The Centennial Report
1870-1970
of the College of Agriculture
University of Missouri - Columbia

by John H. Longwell
Dean Emeritus
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This Centennial Report of the College of Agriculture was prepared primarily through the efforts of Dr. John H. Longwell, dean emeritus of the College. Dean Longwell wrote the major portion of the report. The reports of the various schools and departments were prepared within each subdivision of the College.

We were fortunate in having Dean Longwell prepare this report. His experiences and observations with land-grant universities extends over 55 of the 100-year history of our College. He holds an undergraduate degree in agriculture and a masters degree in animal husbandry from the University of Missouri. He also holds a doctorate in animal nutrition from the University of Illinois.

In addition to his experience as a student, Dean Longwell has land-grant teaching and research experience as a faculty member of animal husbandry departments at Washington State College, West Virginia University, University of Illinois, and North Dakota State College. As an administrator, he was president of North Dakota State College and later Dean of the College of Agriculture at the University of Missouri from September 1, 1948, to August 31, 1960. On several occasions, he served as Acting President of the University of Missouri.

It is a pleasure to have this report as a Centennial publication. The College of Agriculture, with its research and educational programs, has had significant impact on the growth and development of our state. A historical recording of some of the highlights of its activities is most timely. I'm sure this report will be both informative and instructive to all who read it. Much material is new and other information which may be recorded elsewhere has been interpreted in the light of the more recent perspective. This report will be a valuable reference for the future.

Elmer R. Kiehl, Dean
College of Agriculture
University of Missouri - Columbia
January, 1970
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Introduction

*The History of the Missouri College of Agriculture*, by F. B. Mumford, includes much of the detailed information concerning the origin and development of the College prior to 1938. In addition, two histories of the University of Missouri, one by Jonas Viles, 1939, the other by F. F. Stephens, 1962, relate the early development of public support of higher education, the circumstances under which this development took place nationally and in Missouri, and also the origins of the University and the College of Agriculture. M. F. Miller, in two publications, *A Century of Missouri Agriculture* and *Missouri College of Agriculture Through a Half Century in Retrospect*, tells many of the changes which have taken place in Missouri agriculture and some influences which programs of the College have had on the agriculture of the state.

The publications named here deal principally with the general development of the College of Agriculture and include considerable detail concerning the resident teaching program. The Agricultural Experiment Station and the Cooperative Extension Service are not covered as thoroughly as their importance warrants. Development of the Missouri College of Agriculture has been affected substantially by its participation in the Land-Grant Association; hence the origin and development of the association will be included in this history of the College. Relationships of the College, particularly the Agricultural Experiment Station and the Cooperative Extension Service, with the federal government also must be included in the story of the College. In fact the origin and development of resident teaching, research, and extension in the College are so closely associated with those of the Land-Grant Association and USDA that the history of one cannot be told properly without reference to the others.

Extensive changes have been made in the organization of the College and in the nature of the research, resident instruction, and extension programs since 1938, the end of the period covered by the history written by Dean Mumford. This history will cover all programs of the College subsequent to 1938 in considerable detail.

Although many individuals have contributed significantly to the work of the College of Agriculture and its service to the state, special credit is due to a group of 26 men who were appointed to the staff during the first two decades of the century and remained with the College through their entire professional careers. These men became associated with the College during the years when it was becoming the recognized source of valuable information to Missouri farmers; in fact, they were
the men who established the research and teaching programs which resulted in statewide recognition of the College by the agricultural industry of Missouri. Each one of them made a unique and valuable contribution to the development of the College. Their long service gave continuity to the College programs.

All of these men had farm backgrounds and understood farmers’ problems and viewpoints. The research work of the Agricultural Experiment Station was primarily practical in nature, intended to find answers to the most pressing problems of Missouri farmers. Yet the research in animal nutrition, endocrinology, genetics, growth and development, soil chemistry and physics was basic. The undergraduate teaching programs retained considerable vocational work until after World War II. Since then curricula have been revised to include more natural science, social science, and humanities. Some criticism of the College teaching program has developed in recent years because of the reduced emphasis on vocational work.

The limited funds which were available to the College restricted the development of research and teaching programs considerably. At the same time the ingenuity of some of the men enabled them to conduct highly productive work with the limited facilities available to them.

The loyalty of these men to the College and to Missouri is deserving of special note. The salary scale at Missouri was considerably below that at many other agricultural colleges and a number of the men were invited to move to other colleges with increased salaries and higher operating budgets. Each of the men chose to remain at Missouri for reasons of his own, but a major reason probably was the freedom and encouragement which were extended to pursue the research and teaching program of each person’s choice.


The men who contributed so much to the Missouri College of Agriculture and the agriculture of Missouri were:

- W. A. Albrecht
- Samuel Brody
- J. W. Burch
- J. W. Connaway
- A. J. Durant
- W. C. Etheridge
- L. D. Haigh
- Leonard Haseman
- Charles A. Helm
- Albert G. Hogan
- A. A. Jeffrey
- O. R. Johnson
- Mack M. Jones

Harry Kempster
H. H. Krasekopf
M. F. Miller
F. B. Mumford
A. C. Ragsdale
W. H. E. Reid
Sam B. Shirky
L. J. Stadler
T. J. Talbert
E. A. Trowbridge
C. W. Turner
L. A. Weaver
J. C. Wooley
Principle of Government Support of Education Established

The Missouri College of Agriculture owes its beginning to legislation, by the United States Congress, which resulted from a nationwide demand by agricultural leaders for federal support of higher education. The principle of support of higher education by the federal government was not new. The statement of national policy appears in the Ordinance of 1787 by the Continental Congress in the words: "Religion, morality and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged."6

Subsequent to the purchase of the Louisiana Territory in 1803, a series of acts by Congress reserved lands in the new territory for "a seminary of learning." Two townships were designated in the area which became the State of Missouri. The proceeds from the sale of this land was to be a permanent fund to support a university.7

Establishment of the University of Missouri was authorized by the Geyer Act which was passed by the General Assembly and approved by the governor in 1839.8

The colleges which were established in colonial times and during the first half century of the United States as a nation were characterized by adherence to the practices which had been developed by British colleges. These included: limitation of admission to children of families with social and political position who could afford to pay the costs of college education; courses offered were limited to the classics, natural sciences, mathematics, philosophy, and theology; only one curriculum was offered for all students; classes were conducted largely in a catechistic manner, with no electives available, and satisfactory completion of the courses was based mainly on memorizing answers to specific questions. College courses made little pretense of having practical value in business or a profession. The training of ministers was one of the major functions of the early colleges. One principal reason for the establishment of Harvard College was: "Dreading lest an illiterate ministry should come to the churches when the present ministers should lie in the dust."9 A college degree was important as a status symbol.10 Law and medicine were taught mainly by proprietary schools or by apprenticeship or both.
Many national leaders at the start of the nation’s history recognized the need to provide educational opportunities of a practical nature to young people of all degrees of social status and economic level. Thomas Jefferson was the principal spokesman for this idea and he founded the University of Virginia with the intent to implement this kind of educational program. The idea was not accepted generally and it grew slowly for many years before it began to be included in college and university programs.

The population of the United States during the first half of the nineteenth century was predominantly rural. “Despite their apparent isolation and ignorance, farmers were not immune to the growing concepts of democracy. Everywhere—in speeches, letters, editorials—they began to voice dissatisfaction with their economic plight, their social inequality, and their political infirmity. When crops failed in 1838, agricultural need became a pressing issue not only to farmers but to the country as a whole. The period was followed by an amazing economic recovery—the ups and downs of agriculture once again illustrated—and by intense concern over the exhaustion of the soil in the East.”

Interest in improving agriculture was evidenced by the organization of many local, state, and national agricultural associations and societies during the first half of the nineteenth century. These organizations encouraged experiments, essays and reports of improvements in farming practices, and agricultural fairs. In 1852 the United States Agricultural Society was established, with headquarters in Washington. About 300 active societies in 31 states and five territories were members. The concerted support of these organizations had great influence in the eventual success of the impending attempt to secure congressional support of educational programs in agriculture and the mechanic arts.

Practical Education Movement Progresses

By about 1850 sentiment had developed throughout the nation favoring the establishment of colleges which would offer practical education for the agricultural and industrial classes. Although many men were involved in this movement, two emerged as leaders. These were Jonathan Turner, a school teacher in Illinois, and Justin Morrill, Congressman from Vermont.

Jonathan Turner was the evangelist who crystallized the ideas of many men into a definite plan, then promoted the plan through talks and published articles. Turner’s plan included three basic ideas.

1. Establishment of colleges which would be open, at minimum cost, to laborers in agriculture, commerce, and the arts who needed educational assistance.
2. Curricula which would include instruction in practical and vocational subjects for the benefit of the working classes.
3. Endowment of these colleges by grants of land from the vast areas held by the federal government.

Turner succeeded, in 1853, in securing the support of the Illinois legislature, which approved a resolution calling on Congress to implement the plan.

Congressman Morrill was the statesman with the political acumen to secure approval of the idea in Congress. The act, as finally passed and approved by
President Lincoln in 1862, included the basic ideas of Turner but with additional provisions and modifications which Morrill secured from other sources, some of which were politically expedient in securing approval of the bill by Congress.

Advocates of the movement to make available to people of all economic and social levels the opportunity for technical college education were motivated by the belief that education benefits each individual participant and the total society benefits as the numbers of educated individuals increase.

Benefits to the individual include his improved capacity to do the work in which he is engaged, broader perspective in his own work, greater appreciation of the arts and humanities, and better understanding of his responsibilities as a citizen. The total society is improved when a large proportion of its members are well educated because people constitute the most important resource of the nation and when the competence of people improves the nation benefits.

Technical training in agriculture and the mechanic arts was emphasized in the Morrill Act because the nation's population was predominantly rural and employment of people in industry was increasing.

**Missouri College of Agriculture Established**

The provisions of the Morrill (Land-Grant) Act of 1862 were agreed to and accepted by the Twenty-second General Assembly of Missouri in a joint resolution passed March 17, 1863. Because of the Civil War and of widespread and prolonged disagreement over the location of the College of Agriculture, the General Assembly did not agree on the establishment of the College until 1870 when a bill was passed and signed by Governor Joseph McClurg on February 24 which authorized the establishment of the College of Agriculture and Mechanic Arts as a division of the University of Missouri - Columbia. The legislative act marked the culmination of prolonged efforts, first recorded in 1852, to include agriculture in the courses offered by the University. It was part of a nationwide movement to change from the established pattern of higher education and to develop educational programs which would more nearly meet the needs of the developing nation.

The Board of Curators established a chair of agriculture in September, 1870 and appointed George C. Swallow, professor of agriculture. Professor Swallow was first appointed to the University faculty in 1852 as professor of natural science and had been an advocate for a course in scientific agriculture from the time of his appointment. The Board of Curators appointed him dean of the College of Agriculture in 1872.

