agricultural Engineering staff members who teach the professional Agricultural Engineering courses shall be considered members of the faculty of the College of Agriculture and of the College of Engineering and may serve on various committees of either faculty.

2. The initial appointment of Agricultural Engineering staff members who teach the professional courses will be jointly approved by the Deans of Agriculture and Engineering.

C. Agricultural Engineering Major Students

1. The students in the professional Agricultural Engineering curriculum leading to the B.S. Degree in Agricultural Engineering shall be considered students in both the Colleges of Agriculture and Engineering.

2. These students will be granted their degrees jointly by the Colleges of Agriculture and Engineering.

D. Budget

1. It shall be the responsibility of the Dean of Agriculture to provide and administer the budget of the Department of Agricultural Engineering.

II. Research

Research work in Agricultural Engineering shall be administered by the Director of the Agricultural Experiment Station.

Approved By:

Lyman E. Carlson — Dean of Agriculture — Date: Sept. 28, 1954

Lou A. Walker — Dean of Engineering — Date: 9/28/54

President — Date: Sept 28, 1954

APPENDIX 4

Graduates of the Department of Agricultural Engineering, The Pennsylvania State University

1932
J. G. Huda
J. H. Walker

1933
Stephen J. Mech
Gilmore L. Osterling
*David C. Sprague

1934
Waldo E. Bell
O. R. Myers
William R. Stiles
Murrel E. Strickler

1935
James V. Baker
Edwin K. Bonner, Jr.
George W. Grisdale, Jr.
William C. Wenner, Jr.

1936
Harvey F. Corson
Everett R. Curry
John P. Lionberger
Paul A. Whisler

1937
Frank R. Brower, Jr.
Eugene E. Houck
Richard T. Markle
Luther S. Singley

1939
John Heilman
John S. McCurdy
Oscar C. Rice, Jr.
Clarence E. Stevens
S. Merrill Watson
Carl H. Winkleblech

1940
*William F. Ackerman
Clyde N. Arnold, Jr.
Arthur S. Bilger
Frank R. Crow
Stanley B. George
A. Martin Marburger
John H. McCavitt
James B. Robinson
James R. Sausser, Jr.
Llewellyn G. Scherer

1941
Edwin B. Crisman
Richard B. Hopkins
Ausmus S. Marburger
George R. Mowry
Albert E. Powell

1942
John H. Bartram
Albert M. Best
Thomas F. Ford
Allan R. Hunsicker
John R. Jaquish
James B. Kistler
C. L. Martin, Jr.
John N. Moore
Karl H. Norris
*Ervin W. Schroeder
Mark E. Singley
William C. Stephens
John G. Taylor
Harold V. Walton
Calvin N. Wherry
James H. Wright

1943
Robert A. Dennison
Harry J. Hofmeister
Elwood F. Olver
J. L. Stackhouse, Jr.

1944
Charles R. Allen, Jr.
Charles E. Williams

1945
Joseph W. Graul

1947
William A. Calvert, Jr.
Richard C. Hamsher
Burton S. Horne
Jack E. Lange
Oscar C. Lange
Edward C. Proctor
G. Harvey Shriver

1948
Charles B. Adams
Renato L. Barisone
Robert S. Crist
James R. Ewing
Robert D. Fields
Irvin R. Fisher
Edwin D. Frey
Henry N. Funk
Lawrence M. Lucas
Glenn R. Maneval
Joseph A. McCurdy
Earl C. Musser

*Indicates M.S. Degree
**Indicates Ph.D. Degree

John S. Norton
George W. Plonski
Stanford R. Snyder
David E. Thomas
Harold R. Wakefield
Edward B. Webb

1949

Benjamin T. Cannavo
William M. Fennell
Leonard D. Kimmel
John G. McCleary
Allen C. McCully
Robert R. McCully
Merton E. McLean
*Elwood F. Olver
Ralph L. Oyler
*Ralph E. Patterson
William F. Rissmiller
John B. Semple
Earl M. Sherwood
George Shute
Harry H. Watt
Joseph Winton

1950

Paul M. Anderson
Donald E. Arbuckle
Edwin J. Buckley
Torrence W. Dohl
Earl H. Douglas
Harold Ewaldsen
Emmett L. Herr
John H. Herr
William L. Kjelgaard
James L. May
Earl A. Myers
Wallace A. Schlegel
Robert F. Schmieder
Lee E. Vaughn
*Harold V. Walton
Harold E. Wenker, Jr.
John W. Zahradnik

1951

Roderick H. Bergstrom
John A. Bosch
William R. Bower
Glenn K. Bowman
Tom Carbarnes
Eugene H. Dumm
Douglas D. Enslin
Clarence R. Fahnestock
Lester F. George
Alan M. Lehman
George E. Logue
William G. Mathers
John E. Maust, Jr.
Richard L. Mortimer
Arthur L. Myers
George Replogle
Loren G. Sadler
Jason C. Stone
Robert W. Switzer
*Harold R. Wakefield
John N. Walker
Charles K. Williams
Harry D. Wolfe

1952

Carl H. Betz
Harold E. Brannaka
Leonard M. Bumm
Junior J. Campbell
Wallace M. Catanach, Jr.
*Clarence R. Fahnestock
Howard W. Miller, Jr.
Milo J. Moore
*Earl A. Myers
Walter B. Schumacher
James R. Tate
Richard K. White
Richard R. Wick

1953

Gerald S. Birth
Joseph K. Campbell
William D. Carpenter
Robert W. Decker
Ernest U. Gingrich
*William L. Kjelgaard
George L. Klose
William R. Miller
Thomas E. Morton
Lawrence A. Myers, Jr.
George W. Pakala
*John S. Perry
*Shunil E. Roy
Morris E. Schroeder
Carl O. Trautmann

1954

Bennett W. Avery
Nguyen T. Ban
Morton M. Boyd
Harry C. Grube
Dale F. Jones
David F. Moorehead
Roger L. Risser
John W. Scheerer
Mark D. Shaw
Robert J. Troxell
Carl H. Von Wolffradt
Robert A. Weaver

9 MS

1955
*Jerome J. Ahne
John H. Body
*Robert W. Decker
Dean E. Jones
Donald E. McCandless, Jr.
Franklin W. Myers
Donald L. Reichard
John J. Robinson
Bruce D. Schwalm
Robert W. Thompson

1956
James F. Beeman
Donald R. Daum
James G. Greiner
Paul N. Herr
Ronald B. Mohn
Henry J. Retzer
George W. Ridge
Howard J. Slothower, Jr.
James L. Stitt
William B. Straub
Daniel A. Van Duyne