**Problems of the New College**

The enthusiastic promises of great accomplishments that accompanied the establishment of the Missouri College of Agriculture were soon subdued by the sober realization that qualified faculty, necessary subject matter, classrooms and laboratories, and farm buildings and equipment with which to develop a suitable college program were not available. Other states which had established colleges of agriculture were struggling with similar problems. The principal deficiency, which was felt most acutely by agricultural college faculty members, was the lack of subject matter. Most staff members were convinced that research programs must be developed which would find applications of principles of science to agriculture. The
information obtained from research would become the basis for college courses and also could be disseminated among farmers to help them increase the efficiency of their operations.22

Hatch Act Approved

Agricultural research institutes had been established in Scotland in 1847 and in Saxony in 1852. A few American chemists worked in the laboratories of these institutes and were familiar with the organization, administration, and research of each one. They returned to the United States quite convinced that agricultural research must be developed in this country.23 The Morrill Act of 1862 refers, in Sec. 5, to — "the purchase of lands for sites or experimental farms" and to — "recording any improvements and experiments made—", but obviously with no definite research program intended.24 But the struggles and disappointments were to last for 17 years after the Missouri College of Agriculture was established until enactment of the Hatch Act by Congress in 1887 gave promise of eventual relief from the lack of necessary information. This act authorized the establishment of an agricultural experiment station as a department in the land-grant college of each state. The act also authorized the appropriation of $15,000 federal funds to each state annually to pay a part of the costs of establishing and operating the experiment station.25

The same Congress that passed the Hatch Act also authorized the establishment of the USDA. Norman J. Colman of Missouri, who was the last federal commissioner of agriculture, was appointed the first Secretary of Agriculture by President Cleveland.26

The Hatch Act very carefully protected the stations from any form of federal control. It did state, in Sec. 3 of the Act: "That in order to secure, as far as practicable, uniformity of methods and results in the work of said stations, it shall be the duty of the U. S. Secretary of Agriculture to furnish forms, as far as practicable, for the tabulation of results of investigations or experiments; to indicate from time to time such lines of inquiry as to him shall seem most important, and in general, to furnish such advice and assistance as will best promote the purpose of this act. It shall be the duty of said stations annually, on or before the first day of February, to make the governor of the state or territory in which it is located a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Secretary of Agriculture, and to the Secretary of the Treasury of the United States."25

Problems Requiring Solution

While approval by Congress of the Hatch Act constituted achievement of a long and earnestly sought goal of land-grant colleges, the reality presented college administrators with the necessity of developing answers to four problems which would determine the future courses of action and accomplishment of the colleges. Two of the problems had received extensive consideration in the conferences which eventually culminated in establishment of the Land-Grant Association.

The two problems were:
1. What should be the relative status of teaching and research in the organizational structure of the colleges?

2. Should research conducted by the colleges be principally of practical nature, directed toward answering specific farm problems, or should it be mainly basic?27

The other two problems resulted directly from the provisions of Sec. 3 of the Hatch Act. They were:

1. What procedures should be followed to enable the station directors and the Secretary to comply with the exchanges of information called for in Sec. 3?

2. How should fiscal control of the Hatch funds be accomplished?28

Movement to Establish Organization of Land-Grant Colleges

The movement to establish a permanent organization of land-grant colleges began with a meeting of Friends of Agricultural Colleges in Chicago in 1871.29 The meeting was called by President John M. Gregory of the University of Illinois and was attended by representatives of nearly all land-grant colleges which had been established at that time. George C. Swallow, professor of agriculture, represented the Missouri College. Discussions at this meeting emphasized the great need to develop research which would find answers to farm problems, how such research could be organized, and whether or not the research should be included in the total programs of agricultural colleges or in separate research institutions. A part of the delegates, particularly the college presidents, believed that the primary function of the colleges was teaching and that research should be conducted by separate research institutes or as incidental activities of the colleges. No agreement was reached and no organization was formed at this meeting.

Conferences continued to be held by land-grant college administrators and staff, including those who were supporting development of research, through the 1870's and until the passage of the Hatch Act, but without organizing a formal association although agreement was achieved by the entire group in July, 1885. The formal organization was effected on October 18, 1887, when the Association of American Agricultural Colleges and Experiment Stations was formed.30 Although formal organization was not accomplished until six months after the Hatch Act was passed, the emerging association helped to write the bill and gave strong support to its approval by Congress.

In 1882 and 1883, U.S. Commissioner of Agriculture Loring called national conferences of land-grant presidents and faculty in Washington. President George W. Atherton of Pennsylvania State College proved to be the most adept of the participants in directing the discussions. As the spokesman for the presidents, he led the discussions away from research and toward teaching.

In 1885, Commissioner Colman invited the delegates from the colleges and experiment stations to meet in Washington. He proposed three topics for their principal consideration: (1) cooperation between the colleges and USDA; (2) establishment of experiment stations; (3) uniformity in methods of experimenting. Colman, who had served as a member of the University of Missouri Board of Curators for 10 years before being appointed commissioner of agriculture,
understood the problems of the colleges of agriculture. In his address of welcome
he urged the delegates to develop ways to make research the principal identifying
characteristic of the colleges.  

Professor Seaman A. Knapp of Iowa State College, speaking for the delegates
who favored Colman’s recommendation, insisted that the conference deal princi-
pally with the subject of research. President Atherton opposed Knapp’s position of
restricting discussions to research alone. He believed that teaching should be the
primary purpose of the colleges of agriculture and that research should be
conducted principally as a means of popularizing the colleges with farmers.
Agreement was reached during the convention that research would be included in
the college organization. This compromise was accepted by supporters of research
but they remained dissatisfied with the minor position given research. The
institutions represented in this association had been instrumental in securing
passage of the Hatch Act. The association naturally devoted itself very largely
during the first year of its existence to the discussion of questions regarding the
organization, management, and work of the experiment stations and to promotion
of the interests of the stations before Congress and throughout the nation.

Organization Problem of Association Solved

Even after the association was formed, with separate committees for
agriculture, botany, chemistry, entomology, horticulture, and college management,
unity of purpose was not immediately realized. In fact, controversy between the
presidents and the deans of agriculture over the position of experiment stations in
the college organization threatened to destroy the young association on several
occasions.

Director H. P. Armsby of the Pennsylvania Agricultural Experiment Station
was association president in 1898-99 and in his presidential address he skillfully
examined both sides of the controversy in detail, with the object of effecting a
satisfactory solution. Armsby urged proponents of the separate research program to
discard this idea and to recognize the station unreservedly as an integral part of the
agricultural college with its own distinct function as an educational institution. He
argued that the college and the station were not doing two distinct kinds of work,
teaching and experimenting, but one, education.

The controversy did not immediately end but the logic of Armsby’s proposal
was so compelling that in 1902 the opponents agreed to a revision of the
constitution, which resolved the difficulty. The amended constitution established
two sections, a section on college work and administration and a section on
experiment station work. The section on college work and administration was
composed of the presidents, and no final action could be taken by the association
without assent of the section. The section on experiment stations was composed of
the station directors. This settled the long and bitter struggle between the college
presidents and the experiment station directors over the control of the association
in favor of the presidents.

As a result of this solution to the problem, nearly all land-grant colleges have
combined the administration of agricultural research and teaching under one person
who is dean of the college and director of the experiment station. The majority of
staff members hold dual appointments on the teaching faculty and the experiment
station staff. Long experience has shown the effectiveness of the practice. The teacher who does research in his subject matter area not only gains information from his own research but must keep abreast of research being done by others in the same area. The research worker who teaches will keep the results of his research summarized currently and will therefore realize more fully what his research means and what changes he must make in procedures in order to accomplish the results he hopes for.

The fact is recognized that not all staff members are equally competent or interested in both research and teaching. Good undergraduate teachers sometimes are not interested in research, hence do little or no research. Competent research workers may not be good undergraduate teachers but usually have graduate students who assist them in research work. The graduate assistants enable the research worker to do more research and the assistants have the opportunity to learn research techniques and procedures and benefit by working with research leaders.

Debate over the question of relative emphasis to be given basic or applied research continued without definite conclusion. The desire by college administrative officers to gain popular support for the colleges of agriculture from farmers resulted in major emphasis going to applied research. This trend was opposed by staff members who believed the term “original researches” used in the Hatch Act should guide the direction of their work. The discussions eventually led to enactment by Congress of the Adams Act of 1906 which states, “to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry.”

Discussions on this subject have continued until the present time. Agricultural experiment station research has included substantial amounts of basic research. At the Missouri station this has included research in biochemistry and nutrition, endocrinology, genetics, physiology of growth, physiology of reproduction, and plant nutrition. The major share of research at all agricultural experiment stations has been directed to the solution of specific problems.

Office of Experiment Stations Established

After due consideration by officers of the Land-Grant Association and U. S. Commissioner of Agriculture Norman J. Colman, the latter established the Office of Experiment Stations October 1, 1888, as a clearing house through which the exchange of information between the commissioner and experiment station directors could be effected. The OES has been reorganized several times to enable its staff to perform the services which continually changing demands required. The name also has been changed and at the present time it is known as the Cooperative States Research Service (CSRS).

Although the Hatch Act required each experiment station director to make an annual report of receipts and expenditures, nothing was said about an audit of funds. Most of the station directors believed that Hatch funds should be audited annually. The executive committee of the Land-Grant Association recommended to Congress that OES be authorized to make an annual fiscal review of Hatch funds at each agricultural experiment station. The Congress approved this recommendation in 1894.
Each year CSRS Staff members visit each state agricultural experiment station. One duty of the visitors is to audit the federal funds which the station has received during the preceding year. The purpose of the audit is to determine whether or not expenditures of federal funds have been made in accordance with the authorizations that Congress has established. The visitors also review, with the director and with research staff members, all research projects that receive federal funds.

The purpose of OES visits were stated by Dr. A. C. True, director of OES, at the Land-Grant Association convention in 1895. He said: “Their visits—are intended to be more than mere inspections regarding expenditures; they are rather in a larger sense to be conferences with station officers to learn the conditions and needs of their work, to get their views on many of the complex problems involved in the management of station work, to ascertain how the fund entrusted to the stations may be made more effective and useful.”

In addition to accomplishing these purposes the administrative staff members of OES usually have acted as advocates for experiment station directors in their relationships with the Secretary of Agriculture and with the USDA’s Agricultural Research Service (ARS).

**Experiment Station Committee on Organization and Policy**

The establishment in 1903 of two sections in the Land-Grant Association, one for resident teaching, the other for the experiment stations, and the impending passage of the Adams Act, prompted the executive committee of the association to recommend the appointment of a permanent Experiment Station Committee on Organization and Policy. The committee was established in 1905 and authorized to make regular surveys of problems which confronted experiment stations, make constructive criticisms of the station movement, and recommend proposals for corrections when needed. ESCOP established working relationships with OES and other agencies of USDA which conduct or sponsor agricultural research.

ESCOP functions as the executive committee for the experiment station section of the Division of Agriculture. All policy matters which are of concern to a majority of the state agricultural experiment stations are given careful consideration by the committee and recommendations for proposed actions are made to the section. The committee also works closely with CSRS in coordinating research programs in which state agricultural experiment stations and ARS cooperate. The legislative sub-committee of ESCOP works closely with CSRS when annual requests for federal appropriations for agricultural research are being developed. The sub-committee also appears before representatives of the budget bureau and appropriations committees of Congress to support and explain the need for the appropriations being requested.
Bibliography

6. Viles, pp. 7-8; Stephens, p.3.
12. Eddy, p. 11.
15. Ibid., pp. 26-30.
17. Stephens, p. 175.
19. Viles, p. 66.
22. Mumford, Missouri Experiment Station Bulletin 483, pp. 40-42; Mumford, F. B., The Land Grant College Movement, Missouri Experiment Station Bulletin 419, pp. 32-42.
24. Ibid., p. 218.
25. Ibid., p. 219.
26. Ibid., p. 111.
27. Ibid., Chpt. 5.
28. Ibid., Chpt. 6.
31. Ibid., pp. 49-50, 59.
32. Ibid., pp. 71-72.
35. Knoblauch, et. al., p. 221.
37. Knoblauch, et. al., pp. 91-92 and 111-112.
Development of Land-Grant Association

As the states accepted the Land-Grant Act and established colleges of agriculture and mechanic arts, about half of them, like Missouri, made the new college a division of the existing state university. The other states established independent colleges which usually were called agricultural and mechanical colleges. In time the latter colleges expanded their organizations to include schools of arts and science, engineering, education, home economics, and other disciplines. Eventually the A & M colleges evolved into universities in fact, and all, except 11 Negro colleges, have become universities in name as well, except Massachusetts Institute of Technology and Virginia Polytechnic Institute.1 In 1966 Congress authorized the establishment of the Federal City College in Washington, D.C. The College was designated a "land-grant" institution by Congress in 1968.2

Expansion by A & M colleges to include additional disciplines and the changing relationships between the agricultural colleges and other divisions of existing state universities have resulted in several reorganizations within the Land-Grant Association. From the beginning of the association, presidents of the institutions represented the general administration of the institutions, while the deans of agriculture and directors of agricultural experiment stations represented the colleges of agriculture.

Deans of colleges of engineering in land-grant institutions organized the Land-Grant Engineering Association in 1912. In 1919 this association proposed affiliation with the Land-Grant Association. The proposal was approved and the name of the organization was changed to the Association of Land-Grant Colleges. Home economics schools and departments in land-grant institutions also affiliated with the association at that time.3

The Land-Grant Association, following World War I, developed into the most broadly representative organization of higher education in the nation. Each member college or university had a statewide program through its agricultural experiment station and cooperative extension service. Many of the institutions also had statewide programs through their colleges of education, and a number of business schools and engineering colleges worked closely with business and industry. With the wide variety of viewpoints available from the administrative officers of all the state land-grant institutions, the association was able to formulate effective programs and assume leadership in many aspects of higher education.
In states with one state university which included agriculture and engineering, participation by university divisions other than agriculture and engineering in association activities led to the concept that the term "land-grant" should apply to the entire university. During the 60 years since the first Morrill Act was passed the term "land-grant" had lost the original significance and had become a convenient designation for the institutions. Recognizing the situation, the association changed the name to Association of Land-Grant Colleges and Universities.

Prior to World War II the three disciplines, agriculture, engineering, and home economics were included as divisions in the association. In the later years of the war the studies and plans for post-war programs which were made by the association included activities by other disciplines including arts and science, education, business, general extension, graduate work, and veterinary medicine. Immediately following the war these disciplines were added as divisions of the association.

While the association of these disciplines in one organization had some advantages, some concurrent factors required the association to give further consideration to the form of organization. The addition of divisions to the association resulted in increased numbers of administrative officers being absent from their campuses during the annual meeting of the association. This "absenteeism" sometimes resulted in public relations problems which were embarrassing to individual institutions.

Colleges of agriculture had originated and developed the association and it was the only organization in which all of them worked together. For several years administrators of the colleges of agriculture had become increasingly dissatisfied with the developments that were taking place in the association. They felt that the addition of more divisions restricted seriously the activities which were considered important by the division of agriculture. Serious consideration was given by the division to withdrawing from the association and establishing an independent organization by colleges of agriculture.

Following World War II, in those states with separate Land-Grant institutions and state universities, chambers of commerce, state legislatures, and other groups charged both institutions with excessive duplication of facilities and courses and with general inefficiency in their operations. These charges were discussed by the Association of State Universities and Land-Grant colleges and by the National Association of State Universities.

The NASU membership consisted of state universities in all states including the states with separate land-grant institutions and those in which the land-grant colleges were divisions of the state university. This resulted in each of the two associations including about half their membership from states with one state university and half from states with a state university and a land-grant institution.

The discussions between the two associations extended over several years without any agreement.

In 1955 the Land-Grant Association changed its name to the American Association of Land-Grant Colleges and State Universities and invited members of NASU to affiliate. The invitation was not accepted.

In 1957 the executive secretaries of the two associations began coordinating the work of the two offices in Washington. In 1958 a Joint Office of Institutional
Land-Grant Association

Research was established by the two associations. Out of these activities the two associations agreed to unite and form the National Association of State Universities and Land-Grant Colleges. In 1965 the constitution and by-laws of the Land-Grant Association were amended to provide for this union.

In the amended by-laws agriculture remains as the only division. The Association Committee on Organization which prepared the amendments made the following statement: "Retention of the Division of Agriculture within the structure of the Association along substantially its present lines is proposed after careful consideration of the alternatives involved. The Land-Grant institutions within the Association are linked with the Federal government and with each other by a series of Federal laws and state and regional responsibilities which require the maintenance of a national and regional organizational structure. Other member institutions have substantial interests in broad questions of policy related to agriculture. The Association has historically furnished the organizational structure to deal with these problems and relationships, and it was the unanimous conclusion of the Committee on Organization and Executive Committee that it should continue in this role."

Besides the Division of Agriculture the present by-laws provide for the establishment of councils of chief administrators of institutions, and of administrative officers of major policy areas on an institution-wide basis, and for commissions which have responsibility for specific categories of academic or professional education.

The Division of Agriculture consists of the chief administrative officer or officers of the colleges of agriculture who are responsible to the chief executive of the institution for programs in instruction and research related to agriculture and in cooperative extension work, and such other obligations as are determined by the internal organizational structure of the division.

The executive committee of the division consists of three representatives from each of the three sections-experiment station, resident instruction, and extension. Four members of the division executive committee represent the division in the Senate and one of these is a member of the executive committee of the association. Administrative heads of agriculture, sometimes facetiously called "overall deans," constitute a subdivision.

Each of the sections selects its own officers and each one has a Committee on Organization and Policy which functions as an executive committee for the section.

The amendment to the Bankhead-Jones Act of 1946 authorized the allotment of federal funds in support of cooperative research by state agricultural experiment stations. The experiment station section and CSRS agreed that interstate cooperative research would be most effectively planned and conducted by limiting most of the cooperation to states within each of four regions. The basis for establishing the four regions was that the problems which could be most effectively approached through cooperative research were mainly limited to the states in each of the regions. The four regions are designated the Northeastern, Southern, North Central, and Western. The Northeastern and the Western Regions each includes 12 states; the Southern and North Central 13 states each. Missouri is in the North Central Region. The four regions were designated in 1949.
The experiment station directors in each region constitute the Regional Experiment Station Committee. Regional committees establish policies for regional cooperative research within the region, including determination of subjects in which cooperative research project plans are to be made, allotment of funds to the project, and publication of results obtained by the research. Cooperative research projects are planned and the research is carried out by regional committees. The director of each cooperating experiment station appoints a staff member to the regional research committee.

The resident instruction section and the extension section established regional committees in 1949. The committees are composed of the administrative officers of the agricultural colleges in the region. Responsibilities of the committees relate to the policies and programs which are of particular concern to the respective divisions of the agricultural colleges in the region.

**Participation by Missouri Administrators in Association**

Administrative officers of the College of Agriculture have participated actively in the work of the association since its first organization. Dean J. W. Sanborn was active in helping establish the association and participated in subsequent programs. Dean E. D. Porter was elected a vice-president in 1890 and served on several association committees. Through membership on the Committee on Cooperation between Stations and USDA Dean H. J. Waters assisted in preparing the Adams Act which was passed by Congress in 1906. He was appointed a member of the newly established Experiment Station Committee on Organization and Policy in 1905. Dean Waters was a vice-president of the association in 1901.

During the 29 years F. B. Mumford was dean of the College he was very active in the work of the association. He believed firmly that the College of Agriculture should include, as a major division of its program, the dissemination to farmers of useful knowledge which was learned through the research work of the Agricultural Experiment Station. This conviction was supported by his experiences with Farmers' Institutes and agricultural trains. In 1912 the Board of Curators approved his recommendation to establish an Agricultural Extension Service in Missouri. Also in 1912 he addressed the Land-Grant Association on the subject, "Cooperation in Extension Work Between the USDA and the College of Agriculture." He assisted in developing the proposal which was presented to Congress jointly by the association and USDA to establish the Cooperative Extension Service in Agriculture and Home Economics. The proposal, known as the Smith-Lever Act, was passed by Congress and signed by President Wilson May 8, 1914.

Dean Mumford was chairman of the sub-committee of the executive committee of the association that drafted the Purnell Act, passed by Congress in 1925. This Act was the first one to authorize expenditure of federal funds to pay the costs of economic and sociological research related to agriculture. In 1940 Dean Mumford wrote a historical review of the land-grant College movement and evaluation of its contribution to American agriculture. Although he had retired as Dean two years before, in 1940 the Land-Grant Association expressed its high regard for Dean Mumford's ability and excellent service by electing him president of the association.

Dean M. F. Miller served on ESCOP, 1940 and 1941, and as chairman of the experiment station section of the Division of Agriculture in 1941. During World
War II his duties as dean of the College limited his activities in the association to attendance at the annual meetings.

At the annual meeting in 1944 the association appointed a committee to conduct a nationwide study of the impact of the war on agriculture and to develop recommendations for postwar policy for the association. Professor E. A. Trowbridge was a member of the committee and after becoming dean of the College in 1945, he participated in developing the recommendation and in writing the report.

Sam B. Shirky, assistant to the dean, addressed the Division of Agriculture of the association, in 1940, on the subject “A Revised Curriculum for Agriculture”. In subsequent years, as associate dean, he presented papers to the resident instruction section on several topics concerning curricula. In 1944 he was appointed a member of the resident teaching section committee and later was secretary of the section. He was a member of the executive committee of the Division of Agriculture and its secretary 1947-49. A member of the Resident Instruction Committee on Organization and Policy, he was also appointed a member of ESCOP in 1960, 1961, and 1962. He participated actively in the North Central Regional Experiment Station Directors Committee for a number of years.

Following his appointment as Dean, J. H. Longwell was active in association affairs. Appointed to ESCOP in 1956 he was chairman of the Committee in 1957, 1958, and 1959. In 1957 he was named chairman of the Division of Agriculture and chairman of the executive committee of the division. He was active in the North Central Regional Experiment Station Directors Committee and chairman of the committee in 1959-60.

Dean Elmer R. Kiehl is active in association affairs. He delegates responsibility for resident teaching to Associate Dean Homer Folks, who in 1968 was chairman of the North Central Resident Instruction Committee, and for research to Associate Director R. J. Aldrich, who in 1968 was a member of ESCOP and vice-chairman of the North Central Experiment Station Committee.

Directors of the Agricultural Extension Service also have participated in association activities. The first director of extension, A. J. Meyer, served on several committees, including the Extension Committee on Organization and Policy. He also presented several papers before the extension section on various phases of extension work.

During his 25 years as extension director, J. W. Burch served on a number of committees. He served on ECOP in 1941-43 and was chairman in 1943. He was secretary of the extension section in 1949 and section chairman in 1950. He also was a representative of the extension section on the executive committee of the Division of Agriculture in 1950, and representative of the Division of Agriculture on the executive committee of the association in 1956. He presented a number of papers on extension work before the extension section.

Dr. C. B. Ratchford, who succeeded Burch as director in 1959, was appointed dean of the newly established University Extension Division in 1960. In 1961 he was chairman of the Association Extension Marketing Sub-committee, a member of ECOP in 1964 and 1965, member of the Division of the Agriculture Executive Committee in 1964, and chairman of the Association Senate Special Committee on Industrial Extension in 1968.
Dr. Louise Stanley, head of the department of home economics, 1910-1923, was chairman of the Division of Home Economics in 1921, member of the Association Committee on College Organization and Policy in 1922, and chairman of the Committee on Methods of Improving College Teaching in Home Economics, 1934-1937.