1957
*Paul M. Anderson
David H. Bucher
James R. Edmonds
*Shri M. Gupta
Paul W. Hill
Willis E. Kuhns
Kenneth L. Sacks
Edward E. Scott
Donald Snyder
John A. Spangler
Charles A. Williams

1958
*Bennett W. Avery
*James F. Beeman
*Donald R. Daum
Glendyn L. Dietz
David L. Donley
William C. Fecke
Clarence G. Haugh
Theodore H. Ifft
Howard P. Lambert
*Robert G. Light
Harold E. Pellow
William A. Schooley, Jr.
*Mark D. Shaw
Lee H. Snyder
Calvin C. Staudt
Calvin S. Taylor
Robert L. Thomas
Robert W. Tickner
*John N. Walker
Thomas N. Walker
John C. Williams

1959
Gene L. Allison
John J. Atcheson
*David C. Beppler
Ralph D. Eichelbeck
Robert A. Fowler
Roland P. Gehman
*Rajendra K. Gupta
James R. Hammerle
*Paul W. Hill.
William F. Hobbs
D. J. Kaufer
John W. Mickley, Jr.
John H. Miller
Richard H. Paff
Frederick H. Schuetz
Edgar H. Smith
James B. Uhl
Donald B. Van Wolfradt

1960
Harry E. Cooper
Robert G. Diener
Raymond W. Evans, Jr.
Raymond E. Fisher, Jr.
Jack E. Frey
Gerald E. MacDonald
*Milo J. Moore
Conrad D. Shakely
Walter L. Slaugenhaupt
Alfred A. Snyder
*Lee H. Snyder
*Albert J. Swearingen
*Robert W. Tickner
*John C. Williams

1961
*William C. Arble
Edward J. Bortner
*William B. Crawford
*Essex E. Finney
Alvin S. Gustafson
Joseph C. Hurlburt
Gerald M. Lyter
Lynn A. Miller
*Henry L. Mosher
James R. Pifer
James D. Schwartz
Paul H. Seltzer
Lloyd E. Thomas
*Daniel A. Van Duyne
Eli D. Wismer
Samuel E. Young

23

1962
Carl E. Anderson
Lester A. Brower
*David H. Bucher
*William R. Burke
Harry E. Cann
Karl R. Carl
*Harry E. Cooper
Thomas R. Drake
Rodney L. Dreisbach
*Kenneth E. Felton
John D. Graham
*Alvin S. Gustafson
William L. Hicks
Vincent D. McCarty
James A. Merkel
William L. Mosteller
*Nagarbhai G. Patel
Donald R. Shakley
Charles E. Steen
Thomas L. Thompson
*Jodie D. Whitney

1963
Jacob H. Baker
*Karl R. Carl
Ralph E. Curtiss, Jr.
*Robert G. Diener
Kenneth J. Dixon
John C. Herr
Leslie H. Parmele
Ronald R. Rose
Theron A. Schnure
William R. Stitt
Earl C. Tressler
Thomas D. Whelpley

1964
*Larry S. Click
John B. Courtney
*David G. Cowart
*Ram S. Devnani
*Rodney L. Dreisbach
*Stevenson W. Fletcher
John R. Graham
Harvey B. Manbeck
*Arthur L. Myers
John C. Sager
William T. Shufflebotham
John L. Wagner

1965
James H. Boose
James R. Boose
Carl D. Brown
Manuel Elgueta
*Fred B. Givens
Glenn R. Hetherington
John W. Laudenslager
Henry N. Lausch
Bruce E. Lindenmuth
Gerald C. Lindenmuth
Maynard Long
*Harvey B. Manbeck
Daniel E. Moniot
*Charles T. Morrow
*Leslie H. Parmele
Randal J. Scheib
Thomas M. Seltzer
Allan F. Spangler
Ray W. Wilson

1966
*Richard K. Adams
Gary W. Allshouse
Keith B. Anderson
Dale A. Ashcroft
Forrest E. Bard
Donald R. Bittner
Gerald R. Bodman
Lyle F. Bohnert
Dennis E. Buffington
*Axel R. Carlson
John F. Dieterly, Jr.
Jude O. Duru
*Jerome J. Gaffney
Millard P. Garrett
Fred F. Gay
*John R. Graham
*James R. Hammerle
Larry M. Hixon
*Bruce E. Lindenmuth
Richard A. Pucher
Ernest C. Rebuck
Lloyd A. Reed
*John L. Wagner
*Richard K. White
*Ray W. Wilson
*Douglas H. Wood

1967
*Gary W. Allshouse
*Donald R. Bittner
*James R. Boose
*Carl D. Brown
George H. Diener
John B. Furry
*Millard P. Garrett
Kenneth P. Goldbach
Robert R. Haugh
*Glenn R. Hetherington
*Larry M. Hixon
Roger F. Hurd

Mark J. Itle
John M. Karhnak, Jr.
Irwin D. McIlwain
*Charles W. Nelson
*Paul H. Seltzer
Kenneth E. Smith
Roger R. Stoner
*Earl C. Tressler

1968

Kenneth R. Andrews
*Dale A. Ashcroft
*Gerald R. Bodman
*Lyle F. Bohnert
George N. Clark
*Jude O. Duru
William L. Everett
*Fred K. Fox
Lynn D. George
**James R. Hammerle
Albert R. Jarrett
August R. Kriley
Joseph J. Lehman
James E. Moser
Stanley E. Prussia
*Ernest C. Rebuck
Ronald W. Rose
Ernest A. Schoeneberger
Ralph E. Stone
*Lea Y. Tsau
*Yann M. Yang

1969

*Ernest J. Baisden, Jr.
William H. Berning
Edward A. Blakeslee
William J. Bowers
Warren J. Davidhizar
Philip J. Ehrhart
*Fred D. Gay
Milford A. Hanna
John M. Karhnak, Jr.
James B. Kirk
*Mahesh Kumar
William M. Miller
**Charles T. Morrow
David O. Norman
David S. Ross
Arthur C. Shuster
Gary C. Snyder
*William O. Stewart
James R. Wilson
George E. Ziegler

1970

Michael F. Brugger
*Dennis E. Buffington
*Warren J. Davidhizar
Ray C. Doutrich
Lynn E. Herbst
David L. Hess
*Albert R. Jarrett
*John M. Karhnak, Jr.
Edward M. Kehr
Barry L. Kintzer
Frank A. Luongo
Charles G. Perkins

1971

Craig S. Alig
*Edward A. Blakeslee
Dennis L. Carrington
John H. Featherman
Robert D. Fehl
*Milford A. Hanna
Theodore C. Holt
*Joseph J. Lehman
Gary D. Matson
Ronald C. Mease
*William M. Miller
Marshall L. Quade
*David S. Ross
*John C. Sager
*Suresh D. Sawant
Samuel E. Wehr
Alan D. Wood
Emil C. Wunz
*George E. Ziegler

1972

Karl P. Adey
*Craig S. Alig
Thomas G. Bubenheim
**Robert M. Butler
David C. Curtis
*George H. Diener
*Rey Elizondo
Gerald M. Hillegass
**Mahesh M. Kumar
*Gary D. Matson
Thomas R. McCarty
*Ronald C. Mease
*Donald O. Norman
*Emmanuel U. Odigboh
Terence W. Repine
**Suresh D. Sawant
Jack N. Walter
*Mardis R. Warner
Oran Weaver, Jr.