Miss Florence Harrison was chairman of home economics, 1938-1948. She was a member of the Committee on Instruction in Home Economics, 1938-1939, and secretary of the Division of Home Economics, 1940-1943.

Dr. Starley M. Hunter was chairman of the department of home economics, 1948-1955. In 1948 she was a member of the Committee on Working Rules of the Division of Home Economics and a member of the Committee on Recruitment in Home Economics, 1950-1952. She was a representative of the Division of Home Economics on the Advisory Committee on Marketing Research in 1951.

Dr. Margaret W. Mangel became chairman of the department of home economics in 1955 and the first director of the School of Home Economics when it was established in 1960. Dr. Mangel was a member of the Home Economics Committee on Resident Instruction, committee chairman in 1957, and on the Home Economics Executive Committee in 1957-59 and chairman of the committee in 1959. She was a member for research on the National Project on Agricultural Communications in 1957. She became a member of the Commission on Home Economics in 1966 and chairman of the commission in 1967.

Dr. Ruthford H. Westveld was appointed chairman of the forestry department when it was established in 1947 and became the first director of the School of Forestry in 1957.

Forestry work in most land-grant institutions was organized as departments of agricultural colleges. Research and associated graduate work in forestry had not received much attention in most land-grant colleges. Expansion of forestry work by industry and the U. S. Forest Service established a demand for personnel with advanced degrees.

Dr. Westveld recognized the situation and the need to develop a solution to it. Working with other executives of forestry schools he discussed the situation with ESCOP and with administrators of the U. S. Forest Service. The proposal that Congress appropriate money in support of forestry research was approved by the association, the Forest Service and the Secretary of Agriculture. Several bills were presented in Congress and on October 10, 1962, President Kennedy approved the McIntire-Stennis bill, authorizing appropriation of federal funds to support forestry research in land-grant and other public educational institutions. Distribution of McIntire-Stennis money is administered by CSRS.¹⁴

Since the establishment of the Land-Grant Association four of the presidents of the University of Missouri have participated as officers and committee members in the association.

Dr. Richard H. Jesse, President from 1895 until 1907, was vice-president of the association 1895-1902. He was a member of the Executive Committee, the Committee on Appointments and Elections, and the Committee on Military Instruction in Land-Grant Colleges. In 1897 he addressed the association on the subject, “Preparatory Work in Colleges of Agriculture.”
During his term as President Dr. A. Ross Hill was a member of the Committee on College Organization and Policy and chairman of the Section on College Work and Administration in 1915. In 1910 he addressed the association on “The Ideal Plan of University Organization, Including the Agricultural College as a Part of a University,” and in 1915 he spoke on “The Preparation of Teachers as Contemplated in the Nelson Amendment.”

President Frederick A. Middlebush, president from 1935 to 1954, was chairman of the Association Committee on Training for Government Service, 1936-38; member of the Senate Executive Committee, 1947-49; chairman of the Land-Grant Association Committee on Relationships with the National Association of State Universities in 1949, and chairman for NASU of the Joint Committee on Relationships between NASU and the Land-Grant Association in 1950. He was senate representative on the Advisory Panel on ROTC of the Civilian Components Advisory Board in 1950.

Dr. Elmer Ellis was the most active University of Missouri president in Land-Grant Association work. He was a member of the Senate Committee on Foreign Technical Cooperation in 1960, member of the Council of Presidents in 1960-61, and chairman of the council in 1962. He became a member of the Association Executive Committee in 1962, was president of the association in 1964, and chairman of the Executive Committee in 1965. President Ellis was quite active in the negotiations of the Land-Grant Association and NASU which culminated in the formation of the National Association of State Universities and Land-Grant Colleges.

Bibliography

5. Ibid., 1956, Minutes of Senate.
6. Ibid., 1955, Minutes of Senate.
7. Ibid., 1957, Minutes of Senate.
8. Ibid., 1958, Minutes of Senate.
10. Ibid., 1964, pp. 43-44.
12. See Proceedings of the Association Meetings for participation by Presidents, Deans, and Directors, for years of their respective terms.
Administration and Organization of the College

The first department to be established in the College was horticulture, in 1878. George Husmann was named professor of horticulture. Other departments which were established by 1900 were:

<table>
<thead>
<tr>
<th>Department</th>
<th>Year</th>
<th>Chairman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinary Science</td>
<td>1888</td>
<td>Dr. Paul Paquin</td>
</tr>
<tr>
<td>Agriculture</td>
<td>1893</td>
<td>Walter J. Quick</td>
</tr>
<tr>
<td>Agricultural Chemistry</td>
<td>1894</td>
<td>Dr. Paul R. Schweitzer</td>
</tr>
<tr>
<td>Entomology</td>
<td>1894</td>
<td>J. M. Stedman</td>
</tr>
<tr>
<td>Home Economics</td>
<td>1900</td>
<td>Jane A. Zabriskie</td>
</tr>
</tbody>
</table>

With the establishment of the Agricultural Experiment Station in 1888 the dean of the college was given responsibility for administering the research work and was named director of the station. The chairman of each department was responsible to the dean and director for planning and conducting classwork and research in his subject matter area.

F. B. Mumford was appointed professor of agriculture in 1895. His teaching load was 24 hours a week and the courses he taught were agricultural engineering, animal breeding, dairying, farm crops, feeds and feeding, history of breeds of livestock, judging livestock, soils, and an advanced course in experiments in agriculture.

The establishment of departments moved more rapidly after 1900. Information which was being obtained by research in specific subject matter areas enabled individual faculty members to develop more detailed course work than had previously been possible. Between 1901 and 1919 eight additional departments were established. They were:

<table>
<thead>
<tr>
<th>Department</th>
<th>Year</th>
<th>Chairman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Husbandry</td>
<td>1901</td>
<td>Dr. C. H. Eckles</td>
</tr>
<tr>
<td>Animal Husbandry</td>
<td>1904</td>
<td>Prof. F. B. Mumford</td>
</tr>
<tr>
<td>Agronomy</td>
<td>1904</td>
<td>Prof. M. F. Miller</td>
</tr>
<tr>
<td>Farm Management</td>
<td>1910</td>
<td>Prof. D. Howard Doane</td>
</tr>
<tr>
<td>Field Crops</td>
<td>1914</td>
<td>Prof. C. B. Hutchinson</td>
</tr>
<tr>
<td>Soils</td>
<td>1914</td>
<td>Prof. M. F. Miller</td>
</tr>
<tr>
<td>Agricultural Engineering</td>
<td>1916</td>
<td>Prof. E. W. Lehmann</td>
</tr>
<tr>
<td>Rural Life</td>
<td>1919</td>
<td>Prof. O. R. Johnson</td>
</tr>
</tbody>
</table>
The departments of agricultural engineering, field crops, and soils were formed by the division of the agronomy department. The rural life department was formed by converting the farm management department into agricultural economics and adding rural sociology.

Establishment of subject matter departments serve several valuable purposes in the organization of an educational institution. Individuals who are interested in a particular subject matter area can associate closely and develop undergraduate and graduate programs, research programs, and publications. Departmental organization stimulates the advancement of knowledge in each of several limited areas within the broad subject of agriculture. Development of financial needs, budgeting, administering finances, research, and teaching programs are facilitated by departmental operations.

The increased amount of detailed work in the office of the dean and director necessitated the appointment of an administrative assistant, a position which was filled in 1910 by A. J. Meyer. The establishment of the Cooperative Extension Service in Agriculture and Home Economics added a third responsibility to the office of the dean. Meyer was appointed secretary of the Extension Service in 1914 and, because his duties in this position occupied all his time, he was relieved of his position of administrative assistant and appointed director of the Extension Service in 1917. He remained in this position until his death in September, 1930.

Sam B. Shirky was appointed superintendent of short courses and assistant to the dean and director in 1920. He remained in this position until 1948 when he was appointed associate dean of the College and associate director of the Experiment Station. During those years his duties and responsibilities were increased substantially. He initiated and supervised the development of the photo services department of the College. The student advisory and counselling service in the College was developed under his leadership. He managed the finances of the College and Experiment Station from 1948 until his retirement in 1962. Following Shirky’s retirement, Dr. Charles P. Merilan served one year as associate dean and director.

The amount of work for which the associate dean and director was responsible had increased to the point that it was divided. Dr. Homer C. Folks was appointed associate dean in 1962 and Dr. Richard J. Aldrich became associate director of the Experiment Station in 1964.

In 1941 Homer J. L’Hote was appointed assistant to the director of the Agricultural Experiment Station. His title was changed to supervisor of fertilizer inspection and supervisor of photo service in 1947 and to assistant director of the Agricultural Experiment Station in 1957. In this position he supervised the research work at outlying fields and research centers and farm operations on the College farms at Columbia.

During the last 20 years the number of graduates of the College who are employed by industry has increased substantially. Each year representatives of numerous industrial firms come to the campus to interview students who are interested in employment in industry. In 1968 representatives of 115 firms were on the campus interviewing students in the College of Agriculture. Schedules are established for the interviews and students are informed of the times when the interviews are to be held. As assistant in the office of the associate dean of the
College, Earl VanEaton, advises students and assists them in preparing for the interviews.

The student counselling service, which has been supervised by the associate dean of the College, has become an increasingly important responsibility of the College administration and faculty. As a result of the rapid advancements which have been made in agricultural science and technology and in the development of agribusiness, the professional areas for which students may prepare themselves have increased considerably. Many students are not aware of these opportunities at the time they enter college. In 1967 the position of counselling coordinator was established in the office of the associate dean and Ray C. McClure was appointed counselling coordinator. McClure informs all entering students of the functions of the counselling service and arranges for their assignment to faculty advisors. Information which faculty advisors may use in counselling students is provided by the office of the coordinator. The counselling coordinator supplies high school counsellors with information concerning the curricula and courses offered by the College and with the career opportunities which are available to graduates of the College.

Briefly stated, the objective of the student counselling program is to assist each student to plan and complete a program of college work which will be most useful to him in preparing for his preferred career.

**Division of Agricultural Sciences**

When the School of Veterinary Medicine was established in 1946 the intention was to retain a close relationship between the School and the College of Agriculture. Authorization by the Board of Curators to establish the School and appropriation of funds for its initial costs by the General Assembly both were made with the understanding that this relationship would be maintained. In discussions between the dean of the College, president of the University, and members of the accreditation committee of American Veterinary Medicine Association, the agreement was reached to establish a Division of Agricultural Sciences in which the College of Agriculture and the School of Veterinary Medicine would have equal and independent access to the University administration. The dean of the College of Agriculture and the president of the University had in mind the eventual establishment of the departments of forestry and home economics as schools and divisions of the Division of Agricultural Sciences.

The title of director was given the administrative officer of the Division. The dean of the College retained this title and the administrative officer of the School of Veterinary Medicine was named director. The same person originally served as director of the Division and dean of agriculture.

The AVMA accrediting committee was not entirely satisfied with the close relationship of the School with the College, nor with the same person serving as director of the Division and dean of the College. They originally stated that the exact title of the administrative officer of the School of Veterinary Medicine was not important. As time passed they apparently regretted this statement. AVMA continued to press for separation of the School from the College of Agriculture, a move which was made in 1958.
The School of Forestry became a division of the Division of Agricultural Sciences when it was established in 1957. The Division was abolished by the Board of Curators in 1960 and the School of Forestry became a division of the College of Agriculture. At the same time the department of home economics was made a School and a division of the College. This is in line with the plan of organization which the Board of Curators has established throughout the University system.

One characteristic of land-grant colleges of agriculture which distinguishes them from other educational institutions is the close relationships which have existed between them and people who are engaged in agriculture. The Missouri State Horticultural Society was the first organization of Missouri farm people to express an interest in the new college. The society strongly advocated the establishment of the College of Agriculture as a separate institution, not as a division of the University. After the College was located at the University the society attempted a number of times to separate the College from the University. After the appointment of J. C. Whitten as professor of horticulture and H. J. Waters as dean of the College the society’s opposition ended and it has supported the College since that time.

Relationships with the State Board of Agriculture were similar to those with the Horticultural Society. The Board of Agriculture supported the proposal to establish the College of Agriculture as an independent institution and it joined in several attempts to separate the College from the University. The cooperation between the Board of Agriculture and the College in conducting Farmers’ Institutes brought about better support of the College by the Board. Many farm leaders who thought that the College as a division of the University was of no value to farmers, became supporters of the College when they learned of its services by participating in Farmers’ Institutes.

President R. H. Jesse and Dean H. J. Waters recognized the necessity for securing the support of farm leaders and encouraged faculty members to participate in Farmers’ Institutes and to publish information which was useful to farmers. The faculty members who did remarkably fine work in changing farmers’ attitudes from that of distrust and derision to general approval of the value of the research and teaching programs of the College were J. W. Connaway, C. H. Eckles, M. F. Miller, F. B. Mumford, Paul Schweitzer, and J. C. Whitten. Participation by these men in Farmers’ Institutes and agricultural trains, and the establishment of short courses, Farmers’ Week, and a number of organizations, such as the Missouri Seed Improvement Association, was very effective in convincing many farmers that the College administrators and faculty were willing to work with farmers in planning and conducting research and teaching programs.

Farmers’ organizations at times disagreed with College faculty and sometimes accused them of failing to conduct programs which they believed were important. The exchanges between farmers and the College usually resulted in improved relationships and helped the faculty to develop more effective programs. The organization of county extension planning groups increased substantially the number of farm people with whom the College had direct contact.

Farm organizations included the general farm associations and many associations with special interests such as the Bee Keepers Association and Dairy Herd.
Administration and Organization

Improvement Associations. In 1953 more than 60 farm organizations were active in Missouri.

In 1944 a statewide Extension Advisory Committee was established. Discussions between county extension sponsoring groups and extension personnel led to the decision that this committee would be helpful in developing more uniform procedures and objectives for the extension program. The committee designated four sub-committees, one for each of the subjects: rural public affairs, balanced farming, youth programs, and farm and home improvement. The committee remained active for a number of years and was quite effective in helping to develop extension work in the four areas.

A statewide Advisory Council was established in 1953, with the purpose of facilitating cooperation and understanding between the Missouri Division of Agricultural Sciences and agricultural leaders in the state in planning and conducting research, resident teaching, and extension programs. Members of the council included two or more representatives from each county in Missouri and one elected or appointed representative of the various area or statewide organizations interested in Missouri agriculture.

The council appointed committees in the five areas of agricultural production, market organization, food and fiber technology, non-farm agricultural business, and family living and public interests. The council held annual meetings at the College during which the five committees met with staff members, discussed work which was underway, and made recommendations for further development of programs. The relationships which were developed between College staff and council members were very helpful to the College in planning and conducting effective programs for Missouri agriculture.

The Agricultural Alumni Association was reorganized after World War II and during the following 10 years developed a number of activities. The majority of the leaders in the Advisory Council were alumni. Membership in the Agricultural Alumni Association is open to all former students of the College. Associate and honorary memberships are extended to individuals who are not former agricultural students but who show active interest in the work of the College.

In 1962 the decision was made to discontinue the Advisory Council and for the Agricultural Alumni Association to assume the role of the council. The purpose of the Alumni Association, approved October 26, 1962, is: "to organize the interests, abilities and efforts of the University of Missouri College of Agriculture Alumni for the good of Agricultural Education in Missouri, and the University of Missouri College of Agriculture; and to provide the mechanics of individual and group service by these alumni to the University of Missouri. Alumni programs shall be carried out by the volunteer efforts of College of Agriculture Alumni in a manner consistent with the University of Missouri policies and procedures as the University has established through its Alumni Office." Meetings are held by the association members in each of the 14 districts in the state and in a statewide meeting during Agricultural Science Week on the campus. College staff members attend all of these meetings and discuss College programs with association members. This is an effective means of assisting the College to plan and conduct programs which are useful to the agriculture of the state.
Cooperative Research

Many problems which affect agriculture and which are considered to be sufficiently important by research workers to justify inclusion in research programs are not confined within the boundaries of a single state. Many agricultural college staff members were aware of the regional nature of many of the problems and, even before agricultural experiment stations were established, exchanged ideas and information with colleagues in other states by correspondence and personal conferences. After the establishment of experiment stations, research workers at two or more state stations at times worked together to conduct effective research work.

The infectious disease of cattle known as Texas fever is an excellent illustration of effective cooperative research. This disease had been recognized in the southern United States as a serious hazard to cattle for many years. Following the Civil War, cattlemen, especially from Texas, moved cattle from southern areas to ranges and markets farther north. When the southern cattle came in contact with cattle native to northern areas the northern cattle contracted Texas fever and many of them died. This caused northern cattlemen to oppose the movement of cattle from the south and, in an effort to protect their cattle, some northern cattlemen forcibly turned back herds of southern cattle. Sedalia was a rail shipping point to which early Texas cattle were moved. Losses from Texas fever incurred by Missouri cattlemen caused them to participate in the opposition to the Texas cattle drives.

Southern cattlemen, wishing to improve the quality of their herds, secured high class bulls from improved herds in northern states. The bulls were highly susceptible to Texas fever and the majority of them died after arriving in the south.

Dr. Paul Paquin, a highly capable veterinarian, established the department of veterinary science at Missouri in 1885. Dr. Paquin knew about the Texas fever problem and also was familiar with studies which had been made of Texas fever by other investigators. None of the studies had developed significant information concerning control of the disease. In 1888 Dr. Paquin visited the Alabama and Texas Experiment Stations and arranged to carry on cooperative research on Texas fever with those stations.

Dr. Paquin left Missouri in 1890 but, before leaving, he wrote a report of his work, published in Missouri Agricultural Experiment Station Bulletin No. 11. He isolated the microorganism, a piroplasm, which caused the disease and observed that a species of tick was involved in transmitting Texas fever. He did not show conclusively that the tick was the sole vector in transmitting the disease. The
essential role of the tick in transmitting Texas fever was shown by Dr. Theobald Smith and his USDA colleagues, who worked independently of state experiment stations.

Dr. J. W. Connaway, in 1893, resumed the cooperative research with the Texas Experiment Station. This work resulted in developing a vaccine which immunized susceptible cattle from northern states. Dr. Connaway's research, in cooperation with the U.S. Bureau of Animal Industry and a number of state experiment stations, led to the practical elimination of Texas fever as a serious hazard to cattle production in the United States.

The rate of development of cooperative research by state agricultural experiment stations was slow for a number of reasons. Funds available for support of agricultural research were limited and station directors and staff believed they should spend the limited funds to conduct research on pressing problems within the state. Many states imposed restriction on interstate travel of college staff members. Suitable methods and procedures for use in conducting research were in the process of being developed and staff members in the different experiment stations did not always agree on the procedures to use.

Appropriation of funds did not keep pace with the greater demand for research. Regional conferences were organized by state stations and USDA representatives as a means of making more effective use of research resources and exchange of information.

In 1920 the Association Committee of Projects and Correlation of Research, of which Dean F. B. Mumford was chairman, urged all experiment stations to meet the increasing needs by organizing more cooperative research. At the meeting the experiment station directors adopted a national policy of paying travel expenses of research workers to regional conferences. At the 1923 meeting of the association the directors discussed the regional approach to research in detail. 2

The Purnell Bill, passed in 1925, provided federal funds which enabled experiment stations to expand cooperative research. The bill did not make special provision for cooperative research but directors were determined to expand these programs. At a meeting in 1925 they formulated plans to promote and develop federal-state cooperative research. 3 Experience gained from these early cooperative projects was valuable in the extensive development of cooperative regional research following World War II.

Cooperative research by state stations and USDA was encouraged by private organizations. In 1925 the National Livestock and Meat Board sponsored the National Cooperative Project on the quality and palatability of meat. About 25 state stations, including Missouri, and USDA cooperated in the project.

The Bankhead-Jones Act of 1935 authorized the establishment of regional research laboratories. State stations were invited to participate in the research conducted at the laboratories. The Missouri Station has cooperated in the research at the Northern Regional Laboratory, Peoria, Ill.; the Poultry Disease Laboratory, East Lansing, Mich.; and the Swine Breeding Laboratory, Ames, Iowa. The act also provided additional federal funds for state stations. Many stations allotted part of the Bankhead-Jones funds to cooperative research.

Experiment station directors continued to press for additional funds to support cooperative research. In 1941 legislative proposals had been presented in support of
Cooperative research in cotton, forestry, human nutrition, and marketing. The outbreak of war diverted attention to research directed toward increased production of food and fiber.\(^4\)

By 1946 farm organizations were strongly supporting the development of cooperative research in cotton, marketing, nutrition, and rural housing. With their support the directors, through ESCOP, prepared a bill which was called the Research and Marketing Act of 1946. The bill amended the Bankhead-Jones Act of 1935, authorizing increased federal payments to the state experiment stations and providing that up to 25 percent of the amount appropriated under Section 9 of the Act should be used to support cooperative research.

The movement to develop interstate cooperative research results from a number of interrelated and sometimes conflicting factors. Experiment station directors and staff members have recognized, from the beginning of station research, the existence of numerous agricultural problems that are common to wide areas which include a number of states, some of them being nationwide. A few examples of a much longer list are soil fertility, crop varieties, plant diseases, animal breeding, animal diseases, farm management, marketing farm products, and farm family living. The large variety of soil types, annual and seasonal rainfall, temperature variations, length of growing season, transportation, market facilities, and market demands introduce further complications into planning and conducting agricultural research.

When the experiment station in each state conducts research into a problem which is shared by two or more states, duplication of effort and expenses may occur. If the states involved combine their research efforts to solve the problem through a cooperative project the total amounts of work and costs may be reduced. Each station will be responsible for a section of the research which is carried out under the particular conditions which exist in the state. The coordination of those portions of the research conducted by each station which apply to the general aspects of the problem on a regional basis eliminates the need for one or more of the stations to attempt, individually, to search for solutions to the regional problem. Many problems are so complex that if their solutions were attempted by a single state station a very long time and excessive costs to a single station would be required. When experiment stations cooperate in the research both time and costs should be reduced.

Agricultural experiment stations are, at times, accused of duplicating each others research and of wasting public funds provided for research to benefit taxpayers. The accusers attribute alleged duplication of research to failure of station personnel to exchange information among the states. Through their contacts in regional research committees, professional associations, journal articles, and station publications, experiment station workers usually are aware of most research under way at other stations.

In contrast with the objections to duplication, complaints are made by citizens of a state that their experiment station fails to conduct research under the conditions which characterize their state and they must depend on other state experiment stations for research information.