1973

Raymond D. Boyer
Robert L. Carper
G. A. Clay

35

Robert S. Crist
Lynn A. Dietrich
David A. Glass
William J. Horton
James V. Husted
Glenn M. Kimmel
David C. Lutz
Keith E. Masser
Eugene N. Miller
**William M. Miller
Harold E. Myers
Robert E. Naugle
Jack T. Purdy
**David S. Ross
**John C. Sager
Gary A. Smith
Thomas J. Smith
*John D. Studdiford
David E. Tannehill
Ezra Tice
Albert J. Wolfkill
**S. P. Yayathi

1974

R. E. Blauser
G. L. Bollinger
William L. Cleveland
**George H. Diener
Paul E. Dietz
William H. Elliott
*William L. Everett
John W. Heyler
Dale P. Hollinger
*James V. Husted
Wayne B. Martenas
*Alexander Melnyk
**Emmanuel U. Odigboh
Milan J. Pavkov
John A. Pero
Sterlin M. Rebuck
*Terence W. Repine
Philip J. Sutton
*Jack N. Walter
John S. Weller
Andrew C. Zwick

1975

John A. Gaut
Michael J. Green
**George W. Hawkins
Gerald M. Heistand
Barron L. Hetherington
*Yeong C. Ho
**Albert R. Jarrett
Richard E. Jennings
**Vinod K. Jindal
David G. Koons
Dean R. Leech
Michael R. Lorenz
**Ernesto P. Lozada
John G. Lutz
Joseph F. Marcin
Blaine J. Masemore
David P. Mummert
Glenn A. Musser
*Nathan Rosenzweig
*Clarence A. Rotz
Ronald R. Skovira
*Gary L. Smith
Rodney U. Stine
*Djoko Suharto
*David E. Tannehill
Joseph Tecza

1976 (To June 30, 1976)

Eric S. George
Larry D. Hall
Richard A. Herring
Walter H. Latshaw
Gerald D. Lawruk
Frank A. Oellig
*Sterlin M. Rebuck
John M. Sceiford
James G. Schenck
James F. Willats
John Zaganaylo

APPENDIX 5

Graduates of the Farm Equipment Service and Sales Program

1958
Joel E. Dugan
Robert G. Flick
James Goodenough
Harry J. Huffman
William C. McCormick
John W. Moorhead
Walter B. Potter
Donald E. Powell
Paul E. Rieg
Leo Washburn
Jay V. Witmer
Donald M. Wrightstone

1959
John T. Asbury
Clayton L. Blauser
Dale R. Bowersox
Richard L. Bromley
John W. Cook
Randolph Freudig
Edward Fries
Kerwin Gelbaugh
Ralph Jennings
Grover McCormick
Richard W. Newton
Gerland Shank
Orr Smith
Gerald Storm
Robert Topscher
Harold C. Ulsh
Clair D. Worley

1960
Kenneth Bushong
George Dickerson
John R. Groff
Edward J. Hines
John R. Holmes
William W. Martz
Ronald J. Miko
Karl E. Miller
Richard Schmieg
Glen Seeley
Dennis A. Smith
Mark S. Urban

1961
Randall T. Aucker
Clark H. Bashore
Richard Bennett
James Brinker
Roger W. Cann
William T. Criste
David D. Deitrich
David L. Edder
Charles Gruber
Ronald Heginbotham
William E. Kuhn
Charles D. Lester
John I. Mengel
Vernon T. Shenk
Clarence E. Spencer
Edward R. Swingle
Albert J. Wise
Michael A. Zacherl

1962
Kenneth L. Anderson
William J. Bell
Robert E. Gregg
Charles B. Hoober
Walter C. Johnson
Lloyd T. Mackes
William C. Markel
Robert Merkt
James H. Procter
Neal R. Robinson
Restore B. Smedley
Gary L. Snook
Kenneth W. Thomas
Lynn D. Tice
Gary P. Whitfield
William Wigenroth

1963
Paul A. Breneman
Wayne R. Daubert
Raymond Henry
Ronald Kohler
John McMullen
Mark McNally
Fred C. Millen
Harry P. Myers
Dennis Northrop
Edgar Reed, Jr.
Gary Reish
Richard Roland
David Rosenberger
Harold Sheaffer
Robert Thomas
Daniel I. Troutman
Dean E. Varner
Howard Winey
Kenneth P. Worley

1964
Gerald P. Bendis
William H. Brown
Melvin L. Fetzer
Dale R. Griggs
Steve McClain
Jerry B. Noon
Allan Sterner

1965
James Archer
Robert Arendash
Thomas Ballanger
John L. Bish
Robert Dinsmore
Nelson E. Ditzler
Keith Edwards
Glenn I. Fessler
Russel Forgy
Edward M. Gaston
Robert E. Lenker
Richard Maldet
Ellis Rentzel, Jr.
L. Duane Soper
John Werning

1966
John Bradshaw
Douglas Buell
James Chase
Kirby Costill
Dean Diehl
Louis Enos
Richard Hughes
Leonard Leiphart
Arthur Rearick
Richard Rehm
Edward Rowe
Larry Stultz
Richard Weygandt

1967
Bryce Cooper
Henry DuBois
J. Richard Gregory
Timothy Gresh
Joel Jacobsen
Thomas C. Lower
Ken Park
Larry Ruble
Dale R. Searls
David Sheridan
Alan Slezak
David G. Stein
M. Eugene Stoltzfus
Stephen E. Taylor
James Toner
Lloyd S. Yeager

1968
Daniel M. Burket
Paul D. Chonka
Charles F. Lobaugh
Carl W. Reed
Martin J. Revelt
Thomas C. Smith
Roy W. Trout
Howard W. Umnik

1969
Walter G. Barner
James S. Bartron II
Stanley W. Brosius
Lee C. Cogan
Kenneth L. Collins
Kenneth L. Cowher
Philip C. Davis
Everett C. Dickinson
Galen L. Edris
Jay L. Fisher
David M. Folcomer
Kenneth L. Frankenberger
Gary L. Haywood
Raymond G. Holsopple
Charles S. Kuffa
William H. Lisbon
Dale E. Lynn
Donald Musser
Gary R. Myers
Thomas E. Peterman
Wayne R. Pittman
Charles C. Smith
James P. Steele
Samuel A. Steele
Max L. Tears
David H. Trout
William R. Walker
Stephen C. Winey

1970
Kenneth L. Bodman
Mark A. Brinker
Lester A. Brown
Melvin R. Dickinson, Jr.
James C. Henderson
Joseph M. Kozik, Jr.
Daniel L. Moyer
Barry R. Nickel
Allan J. Parrish
Charles S. Risser
Walter C. Robinson
Benjamin A. Rook
Thomas Sedlock
Dewaine E. Shoop
Terry C. Smith
Ervin D. Steinly, Jr.