The four regions which were established by directors about 1926 were accepted without question in 1946. They are (1) Northeast, (2) Southern, (3)
North Central and (4) Western. Originally the regions included, respectively, 12, 13, 12, and 11 states. In addition Puerto Rico was affiliated with the Southern Region. Later Alaska asked to be added to the North Central Region and Hawaii was included in the Western Region. Missouri is a member of the North Central Region.

The Research and Marketing Act provides that the cooperative research fund “shall be designated as the ‘Regional Research fund, Office of Experiment Stations’ and shall be used only for cooperative regional projects recommended by a committee of nine persons elected by and representing the directors of the state agricultural experiment stations and approved by the Secretary of Agriculture or his authorized representative.” The Committee of Nine is composed of eight station directors and one home economics research administrator. The committee reviews all proposed cooperative research projects and approves for activation those which it finds qualify as cooperative projects. The committee also recommends the amounts of the cooperative funds for allotment to each of the four regions.

The directors in each region act as a committee to supervise cooperative research within the region. Each regional research project is planned by a technical committee composed of one staff member from each station which cooperates in the project. One director is designated by the regional committee of directors to serve as administrative advisor to the technical committee. Each proposed regional research project must first be approved by the Committee of Directors, the Committee of Nine, and CSRS before it can be activated. The regional directors determine the amounts of the regional research fund to be allotted to each station. Each director allots money from the research fund to the regional projects participated in by the station.

Criteria have been developed with which to decide whether a research project qualifies as a regional project. To qualify as a regional project the research must deal with a subject which is of direct concern in two or more states. The regional project plan provides that each cooperating station will give particular attention to the section of the total project which the interests of the state, the qualifications of the research personnel, and the equipment available to the station permit it to do.

Some duplication of research does occur among experiment stations. Not all duplication is bad. Plant breeders, for example, may conduct similar research work at several state stations and, because of differences in environmental conditions, such as soil or climatic variations, find substantial differences in such characteristics as disease resistance or rate of maturity. Some duplication of research has little or no value and directors attempt to reduce it as much as possible.

Cooperative regional research has produced much valuable information. Much time and effort have gone into developing procedures for planning and administering regional research but entirely satisfactory procedures have not been developed. Station directors and CSRS continue their efforts to improve operating procedures.
Bibliography

Resident Instruction

The evolution of agriculture from the self-sufficient type of operation to the present "agribusiness" type has brought about great changes in the resident teaching programs of the College. Prior to World War I substantially all students who enrolled in the College of Agriculture came from farms. The majority of them expected to become farm operators after graduation. The curricula offered by the College included basic courses in the arts and in the biological and physical sciences, in which the student could learn the principles upon which courses in agriculture were based. Many agricultural courses included instruction and practice in skills which could be used to increase the ease and efficiency of farm work.

Following World War I the effects upon agriculture of the applications of the principles of science and technology, which had been developed by research, became increasingly evident. Some of the developments were: replacement of animal and human labor with machines, use of mineral fertilizers, and improved varieties of crops and animal feeds which supplied the nutrients required for production.

Acceptance of these new materials and practices by farmers was slow. Their use involved changes in ways of doing things and increased cash expenditures. Knowledge of how they could be used most effectively was lacking and results were often disappointing. Research results which were obtained under controlled conditions sometimes did not prove successful under farm conditions. Research workers and representative of industry learned that extensive testing under actual farm conditions must be made and materials and recommendations modified as indicated by results of the tests.

The gradual acceptance by farmers of the new ideas and materials was accelerated by increased agricultural research information and the development by industry of more useful equipment and materials for farm use. Opportunities increased for employment of agricultural college graduates in agricultural research, resident teaching, extension work, and by agricultural industries.

Graduates who entered agricultural research and teaching found that the practical work in farm skills which was included in some courses was not useful, but they needed much broader knowledge in science. Those who were employed in industry likewise learned the value of the sciences, English, writing, and economics.

The agricultural faculty modified the requirements for graduation by reducing the number of required courses in agriculture and permitting each student to elect courses which he expected to be most useful to him. Many faculty members were
hesitant in accepting changes in curricula and in believing that some of the changes in agriculture were significant or lasting in nature. One of the more difficult ideas for animal husbandmen to accept was the replacement of horses with mechanical power. Many of the traditional production and vocational type courses remained in the curriculum until after World War II but eventually were dropped because few students enrolled in them.

In 1934, during the depression years, the curriculum was revised to permit students to enroll in courses in agriculture during the first two years and in science courses later if they returned for the third and fourth years.1 This enabled students who could not remain in college more than one or two years to secure some knowledge which would be valuable to them on the farm. At the same time a program was developed in which each student was assigned to a faculty member who became the student’s adviser. The student advisement is under continued study to make it more effective. It is recognized that not all faculty members are interested in or well qualified to advise students. Many students do not secure the help they need from their advisers. This may be because the student hesitates to consult his adviser or because the adviser does not give the student the help he expects. A survey of students who were enrolled during the years 1962-67 indicates a positive correlation of the student-adviser relationship and the satisfaction of the student with the College.

A faculty committee made a detailed study of the curricula and courses which were offered by the College of Agriculture in 1956 and recommended extensive revisions to the faculty. The rapid and extensive evolution of agriculture made the revision necessary. The faculty reviewed the recommended changes and, with minor revisions, approved them.

Curricula were established which enabled students to qualify for the B. S. in Agriculture or B. S. in Home Economics, with considerable freedom to elect courses which would be most effective in meeting the student’s objectives.

Continuing developments in agriculture led to another revision of the curricula in 1967-68. The new program enables each student to select a program of study in one of three general areas—business, professional, or science. Students who plan to enter business, such as agricultural chemicals or meat packing, choose the business option; those interested in a professional career, such as agricultural journalism or farm credit will choose that curriculum; and those who intend to continue with graduate school, preparing for research or college teaching will elect the science program.

All incoming freshman and transfer students are assigned to an adviser. This adviser will be a faculty member in the department in which the student indicates his interest. Students who are undecided are assigned to advisers who are able to acquaint students with the various alternatives and help the student to choose the area of specialization in which he is most interested.

A criticism which has been directed at the College of Agriculture is, “It educates boys away from the farm.” Dean Mumford said, “If one may attempt to evaluate the progress and development of the College as indicated by the progressive changes in the curricula, we will observe that the curriculum of 1938 is an index of the progress of agricultural education. What influences or activities of
the College itself influenced these changes? Probably the most important was the trend to specialization beginning about 1909-10 and continuing even to 1938.” It can be added that the trend continues in 1970.

Mumford further stated that a problem which the faculty had not completely solved was whether the real objective of the teaching program is to teach farming to farmers or to train teachers of agriculture and investigators in agricultural science. The curriculum, he stated, had been a compromise by which the faculty attempted to teach agriculture to farmers and also hoped to prepare teachers and investigators as well. It is worth noting that he did not mention preparation for employment in business and industry as an objective of the educational program of the College. The omission illustrates the fact that, in 1938, agriculture was still thought of as synonymous with farming. The transition from self-sufficient farming to agribusiness, though it had been developing slowly for a number of years, was not at that time recognizable as the development of the future.

Some graduates of the College were employed in agricultural business, such as commercial feed or meat packing, before World War I. Following the War the number of graduates who entered business increased and more kinds of business employed agricultural graduates.

In 1958 questionnaires were sent from the dean’s office to all alumni of the College whose addresses were known.2 Replies were received from 4,383 of them. Full or part-time farming was reported as their occupation by 612, or 14 percent of them. Eight and a half percent, 374, held administrative positions in agricultural corporations and 1,592, or 36 percent, were engaged in non-agricultural business. The remaining 1,805 were engaged in agricultural work, including administration, research, extension, and resident teaching.

Has the College educated boys away from the farm? The first look at the number of graduates, 3,771, or 86 percent, who were not farm operators indicates an emphatic yes. Further consideration of other factors suggests the College is not as guilty as the figures may indicate. Many farm boys decided before they attended college that they would not be farmers. A principal reason many of them attended college was to prepare themselves for another way of life. Some of them hoped they could learn in college to qualify as research workers, teachers, or to enter business which would help improve agriculture and thereby assist farm people. Of the 3,771 who were not farming, more than 1,800 were engaged in agricultural work. The information developed by research and disseminated to students, farmers, and business by these graduates has influenced the development of agriculture, not only in Missouri but nationally.

The curriculum of 1970 is an index of the progress of agricultural education. It also indicates recognition by the faculty of the importance of offering students the opportunity to prepare themselves for participation in the segment of agribusiness in which they have the greatest interest. The earlier question of whether the faculty is teaching farmers to farm or teachers to teach appears to have been resolved.

Undergraduate enrollment in the College has ranged widely during the war and postwar years. In 1939-40 enrollment was 1,300, the highest number enrolled up to that time. In 1944-45 the war reduced the number to 300. Servicemen were released in large numbers in 1945 and by 1947-48 undergraduate enrollment reached the alltime high of 2,300. The majority of World War II veterans had
completed college work by 1950-51, and the Korean War caused a further decline until 1953-54 when 1,520 were enrolled.

By the middle 1950's the decline in the number of farms and of farm people began to affect agricultural college enrollments, not only in Missouri, but nationally. From a post-world war enrollment in all colleges of agriculture, in 1951, of about 35,000 undergraduates, enrollments declined to 31,720 in 1959. Although American farmers continued to increase production and consumers could purchase a wider variety of high quality foods, wide publicity was given to the alleged decline in American agriculture. Farm parents, especially those who were less successful, discouraged their children from enrolling in agricultural colleges.

The appearance of Sputnik I sparked a violent attack on all American education. Politicians who were in need of a cause were among the more vocal assailants. Extensive publicity, especially in national magazines, was given to the alleged shortcomings of American education, from primary through higher education. The launching of the first earth satellite by Russia was widely claimed as proof that Russian education was superior to that of the United States.

The publicity emphasized the importance of chemistry, physics, and mathematics and omitted other physical sciences, biological sciences, and social sciences and their applications in agriculture, medicine, and sanitation. Many students were led to believe that their best chances for satisfactory careers would be achieved by enrolling in science or engineering.

The commotion subsided by 1962. Some benefit probably resulted by the institution of improved science work in secondary schools and colleges. But many students soon found that their talents and interests were in the arts, biological sciences, agriculture, medicine, or other areas.

Enrollment in agriculture at Missouri continued to decline until 1962 when it was 896. The number has increased substantially each year since and in 1968 was 1,565. From the low of 31,720 students enrolled in all U. S. colleges of agriculture in 1959, the total had risen to the all-time high of 50,717 in 1968. The sharp increases in agricultural enrollments reflect the greatly increased demand for graduates of agricultural colleges by business.

The curriculum revision in 1967 included the development of two new courses. For a number of years the beginning courses in botany and zoology had not included much information which members of the plant and animal science departments in the College of Agriculture believed was important. The elementary courses offered in the animal and plant science departments also were unsatisfactory. The first courses offered by animal husbandry, dairy husbandry, and poultry husbandry duplicated many topics and contained much material from earlier areas which was no longer appropriate.

Representatives of the three animal science departments and the School of Veterinary Medicine planned a new course called animal science 12, which was first offered in 1966-67. This course is a survey of the principles of animal production including the importance of animal agriculture and animal products, genetics, anatomy, physiology, nutrition, animal diseases, and public health. The course replaces the beginning courses animal husbandry 1 and poultry production 1. Beginning in 1967 the zoology 1 requirement for all students was dropped and the animal husbandry department replaced the zoology course with animal science 12.
The field crops department discontinued the course field crops 1 in 1965 and replaced it with crop science 110. The new course includes the nature, importance, and ecology of crop plants and principles of production and management. It is being continued by the field crops division of the agronomy department.