Charles E. Wagner
Steven P. Wagner
Gregory A. Warrick

1971

W. Bruce Agens
Dennis J. Allshouse
John C. Bechtel
John E. Blyler
Kenneth E. Forshey
Mark G. Gleeson
Danney E. Hawn
A. Christine Kalp Sauder
John D. Lourie
Norbert J. Matula
Stephen B. Moncrief
Ronald W. Nickel
Timothy R. Olson
John C. Ribovich
John B. Sauder, Jr.
Dwight N. Simmons
Arthur R. Sivers
William R. Solly
David M. Stockdale
Richard W. Stuchal
Douglas W. Thompson
James J. Wakefield
Thomas W. Wimer

1972

Steve A. Adams
Robert S. Byler
Mark Buckfield
Dennis R. Dreibelbis
James Everhard
Franklin D. Gould
David N. Harkenreader
Thomas T. Hughes
Joseph C. Irona
William M. Jeffries
Stephen E. McCarl
David S. McConnell
Ray C. McGee
Larry G. Miller
Charles F. Moore
William E. Neagley
Frank A. Rombola
Rexford F. Shade
Ronald A. Sheard
Richard W. Swendsen
Charles F. Swihart
Frank T. Whitcraft

1973

Douglas Barnes
Francis L. Cline, Jr.
James C. Cornell
Charles Cowher
James L. Headley
Robert G. Karp, Jr.
Larry M. Kocher
Brian E. Miller
Dale R. Morgan
Robert C. Osborne
Roy S. Reiner
Rawn L. Shumaker
Edward E. Soper
Terry L. Weiler

1974

John E. Bucko
Paul W. Cope, Jr.
Michael E. Dreibelbis
Roy S. Fasnacht
Stewart C. Foradora
Thomas A. Frantz
Robert A. Kocher
Mark D. Mendenhall
Dana C. Mott
Herbert L. Musser
Kenneth E. Myers
Dennis E. Palm
Dale E. Ross
Randy L. Schreffler
Glenn A. Shelly
Charles R. Smith
Brooks A. Way

1975

Carl S. Brytz
John H. Coombs
Chester A. Cyphers
Daniel T. Magness
Daniel W. Miller
John N. Mortenson
Alan R. Mowry
Kenneth C. Pratt
Craig R. Swigart
Glen A. Walker
Michael R. Yaskin

1976

Gary M. Cowden
Robin R. Hitchner
Kenneth R. Houser
Robert S. LaVan
Todd D. Sloane
George A. Wilson
Howard J. Zurn

APPENDIX 6

Agricultural Mechanization Graduates

1962 Harold D. Goss
Thomas G. Kashatus

1963 Frank R. Bixby, III
Richard A. Schmidt

1964 Richard W. Dingle
Michael J. Irlenborn
Edward R. Mayka
James A. Pauling
Jack M. Preston
Joseph D. Taggart
Frederic N. Thompkins

1965 Richard B. DeVore
Paul H. Pinkerton

1966 Larry L. Herr

1967 Robert L. Catherwood
Paul R. Johnson

1968 Joseph R. Bashista
William J. Rohaly
Jay V. Rush
Dennis W. Shoop

1969 Perry H. Ballek
Keith R. Brong
Craig J. Hayes
Robert W. Jaditz
Richard L. Ross
Lloyd W. Shaeffer
Theodore R. Thompson

1970 Dennis W. Berkey
Raymond H. Eick
Malcolm L. Grove
Kirk C. Manchester
Thomas O. Mischen
Don C. Myers
Donald L. Henninger
Robert A. Seesholtz
Dale A. Stevens

1971 Robert L. Blauser
Dale V. Brubaker
Zane R. Helsel
Alfred E. Kammerer
Dennis P. LeVan
Daniel W. Neff
Jay F. Partner
John E. Pore
Frederick H. Reisinger

1972 Karl P. Adey
Dale W. Fredrick
Gerald L. Henderson
Edward M. Kaminsky
Carl E. Naugle
Daniel H. Rohrer, III
Blair H. Shaffer

1973 Daniel L. Bell
Thomas L. Brooks
James T. Donovan
Richard G. Frazier
Paul D. Haldeman
Robert E. Jackson
William B. Lensie
William B. Sowers
Paul O. Wentzler
Edwin J. Westrick

1974 Michael L. Bandi
Barry W. Bloss
Willis A. Eshelman
Wayne L. Fowler
John M. Michener
Bruce D. Mungai
William J. Stevens
Frederic B. Thomson, Jr.

1975 David A. Bair
Randolph W. Cormack
Barry Grettler
Kirk D. Lake
Roy A. Schanbacher
Dale P. Sones
Richard R. Sutton
David D. Wilmot

1976 Bryan Bard
Robert P. Bean
Richard L. Caswell
Ray E. Duke
James W. Hallowell
Robert Keith, Jr.
J. Mark Lindely
Jeffrey D. McCord
Douglas R. Myers
Michael J. Wiley

APPENDIX 7

List of Agricultural Engineering Division IPAC Members

1959-1976

George G. Connor	General Manager, Pennsylvania Farm Bureau	*1959-1966*
Paul K. Girton	President, Girton Manufacturing Company	*1959-1966*
Robert E. Hartford	Executive Director, Pennsylvania Retail Farm and Industrial Equipment Association	*1959-1964*
Charles M. Hench	Branch Manager, New Idea Division, Avco Corporation, Harrisburg	*1959*
Ausmus S. Marburger	General Manager, Belleville Plant, New Holland Machine Company	*1959-1966*
J. R. McGraw	Branch Manager, Oliver Corporation, Harrisburg	*1959-1964*
R. Stanley Reaves	Chief Engineer, Tractor Group, Allis-Chalmers Manufacturing Company	*1959-1967*
Henry A. Wright	Branch Manager, J. I. Case Company, Baltimore	*1959-1960*
P. W. Gorman	District Manager, International Harvester Company, Harrisburg	*1960-1965*
J. W. Stiles	Director of Research, Cooperative Grange League Federation Exchange, Inc.	*1960-1965*
Hugh J. Hansen	Publisher and Editorial Director, Electricity on the Farm Magazine	*1962-1968*
Walter M. Carleton	Associate Director, Agricultural Engineering Research Division, ARS, USDA	*1965-1970*
Robert L. Evans	Product Manager, New Idea Division, Avco Corporation	*1965-1970*
Sherwood A. DeForest	Manager, Agricultural Equipment, United States Steel Corporation	*1966-1971*
William Morris	District Manager, International Harvester Company, Harrisburg	*1967*
Robert M. Rinn	Chief Product Engineer, Sprout-Waldron	*1967-1972*

Paul E. Schleusener	Principal Agricultural Engineer, Cooperative State Research Service, USDA	*1967-1973*
David C. Sprague	Director, Agricultural Engineering Research, Agway, Inc.	*1967-1969*
Earl A. Comerford	District Manager, International Harvester Company, Harrisburg	*1968*
James P. Hitchner	District Manager, International Harvester Company, Harrisburg	*1967-1970*
Horace G. McCarty	Director of Engineering, New Holland Group, Sperry Rand Corporation	*1969-1974*
Rodney O. Martin	Director, Farm Systems Research, Agway, Inc.	*1970-1975*
H. Paul Brown	Branch Manager, The Oliver Corporation, Harrisburg	*1971-1976*
Roland P. Gehman	President, MGS, Inc.	*1971-1976*
Lawrence A. Parrott	President, McDowell Manufacturing Company	*1971-1976*
Russell R. Poynor	General Supervisor, Product Planning, Farm Equipment Division, International Harvester Company	*1971-1973*
William F. Matson	General Manager, Pennsylvania Rural Electric Association	*1972-*
John W. Ackley	Research Engineer, Deere and Company Technical Center	*1973-*
Wayne A. Maley	Agricultural Engineer, United States Steel Corporation	*1973-*
John H. Hamilton	Marketing Planning Manager, Agricultural-Industrial Division, International Harvester Company	*1974-*
Robert G Yeck	Staff Scientist, Soil, Water, and Air Sciences, USDA	*1974-*

APPENDIX 8

Research Projects in Agricultural Engineering

1925-1976

Project 705. A Study of the Power and Labor Factors Involved in Crop Production in Pennsylvania. Cooperating Departments: none. Agricultural Engineering staff involved: R. U. Blasingame, H. B Josephson.* Dates: 1925-1929.**

Project 727. Improvement of Dairy Buildings in Pennsylvania. Cooperating Departments: none. Agricultural Engineering staff involved: E. G. Lantz. Dates: 1926-1927.

Project 728. The Development and Improvement of Labor Saving Machinery. Cooperating Departments: none. Agricultural Engineering staff involved: R. U. Blasingame, D. C. Sprague. Dates: 1927-1937.

Project 741. An Investigation of the Biology and Control of the European Corn Borer. Cooperating Departments: Agronomy, Agricultural Economics, Zoology and Entomology. Agricultural Engineering staff involved: R. U. Blasingame. Dates: 1928-1932.

Project 754. Use and Application of Chemicals for Control of Potato Diseases. Cooperating Departments: Botany, Plant Pathology. Agricultural Engineering staff involved: R. E. Patterson, P. M. Anderson, W. L. Kjelgaard. Dates: 1955-1961.

Project 764. Electrical Refrigeration Requirements for Pennsylvania Dairy Farms. Cooperating Department: Bacteriology. Agricultural Engineering staff involved: R. U. Blasingame, J. E. Nicholas. Dates: 1928-1943.

Project 765. A Study of Small, Portable, Electric Motor Requirements for Pennsylvania Agriculture. Cooperating Departments: none. Agricultural Engineering staff involved: R. U. Blasingame, J. E. Nicholas. Dates: 1928-1940.

Project 780. Tractor and Implement Control, with Special Reference to Sidehill Operation and to Certain Hitching Devices. Cooperating Departments: none. Agricultural Engineering staff involved: A. W. Clyde. Dates: 1943-1948.

Project 794. Artificial Curing of Hay and Other Forage Crops. Cooperating Departments: Agronomy, Dairy Husbandry. Agricultural Engineering staff involved: A. W. Clyde, H. B. Josephson, J. E. Nicholas, W. F. Ackerman, D. C. Sprague, E. F. Olver, H. R. Wakefield, A. S. Mowry, E. A. Myers, P. M. Anderson. Dates: 1929-1954.

**The names listed are the agricultural engineering faculty members who were involved in the project. Some of those listed, especially on projects of long duration, were with the project only part of the period.*

***Duration of the project.*

Project 795.	The Design of a Potato Harvesting Machine to Meet Pennsylvania Requirements.[1]
Project 925.	Atmospheric Corrosion Tests of Wire and Wire Products. Cooperating Departments: none. Agricultural Engineering staff involved: E. W. Schroeder, R. U. Blasingame, O. A. Kimmel, H. V. Walton, Dates: 1938-1967.
Project 982.	Application and Management of Electric Light, Heat, and Power on Pennsylvania Farms. Cooperating Departments: none. Agricultural Engineering staff involved: R. N. Jones, E. F. Olver, H. V. Walton. Dates: initial date unknown-terminated 1954.
Project 1016-E.	The Nutritive Value of Hay as Affected by the Method of Curing. Cooperating Departments: Animal Nutrition, Agronomy. Agricultural Engineering staff involved: A. W. Clyde, R. R. Yoerger, M. E. Schroeder. Dates: 1954-1961.
Project 1020.	Protective Coatings for Farm Structures. Cooperating Department: Forestry. Agricultural Engineering staff involved: D. C. Sprague, W. F. Ackerman, R. U. Blasingame, H. V. Walton, O. A. Kimmel. Dates: 1944-1972.
Project 1024-D.	Renovation of Unproductive Pastures. Cooperating Departments: Agronomy, Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: A. W. Clyde, R. R. Yoerger. Dates: 1952-1958.
Project 1053.	Handling Chopped Forage. Cooperating Departments: none. Agricultural Engineering staff involved: A. W. Clyde, R. N. Jones, H. V. Walton, P. M. Anderson, W. L. Kjelgaard. Dates: 1950-1962.
Project 1061.	Economic and Physical Factors Affecting Efficiency in the Production of Eggs and Poultry Meat. Cooperating Department: Poultry Husbandry. Agricultural Engineering staff involved: R. N. Jones, E. F. Olver, D. C. Sprague. Dates: 1946-1956.
Project 1065.	Factors Involved in the Preparation for Freezing, Storing, and Serving of Foods. Cooperating Departments: Agricultural Biochemistry, Bacteriology, Home Economics. Agricultural Engineering staff involved: J. E. Nicholas, M. D. Shaw. Dates: 1947-1957.
Project 1078.	Factors Affecting the Market Quality of Eviscerated Poultry and Poultry Meat Products. Cooperating Departments: Poultry Husbandry, Agricultural Biochemistry, Bacteriology. Agricultural Engineering staff involved: J. E. Nicholas. Dates: 1947-1957.
Project 1083.	Tillage Tool Design and Performance. Cooperating Departments: Agronomy, Zoology and Entomology. Agricultural Engineering staff involved: A. W. Clyde, R. E. Patterson, H. V. Walton, W. L. Kjelgaard, E. A. Myers, H. R. Wakefield, R. R. Yoerger. Dates: 1947-1958.