All of the older departments have revised and combined courses, added new ones and dropped old ones, and the departments which were established in 1967 have added a number of courses. The course additions and changes have brought the courses offered by the College more nearly up-to-date than they have been for many years. The rapid acquisition of new knowledge from research requires frequent revisions of many courses if they are to acquaint students with current information.

The graduate programs offered by the College have greatly increased during the last 20 years. Knowledge gained in graduate work has become a requirement for employment and advancement in both public and private research institutions, college teaching, and extension work. The intellectual development which an advanced degree represents is important, not the mere possession of the degree. A comparison of the number and percentage of the highest degrees earned by faculty members in agriculture, forestry, and home economics between 1948 and 1969 indicates the progress which is being made in faculty competence.

### Highest Degrees Earned by Resident Faculty in Agriculture, Forestry and Home Economics

<table>
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<tr>
<th>Year</th>
<th>Bachelor of Science</th>
<th>Master of Science or Equivalent</th>
<th>Doctor of Philosophy or Equivalent</th>
<th>Total</th>
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<td>1948</td>
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<td>Percent 12</td>
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<td></td>
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The increase in graduate programs and in the number of graduate students has been made possible by the competence of the faculty to conduct research and graduate teaching and the new up-to-date research equipment and facilities which have been acquired. The substantial increases in state appropriations, federal grants, and gifts by individuals and business firms have provided for capital expenditures and operating costs.

Evaluation of credit for undergraduate agricultural courses which are offered by students who transfer from one land-grant college to another has never been a serious problem. The resident teaching section of the Division of Agriculture of the Land-Grant Association has discussed and resolved questions concerning transfer of credits among the colleges of agriculture. No accrediting organization, similar to those in many other subject matter areas, has been needed by land-grant colleges.
Many teachers' colleges, early in their development, offered courses in general agriculture. The courses were intended to inform students, who expected to teach in rural areas, about the general subject of agriculture. Eventually the colleges appointed teachers, who had been successful teachers of vocational agriculture in high schools, to teach agricultural courses. The majority of these teachers replaced the general agriculture courses with courses in subject matter areas such as agricultural engineering, animal husbandry, horticulture, and soils. Similar developments have occurred in almost all states.

The five state colleges in Missouri offer agricultural courses in all subject matter areas which the Missouri College of Agriculture includes. Two of the state colleges, in 1950, each had one man teaching all of the courses, two of them had two men each, and the fifth college had a three-man staff. In 1950, the College of Agriculture included 14 subject matter departments, each department having a staff of five or more members, with a total of about 130 teachers on the College faculty.

The rapid accumulation of new information in agricultural science and technology requires the specialists in each subject matter area to revise and update the material which they include in their courses. This they can do by conducting research and by continuing reviews of research conducted by other staff members and other institutions.

The small number of state college staff members, each of whom attempted to cover all of the specialized subjects in agriculture, could not teach all of the subjects adequately nor were they in position to keep up to date in one subject. Yet the state colleges insisted that the College of Agriculture accept all the credits in agriculture which were offered by students who transferred from the colleges to the College of Agriculture. These students rarely had acquired sufficient grasp of any agricultural subject to enable them to proceed satisfactorily with more advanced work in the College of Agriculture.

The faculty of the College of Agriculture discussed the matter and early in 1953 approved a proposal to require all transfers from the state colleges to pass examinations in the subjects for which they submitted credits from the state colleges before they received credit for the courses in the College of Agriculture. The dean of the College discussed the subject with the president of the University, who approved the plan and the dean's proposal to notify the five colleges.

A notice was sent by the dean to each of the five colleges. The response was immediate and violent. The University was accused of again attempting to dictate policy to the colleges and to grossly insult the colleges by saying that their teaching programs were of low quality. The Boards of Regents of the colleges protested to the Board of Curators of the University. President Middlebush retired during the controversy and the College did not have his promised support. The Board of Curators informed the dean of the College that the proposal to require transfer students from the state colleges to take the examinations interfered with the Board's efforts to improve relationships with the state colleges and recommended that the proposal not be made effective.

The state colleges were quite pleased over the outcome of the issue and expanded their efforts to develop agricultural courses. The next announcement of courses which Southwest Missouri State College issued stated that the courses
offered in agriculture led to a B.S. with major in agriculture which was equivalent to a B.S. in agriculture offered by a land-grant college of agriculture.

A committee was appointed in 1954 to consider the matter. The committee included three staff members from the College of Agriculture and one from each of the five state colleges. Discussions held by the committee served to ease some of the tensions which had developed. Southwest Missouri State College was persuaded that the claim which it had made about its degree misrepresented the facts and it was not repeated. In 1956, the faculty of the College of Agriculture discontinued some elementary courses and extensively revised others so that most courses offered by the state colleges no longer qualified for credit.

The revisions in courses made by the College of Agriculture in 1956 eliminated most of the elementary and vocational material which had been retained for many years but was no longer of college level. The revised courses include much more of the applications of science and technology which are important in modern agriculture. The state colleges point to this change in emphasis by the College of Agriculture as evidence that the College is no longer concerned with the needs of farmers. The state colleges have continued to increase their agricultural offerings with emphasis on vocational work. They continue to insist that the College of Agriculture accept their courses for credit by transfer students.

A number of junior colleges now offer, or plan to offer, courses in agriculture and have asked the College of Agriculture to accept the courses for credit.

Bibliography

Financial Support

Resident Instruction

Adequate financing was a serious problem for the College for many years after the date of its establishment. The endowment which the Morrill Act authorized consisted of Ozark area land for which a limited market existed. Although excellent timber stood on much of the land, the lumber industry had not entered the area and no income could be obtained from the sale of timber. The University had little or no other funds with which to finance the new division.

The General Assembly stipulated in the law which established the College of Agriculture and the School of Mines and Metallurgy that three-fourths of the income obtained from the sale or lease of the Morrill lands should go to the College of Agriculture and one-fourth to the School of Mines.

Boone County's generous contribution of $60,000 to pay for the 640-acre farm and an additional $30,000 cash constituted nearly all the financial assets available to the College. Some receipts were obtained from the sale of products grown on the farm but these were limited in amount and varied considerably from year to year.

The legislature's appropriation to the University in 1872 included $81,400, from the sale of land, as endowment for the College of Agriculture. The Thirty-fourth General Assembly, 1887, made the first direct appropriation, from taxes, to the College. This money was to pay for a variety of items which included small farm buildings, two cottages for farm laborers, purchase of cattle, sheep, swine, horses, implements, library books, student labor, and laboratory equipment.

Interpretation of the clause in the Morrill Act "...without excluding other scientific and classical studies," caused confusion and resulted in considerable difficulty for President Laws. By 1886, the endowment funds for the College were greater than those of the rest of the University but the income from both funds was used for expenditures which were common to both the College of Agriculture and other divisions of the University as, for example, the salary of a chemistry professor. This led President Laws to conclude that the College "was the central column of the University, that the academic schools constituted the course of culture for the College of Agriculture and a fitting name for the institution would be "The Missouri Agricultural College and Industrial University."
“On the cover of the title page of the catalog of 1886 appeared the following: "The Forty-Fourth Catalogue of the Missouri Agricultural College and University." Immediately after the listing of the names of the faculty and students was an outline of the University and entered under "The Academic Schools of the Agricultural College" were the various scientific, literary, and language departments—making up the regular arts and science course. Following that classification were the professional or business schools, nine in number, including agriculture, military science, mining, and engineering. This was followed by the explanation that the academic schools belonged to the Agricultural College which, according to law (the Act of Congress of 1862), was organized with a course of general culture for the farming class. In this section of the catalog devoted to the Agricultural and Mechanical School, was an elaborate and technical interpretation of the act by which the Agricultural College was established, probably an interpretation never in the minds of the authors of the act. The intention of the whole theory presented by President Laws was found in one italicized sentence near the end of his explanation: "The income of the Agricultural College moneys is just as legitimately used in teaching the general as the special course."

This action by Laws elicited vigorous objections by faculty, students, and numerous people around the state. The Board of Curators eventually refused approval and issued a statement that the name of the institution is the State University as provided in the State Constitution.

For the first 25 years, 1870-1895, the condition of the College finances was precarious, the result of several factors. Important among the factors were a) uncertainty on the part of College and University administrators and faculty concerning the curricula and courses to be offered; b) lack of information which could be included in courses; c) impatience and resulting adverse criticism of the College and University by farmers and the public generally. The Legislature, representative of the entire state, regarded the College and the whole University as a Boone County institution, hence did not understand why money paid by taxpayers from the entire state should be appropriated to support an institution in a single county. This attitude on the part of some members of the Legislature continues at the present time.

An almost continuous campaign of opposition to the College was carried on, several times taking the form of bills introduced in the Legislature to remove the College from the University and establish a separate institution. The University administration was repeatedly accused of misuse of Morrill endowment income and of failure to provide proper facilities for the College. Under these circumstances the reluctance of the Legislature to appropriate the funds needed by the College is understandable, even though several investigations failed to show any misuse of funds.

The change for the better actually started with the establishment of the Agricultural Experiment Station in 1888 and a research program organized with Hatch funds, to support it. But time was required before research began to produce information which was useful in the classroom and on farms.

An administrator with the ability to organize and direct the teaching and research programs was required. This man came in the person of Henry J. Waters who was appointed dean of the College and director of the Experiment Station in
1895. Dean Waters was an able administrator and realized the necessity to inform people of the work of the College and to consult with them in developing College programs. Under his able guidance the public attitude changed from one of distrust and derision to general recognition of the value to Missouri agriculture of the research and teaching programs of the College. This improved attitude by the farm leaders of the state was reflected in friendlier relations with the Legislature, which became eventually more liberal in appropriating funds to the College.

Second Morrill Act

Justin Morrill, elected senator in Vermont in 1866, continued his great interest in developing the colleges which the law, named for him, had made possible. Representatives of the land-grant colleges continued to work with him in persuading Congress to approve additional federal financial support for the colleges.

In December, 1871, Frederick Watts, U. S. Commissioner of Agriculture, invited each state agricultural college, agricultural society, and state board of agriculture to send two representatives to meet in Washington on February 15, 1872. Among the topics that Commissioner Watts suggested for consideration was that of seeking further land grants from Congress for support of colleges of agriculture and mechanic arts. Professor Swallow represented the Missouri College of Agriculture at this meeting.

The convention authorized the appointment of a committee to draft a bill which would provide additional federal funds to support the colleges. The bill was sponsored by Senator Morrill, who introduced it in the Senate February 23, 1872. This bill was not passed. It was followed by a number of bills that were introduced by various members of Congress during the next 18 years, most of them written or at least approved by land-grant college representatives.

Senator Morrill introduced a bill in March, 1890, which authorized the allotment of $25,000 annually to each state and territory for further support of land-grant colleges. The bill was passed by both houses of Congress and signed by President Harrison in August, 1890. It is known as the second Morrill Act. The first Morrill Act of 1862 was believed by many people to be too vague with respect to the college subjects for which it could be spent. The second Morrill Act states that the federal funds provided by the Act are restricted to the teaching of "agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic science, with special reference to their applications in the industries of life and to the facilities for such instruction." The executive committee of the Land-Grant College Association wrote a substantial part of the bill and gave strong support to it before congressional committees.