[1]*No further information available. Microfilm on which project was recorded has been lost.*

Project 1095-A.	Weed Control in Corn by Pre-emergence and Post-emergence Herbicidal Treatments and Cultivation. Cooperating Departments: Agronomy, Botany and Plant Pathology. Agricultural Engineering staff involved: R. E. Patterson, P. M. Anderson. Dates: 1948-1957.
Project 1137.	Harvesting and Processing Equipment for Seeds of Certain Grasses and Legumes. Cooperating Department: Agronomy. Agricultural Engineering staff involved: E. F. Olver, A. W. Cylde, J. E. Nicholas, E. A. Myers, D. C. Beppler. Dates: 1950-1959.
Project 1140.	The On-farm Service Center in Mechanized Farming. Cooperating Department: Agricultural Education. Agricultural Engineering staff involved: R. U. Blasingame, A. S. Mowry, R. N. Jones, O. A. Kimmel. Dates: 1950-1957.
Project 1148-A.	Environmental and Management Factors Affecting the Quality of Poultry Meat and Eggs. Cooperating Department: Poultry Husbandry. Agricultural Engineering staff involved: H. V. Walton. Dates: 1951-1959.
Project 1148-D.	Poultry House Design for Effective Use of Solar Heat in the Control of Environmental Temperatures. Cooperating Departments: none. Agricultural Engineering staff involved: H. D. Bartlett. Dates: 1957-1964.
Project 1149-A.	Electromotive Forces in Inbred and Crossbred Plant Materials. Cooperating Department: Horticulture. Agricultural Engineering staff involved: J. E. Nicholas, J. S. Perry. Dates: 1951-1954.
Project 1149-B.	Electromotive Forces in Insects. Cooperating Department: Zoology and Entomology. Agricultural Engineering staff involved: J. E. Nicholas, J. S. Perry. Dates: 1951-1954.
Project 1152-C.	Irrigation of Forage Crops for Hay and Pasture. Cooperating Department: Agronomy. Agricultural Engineering staff involved: H. R. Wakefield, E. A. Myers, M. D. Shaw. Dates: 1951-1957.
Project 1152-E.	Instruments and Methods for the Design and Operation of Sprinkler Irrigation Systems. Cooperating Department: Agronomy. Agricultural Engineering staff involved: E. A. Myers, M. D. Shaw, F. W. Peikert. Dates: 1955-1964.
Project 1196.	Handling and Processing Grain on the Farm. Cooperating Departments: none. Agricultural Engineering staff involved: A. W. Clyde, R. E. Patterson, E. F. Olver, M. J. Moore, R. P. Prince, M. E. Schroeder, W. L. Kjelgaard. Dates: 1954-1965.
Project 1198.	Air Distribution in Drying Hay and Grain. Cooperating Departments: none. Agricultural Engineering staff involved: A. W. Clyde, E. F. Olver, P. M. Anderson, W. L. Kjelgaard. Dates: 1954-1958.
Project 1199-C.	Seasonal Variation of Shell Quality in Chicken Eggs. Cooperating Department: Poultry Science. Agricultural Engineering staff involved: J. E. Nicholas, D. C. Beppler. Dates: 1955-1965.

Project 1201. Quality Control of Raw Milk Supplies. Cooperating Department: Dairy Science. Agricultural Engineering staff involved: J. E. Nicholas, J. D. Hovanesian, M. D. Shaw. Dates: 1954-1964.

Project 1229. Influence of Environmental Factors on the Effectiveness of Herbicides. Cooperating Departments: Agronomy, Botany and Plant Pathology. Agricultural Engineering staff involved: R. E. Patterson, P. M. Anderson. Dates: 1954-1959.

Project 1260-B. The Agricultural Engineering Aspects of Deep Tillage on Pennsylvania Soil. Cooperating Departments: none. Agricultural Engineering staff involved: E. A. Myers, R. E. Patterson, H. A. Peterson. Dates: 1955-1965.

Project 1282-A. Methods, Materials, and Equipment Involved in the Dairy Operation. Cooperating Departments: Dairy Science, Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: R. P. Prince, M. E. Schroeder, H. D. Bartlett. Dates: 1957-1967.

Project 1282-B. An Economic and Engineering Appraisal of Mechanical Dairy Barn Gutter Cleaners. Cooperating Departments: Dairy Science, Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: M. E. Schroeder. Dates: 1956-1961.

Project 1295. Economics of Irrigation of Forage Crops on Pennsylvania Dairy Farms. Cooperating Department: Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: M. D. Shaw. Dates: 1956-1960.

Project 1315-A. Effect of Technology on the Physical and Financial Organization of Individual Farms in the Market Milk Industry. Cooperating Department: Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: R. A. Keppeler. Dates: 1956-1959.

Project 1316. Equipment for Efficient Poultry Production. Cooperating Department: Poultry Science. Agricultural Engineering staff involved: H. D. Bartlett, D. C. Beppler. Dates: 1957-1967.

Project 1335-A. The Effect of Maturity on the Market Value and Quality of Frozen Vegetables and Fruits. Cooperating Departments: Foods and Nutrition (Home Economics), Biochemistry, Dairy Science, Horticulture. Agricultural Engineering staff involved: J. E. Nicholas, K. Q. Stephenson, P. M. Anderson. Dates: 1957-1964.

Project 1335-B. The Investigation of Non-blanching versus Blanching the Final Quality of Vegetables Frozen for Market Under Conditions of a "Quick-Freeze." Cooperating Departments: Foods and Nutrition (Home Economics), Biochemistry, Dairy Science, Horticulture. Agricultural Engineering staff involved: K. Q. Stephenson, P. M. Anderson, R. A. Keppeler. Dates: 1957-1964.

Project 1346-A.	Weed Control in Agronomic Crops. Cooperating Department: Agronomy. Agricultural Engineering staff involved: P. M. Anderson. Dates: 1958-1969.
Project 1350.	Forage Dehydration. Cooperating Departments: none. Agricultural Engineering staff involved: W. L. Kjelgaard. Dates: 1958-1962.
Project 1379.	Design of Spraying Equipment for Efficient Application of Pesticides. Cooperating Departments: none. Agricultural Engineering staff involved: P. M. Anderson, F. W. Knipe, Dates: 1959-1967.
Project 1383.	Methods and Equipment for Drying and Processing Seeds. Cooperating Department: Agronomy. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1959-1964.
Project 1397.	Mechanical and Rheological Properties of Fruits and Vegetables. Cooperating Department: Horticulture. Agricultural Engineering staff involved: N. N. Mohsenin. Dates: 1960-1965.
Project 1410.	An Economic Analysis of Size of Pennsylvania Dairy Farms. Cooperating Department: Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: M. E. Schroeder. Dates: 1960-1967.
Project 1415-A.	Mechanization of Fruit and Vegetable Harvesting and Handling. Cooperating Department: Horticulture. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1961-1968.
Project 1415-B.	Mechanized Planting for Fruits and Vegetables. Cooperating Department: Horticulture. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1961-1967.
Project 1416.	Thermodynamics of Packaged Forage. Cooperating Departments: none. Agricultural Engineering staff involved: W. L. Kjelgaard, M. E. Schroeder. Dates: 1961-1966.
Project 1421.	Stability of High Moisture Forage Pellets. Cooperating Departments: none. Agricultural Engineering staff involved: W. L. Kjelgaard. Dates: 1961-1966.
Project 1463.	Micro-climate in Dairy Housing Structures. Cooperating Department: Dairy Science. Agricultural Engineering staff involved: R. A. Aldrich. Dates: 1963-1967.
Project 1464.	Vibration Responses of Deciduous Fruit Trees with Reference to Fruit Detachment. Cooperating Department: Horticulture. Agricultural Engineering staff involved: N. N. Mohsenin. Dates: 1963-1965.
Project 1471.	Environmental Requirements of Poultry. Cooperating Department: Poultry Science. Agricultural Engineering staff involved: H. D. Bartlett. Dates: 1963-1967.

Project 1481. Renovation of Waste Water Through Application to Cropland and Forest Land. Cooperating Departments: Agronomy, School of Forest Resources, Geology, Civil Engineering, Microbiology. Agricultural Engineering staff involved: E. A. Myers. Dates: 1963-1968.

Project 1501. Structural Use of Rigid Plastics in Greenhouse Design and Plant Response Within These Structures. Cooperating Department: Horticulture. Agricultural Engineering staff involved: R. A. Aldrich. Dates: 1963-1971.

Project 1510. The Control of Bird Depredation. Cooperation Department: Zoology. Agricultural Engineering staff involved: P. M. Anderson. Dates: 1964-1966.

Project 1514. Marketing of Frozen Dairy Products in Pennsylvania. Cooperating Department: Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: R. A. Keppeler. Dates: 1964-1968.

Project 1517-A. An Economic-engineering Analysis of the Production of Mushrooms. Cooperating Department: Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: M. E. Schroeder. Dates: 1964-1967.

Project 1517-B. Marketing and Distribution of Mushrooms and Mushroom Products. Cooperating Department: Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: R. A. Keppeler. Dates: 1964-1966.

Project 1518. Thermal Characteristics of Frozen Solutions. Cooperating Departments: none. Agricultural Engineering staff involved: R. A. Keppeler. Dates: 1964-1968.

Project 1533. Mechanical Methods for Control of Insect Pests. Cooperating Department: Entomology. Agricultural Engineering staff involved: P. M. Anderson. Dates: 1965-1969.

Project 1550. Sublimation and Rehydration Processes in Stability of Freeze-Dried Foods. Cooperating Departments: Foods and Nutrition (Home Economics), Dairy Science. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1965-1969.

Project 1563. Principles of Mechanical Harvesting of Fruits and Vegetables. Cooperating Department: Horticulture. Agricultural Engineering staff involved: N. N. Mohsenin. Dates: 1965-1970.

Project 1564. Dwarfing Virus Diseases of Corn. Cooperating Departments: Plant Pathology, Agronomy. Agricultural Engineering staff involved: P. M. Anderson. Dates: 1965-1967.

Project 1575. Improvement of Efficiency in Harvesting Apples. Cooperating Department: Horticulture. Agricultural Engineering staff involved: G. W. Allshouse, F. W. Peikert, C. T. Morrow. Dates: 1965-1970.

Project 1585. Utilization of Agricultural Wastes in Crop Production. Cooperating Departments: Agronomy, Dairy Science. Agricultural Engineering staff involved: H. D. Bartlett. Dates: 1966-1969.

Project 1605. Mechanical and Physical Properties of Forage Related to Processing, Preservation, and Utilization. Cooperating Departments: none. Agricultural Engineering staff involved: W. L. Kjelgaard. Dates: 1966-1970.

Project 1640. Treatment of Greenhouse Soils with Low Temperature, Aerated Steam. Cooperating Departments: Plant Pathology, Horticulture. Agricultural Engineering staff involved: R. A. Aldrich. Dates: 1967-1969.

Project 1670. Feed and Waste Handling in the Dairy Operation. Cooperating Department: Dairy Science. Agricultural Engineering staff involved: H. D. Bartlett. Dates: 1967-1971.

Project 1730. Development of Mechanized Equipment for the Nursery Industry. Cooperating Department: Horticulture. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1967-1970.

Project 1731. Apple Harvesting Mechanization. Cooperating Department: Horticulture. Agricultural Engineering staff involved: C. T. Morrow, F. W. Peikert. Dates: 1967-1970.

Project 1741. Tillage Machine Application of Anhydrous Ammonia. Cooperating Departments: none. Agricultural Engineering staff involved: W. L. Kjelgaard. P. M. Anderson. Dates: 1967-1969.

Project 1759. System of Swine Production Designed to Improve Competitive Position. Cooperating Departments: Animal Science, Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: R. A. Aldrich. Dates: 1968-1970.

Project 1969. Thermal Properties of Agricultural Products. Cooperating Departments: none. Agricultural Engineering staff involved: R. A. Keppeler. Dates: 1968-1972.

Project 1787. Disposal and Utilization of Dairy and Poultry Manure by Land Application. Cooperating Department: Agronomy. Agricultural Engineering staff involved: H. D. Bartlett, R. M. Butler. Dates: 1968-1972.

Project 1809. Using Cropland and Forestland for Sewage Wastewater and Sludge Disposal. Cooperating Departments: Agronomy. School of Forest Resources. Agricultural Engineering staff involved: E. A. Myers, W. R. DeTar. Dates: 1968-1975.

Project 1815. Principles of Mechanical Harvesting of Fruits and Vegetables. Cooperating Department: Horticulture. Agricultural Engineering staff involved: N. N. Mohsenin, C. T. Morrow. Dates: 1969-1974.

Project 1819. Electronic Scanning, Detection, and Controls for Fruit and Vegetable Sorting. Cooperating Departments: none. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1969-1973.

Project 1826. Mechanization of Mushroom Harvesting. Cooperating Departments: none. Agricultural Engineering staff involved: S. P. E. Persson. Dates: 1969-1972.

Project 1832. Dynamics of Sublimation in Food Processing. Cooperating Departments: none. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1969-1972.

Project 1837. Combustion Performance of Burner Nozzles in Flaming Equipment for Insect Control. Cooperating Departments: none. Agricultural Engineering staff involved: P. M. Anderson. Dates: 1969-1971.

Project 1848. Methods of Reducing Corrosion of Irrigation Pipe. Cooperating Departments: none. Agricultural Engineering staff involved: E. A. Myers, R. M. Butler, F. W. Peikert. Dates: 1969-1973.

Project 1972. Improvement of Efficiency in Harvesting Apples. Cooperating Department: Horticulture. Agricultural Engineering staff involved: C. T. Morrow, F. W. Peikert. Dates: 1970-1974.

Project 1873. Engineering Systems for Forage Crop Production and use. Cooperating Departments: none. Agricultural Engineering staff involved: W. L. Kjelgaard. Dates: 1970-

Project 1901. Physical Properties of Agricultural Materials. Cooperating Departments: none. Agricultural Engineering staff involved: N. N. Mohsenin, C. T. Morrow. Dates: 1971-1974.

Project 1943. Environment Modification and Control in Greenhouses. Cooperating Department: Horticulture. Agricultural Engineering staff involved: R. A. Aldrich. Dates: 1971-1975.

Project 1953. Ventilation System and Controls for Phase II Composting in Conventional Mushroom Production. Cooperating Departments: none. Agricultural Engineering staff involved: M. E. Schroeder. Dates: 1971-1975.

Project 1957. Recycling Waste Through Ruminants. Cooperating Department: Animal Science. Agricultural Engineering staff involved: H. D. Bartlett. Dates: 1972-1975.

Project 1958. Equipment and Methods for Applying Liquid Ammonia to the Soil. Cooperating Departments: none. Agricultural Engineering staff involved: W. L. Kjelgaard, P. M. Anderson. Dates: 1972-1975.

Project 1960. Heat and Mass Transfer Through Greenhouse and Mushroom Soils and Soil Mixes. Cooperating Departments: none. Agricultural Engineering staff involved: R. A. Aldrich, M. E. Schroeder. Dates: 1971-1973.

Project 1970.	Management of Dairy Farm Waste Materials. Cooperating Departments: Agronomy, Dairy Science, Animal Science. Agricultural Engineering staff involved: H. D. Bartlett, M. D. Shaw, W. R. DeTar. Dates: 1972-
Project 1974.	Electro-mechanical Starting of Electric Motors. Cooperating Departments: none. Agricultural Engineering staff involved: P. M. Anderson. Dates: 1972-1973.
Project 1989.	Mechanization of Shoot Positioning in Geneva Double Curtain Grape Vineyards. Cooperating Department: Horticulture. Agricultural Engineering staff involved: C. T. Morrow, M. D. Shaw. Dates: 1972-1975.
Project 2031.	Thermal Properties of Agircultural Products. Cooperating Department: Food Science. Agricultural Engineering staff involved: R. A. Keppeler. Dates: 1972-
Project 2047.	Grass Filtration for Final Treatment of Wastewater. Cooperating Departments: none. Agricultural Engineering staff involved: A. R. Jarrett, W. R. DeTar. Dates: 1972-1975.
Project 2049.	Disposal and Utilization of Dairy and Poultry Manures by Land Application. Cooperating Department: Agronomy. Agricultural Engineering staff involved: H. D. Bartlett. Dates: 1972-
Project 2061.	Electronic Detection, Controls, and Systems for Sorting Fruits and Vegetables. Cooperating Department: Horticulture. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1973-
Project 2082.	Experimental Mechanized Mushroom Test Demonstration Facility. Cooperating Departments: Plant Pathology, Entomology, Agricultural Economics and Rural Sociology. Agricultural Engineering staff involved: M. E. Schroeder. Dates: 1973-
Project 2098.	Mechanized Harvesting in Tray-type Mushroom Farms. Cooperating Department: Plant Pathology. Agricultural Engineering staff involved: S. P. E. Persson. Dates: 1973-
Project 2100.	Batch and Continuous Flow Thermal Treatment of Soils, Mixes, and Soil Substitutes with Aerated Steam. Cooperating Departments: none. Agricultural Engineering staff involved: R. A. Aldrich, M. E. Schroeder. Dates: 1973-1975.
Project 2103.	Methods for Reducing Starting Current Requirements of Single Phase Electric Motors. Cooperating Departments: none. Agricultural Engineering staff involved: P. M. Anderson. Dates: 1974-1975.
Project 2114.	Physical Properties of Agricultural Materials. Cooperating Departments: none. Agricultural Engineering staff involved: N. N. Mohsenin, C. T. Morrow. Dates: 1974-

Project 2122. Mechanical Harvesting and Handling of Fruits and Vegetables. Cooperating Department: Horticulture. Agricultural Engineering staff involved: N. N. Mohsenin, C. T. Morrow. Dates: 1974-

Project 2132. Methane Gas Production from Farm Waste. Cooperating Departments: Civil Engineering, Dairy Science. Agricultural Engineering staff involved: S. P. E. Persson, H. D. Bartlett. Dates: 1974-

Project 2155. On-site Residential Wastewater and Sewage Treatment. Cooperating Departments: none. Agricultural Engineering staff involved: K. Q. Stephenson. Dates: 1975-

Project 2165. Equipment and Application Methods for Cold Liquid Ammonia. Cooperating Departments: none. Agricultural Engineering staff involved: W. L. Kjelgaard, P. M. Anderson. Dates: 1975-

Project 2169. Mechanization in Grape Vineyards. Cooperating Department: Horticulture. Agricultural Engineering staff involved: C. T. Morrow, M. D. Shaw. Dates: 1975-

Project 2194. Energy Conservation Systems for Greenhouses. Cooperating Department: Horticulture. Agricultural Engineering staff involved: R. A. Aldrich. Dates: 1975-

Project 2196. Preservation and Nutritive Values of Forages and Grains. Cooperating Departments: Agronomy, Dairy, and Animal Science. Agricultural Engineering staff involved: W. L. Kjelgaard. Dates: 1976-

Project 2207. Orchard Microclimate Modification. Cooperating Departments: Horticulture, Agronomy. Agricultural Engineering staff involved: C. T. Morrow. Dates: 1976-