Twenty-five percent of the land-grant money received through the first Morrill Act went to the School of Mines, the other 75 percent to the University at Columbia. One-sixteenth of the $25,000 which the second Morrill Act made available to Missouri was allotted to Lincoln University, 25 percent of the remainder to the School of Mines and the remainder, about $17,579, to the College of Agriculture.

Although the Morrill Act of 1862 authorized the teaching of "such branches of learning as are related to agriculture and the mechanic arts...in order to promote the liberal and practical education of the industrial classes," the land-grant colleges
developed agricultural education as their primary activity and professional engineering next in importance. Morrill and others, who supported the idea of public support for education, specifically included industrial laborers among those for whom the colleges would develop educational programs.

The emphasis which land-grant colleges gave to agriculture resulted from the great interest of agricultural leaders in the development of teaching and research. Professional engineering education developed because of support by manufacturing and mining industries. Labor leaders and the organizations which they represented did not support the development of specific educational programs for laborers as assiduously as the leaders in agriculture and industry.

President R. H. Jesse strongly supported the efforts of Dean Waters and the faculty of the Missouri College of Agriculture to encourage farm people to make use of the educational facilities of the College. He advocated teaching agriculture in the public schools and, in an address to the State Teachers Association in 1898, he urged the teachers to come to the University to learn to teach agriculture. The next year the association endorsed the teaching of agriculture in the public schools. Other states were moving in the same direction. In 1906 Illinois, Missouri, and Washington offered training in agriculture to public school teachers.10

The Association of American Agricultural Colleges and Experiment Stations, in 1906, adopted a resolution which called for the introduction of a measure before Congress requesting additional federal appropriations along the same general lines as the Morrill Act of 1890. Such a bill was introduced by Senator Nelson of Minnesota, as an amendment to the second Morrill Act. The bill became law, March 4, 1907. The Nelson amendment increased federal funds to each state and territory by $25,000 annually. The Nelson money was distributed to Lincoln University, the School of Mines, and the University in the same proportions as the second Morrill Act money. Discussions in the association had indicated the intention to use part of this new money to develop courses in agriculture for public school teachers, but rapid increases in enrollment in colleges of agriculture and increasing specialization in the different areas of agricultural education did not leave agricultural college faculty members sufficient time for appreciable increases in public school teacher training.11

Enrollment in the Missouri College of Agriculture increased rapidly during the first decade of this century. In 1900-01 total enrollment was 160, in 1905-06 it was 186, and in 1910-11 a total of 702 students were enrolled in the College.12

The teaching program in agriculture was paid for with funds received from three principal sources. One source included money from the original land-grant endowment, the Morrill Act of 1890 and, after 1906, the Nelson Grant. Not all of this money was allotted to the College of Agriculture. The portion of the Morrill-Nelson funds received by the University was used to pay parts of the teaching costs in arts and sciences, engineering, and agriculture.

The money obtained from the sale of animals, animal products, and crops which were produced in the teaching program was included in the teaching budget. The sales money received by each department was credited to the teaching fund of that department. This practice sometimes resulted in too much emphasis by department chairman on production for the purpose of securing more money for department operations. In recent years money received from sales of materials
produced in the teaching program has been placed in the general college teaching fund. The money is allotted by the dean’s office to supplement the teaching budgets of departments. Income from sales varies considerably from year to year and cannot be relied upon for regular, continuing costs.

Substantially all the costs of conducting the teaching programs by the College of Agriculture during the first 40 or 50 years appear to have been paid from the two Morrill funds, the Morrill-Nelson fund, and sales income. Probably during the administration of President R. H. Jesse the first allotments of funds for teaching were made to the College of Agriculture from the general University maintenance fund. The maintenance fund included money appropriated by the General Assembly and fees paid by students.

During the administrations of President R. H. Jesse and Dean H. J. Waters, the General Assembly responded fairly well to University appropriation requests for buildings for the College of Agriculture. Whitten Hall, the east section of Eckles Hall, Waters Hall, a building for animal husbandry now used by agricultural engineering, the agricultural engineering shop building and several barns were constructed between the years of 1900 and 1909. Some increases were made in appropriations for faculty salaries, equipment, and operations but the amounts were less than were needed to add staff members and teaching facilities to properly provide for the increase in student enrollment. Stephens states, “The total asked for the University at Columbia in 1907 was $1,235,800 and the total granted was $817,000—nearly $200,000 more than the sum recommended by the Board of Visitors. It was $10,000 more than was recommended at first by the appropriation committee of the House. As had happened so many times before, not all of the appropriation was received, and as the end of the period approached it was found that the University would have a deficit of over $100,000.”

Dr. A. Ross Hill became president of the University in 1907 and F. B. Mumford was appointed dean of agriculture in 1909. During the first five or six years of their administrations the General Assembly increased appropriations appreciably. Stephens says that the years from 1912 to 1914 may be considered the zenith of Hill’s administration.

In 1914 and 1915 there occurred several incidents which resulted in the development of extensive opposition to President Hill and the University by the General Assembly. In addition, the finances of the state were in bad shape. The depressing effects of World War I on University activities began in 1915, were most evident in 1918, and continued into 1919. The result was the beginning of a lengthy period of insufficient funds with which to operate and develop the University.

The General Assembly, in 1921, increased University maintenance appropriations considerably and faculty salaries were raised. The cost of living had increased rapidly after the war, and faculty salary raises were little more than enough to meet rising costs. A number of faculty members, who objected to President Hill’s policies and who thought they should have received greater salary increases, organized in opposition to the president. They were encouraged by three local men who had developed personal animosities to Hill and attempted to attack him in the Board of Curators and the General Assembly. Their efforts to oust him failed, but he tired of working under the handicap of their opposition and resigned in 1921.
Financial Support of Instruction

The University did not make such progress during the 14 years, 1921-1935, during which three men served as presidents. J. C. Jones, dean of the College of Arts and Science, had reached retirement age when he was asked by the Board of Curators to become successor to Dr. Hill. Jones accepted with the understanding that he would serve until a younger man could be found. He was successful in securing appropriations from the General Assembly and in public relations in the state. He served during 1922 and 1923 when Dr. S. D. Brooks was appointed president. Brooks was not able to secure the support of the General Assembly and the financial condition of the University reached a dismally low state during his administration. He resigned as President in 1930.

The Board appointed Walter Williams, founder and dean of the School of Journalism, to replace Brooks. President Williams was widely and favorably known throughout Missouri and had good relationships with the General Assembly. Unfortunately, his term as President, 1930-1935, coincided with the worst years of the great depression. Funds were not available to the state government from which the General Assembly could appropriate the money required to meet the minimum needs of the University. The decline in University activities and development, which began during the administration of President Brooks, continued through President Williams’ term.

The resident teaching programs of the College of Agriculture suffered equally with the other divisions of the University. No buildings or other facilities were added after construction of Mumford Hall in 1922. Dean Mumford was able to hold the faculty together pretty well by increasing the share of their time given to research in the Station. The addition of funds by the Purnell Act helped considerably, although state appropriations to the Station declined.
Agricultural Experiment Station Finances

For the first 13 years of its existence the Agricultural Experiment Station received no funds appropriated by the General Assembly. The only funds available were the Hatch grants and small amounts obtained from the sale of crops and animals produced in research work which were added to the Hatch money. Although small in amount this income was a valuable supplement to the Hatch money in paying costs of research. The first state appropriation to the Station was in 1901, in the amount of $3,500. The next appropriation to the Station by the General Assembly was in 1905, when $10,466 was appropriated. The General Assembly has appropriated funds for the Station every year since 1905 but for many years the amounts were quite limited. In 1939 the appropriation was $100,160, the first appropriation of $100,000 or more.

The Congress passed the Adams Act in 1906. This provided for federal grants to each experiment station in the amount of $5,000 in 1907, $10,000 in 1908, and $15,000 in 1909 and in each succeeding year. These grants were in addition to the $15,000 provided by the Hatch Act. Experiment station directors generally believed that the broad wording of the Hatch Act, "...to aid in acquiring and diffusing...useful and practical information..." gave undue emphasis to the development of "practical information" and discouraged "original research." Hence they supported the proposal to restrict use of funds provided by the Adams Act to support scientific research. Accordingly the act specifies that the money is "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States."

Director Waters and station staff members applied the Adams money to the support of several basic research projects including "effects of plane of nutrition on the growth and composition of cattle," "effects of nutrient supplies on the composition of milk," "a study of the periods of gestation and lactation upon the growth and composition of swine," and "development of the maize plant as affected by the nutrition and moisture supply." These projects yielded information which was of practical value and also led to further basic research in endocrinology, growth, nutrition, and physiology of reproduction.

The new Fertilizer Control Law which was passed by the General Assembly in 1903 provided that all costs of administering the law would be paid from proceeds derived from the sale of tags which must be attached to containers in which fertilizers were offered for sale. Any surplus funds remaining after such costs were paid was to be used by the director to pay for other Experiment Station work
which would benefit farmers. At first these surplus funds were small but as fertilizer
use has increased, they have become a significant part of the income for the
Agricultural Experiment Station. Subsequent to the year 1905, Experiment Station
income was derived from four principal sources. These were, federal (Hatch and
Adams), state appropriations, sales, and fertilizer fees. The two latter funds are
combined in an item designated “other income.” In about 1926 industries and
individuals began to make grants to help support research work. Grant funds also
are included in the “other income” item.

Federal funds totaled $30,000 a year until 1926, when the Purnell Act
provided an additional $20,000 with annual increments of $10,000 up to $60,000
in 1930. Appropriations by the General Assembly varied widely, from $79,216 in
1908 to $2,989 in 1919, with the annual average, between 1905 and 1929, being
$24,478. Other income varied between $151,850 in 1929 and $11,575 in 1917.

Although Missouri for many years has ranked 10th or higher in cash income
from the sale of farm products, it has stood 28th or lower in the amount of
money appropriated by the General Assembly to the Agricultural Experiment
Station. Throughout the entire history of Missouri, farming has been the most
important industry, measured by the number of people employed and total cash
income. Industries directly related to agriculture constitute the major segment of all
urban business in the state. A number of states which have less favorable natural
conditions than Missouri, such as soil types, rainfall, and length of growing season,
have received substantially higher state appropriations and have increased farm
production and income relatively more than Missouri has. The Missouri Station has
received credit for making more effective use of the limited funds available than
any other station.

Reasons for the reluctance of the General Assembly for so many years to give
more liberal support to the Experiment Station are not clear. Probably they were
integral parts of the legislators’ failure to recognize the financial needs of the entire
University and appropriate the funds required to support it adequately. In their
requests for state appropriations for the Agricultural Experiment Station, the
station director and the University president repeatedly emphasized the fact that
the great variety of crops which are produced on Missouri farms requires a more
varied and therefore more expensive research program than is true in most other
states.

The General Assembly increased appropriations to the Experiment Station
substantially in 1938, 1939, and 1940. These increases and the larger amounts
from the Bankhead-Jones fund raised the total amounts available to the Station to
the highest amounts received up to that time. During World War II, the research
programs of the Station were restricted. A number of staff members were given
leave for service in the armed forces or in war industry, materials and equipment
which were required for research were not available, and funds from state
appropriations, sales, and fertilizer fees were reduced.

The effects upon agriculture of a number of factors which had been developing
gradually for a number of years were accelerated greatly by circumstances which
were imposed by the war. The factors are elements in the general process in which
labor is replaced by capital. Included are: greater cash expenditures, substitution
of mechanical power for human and animal labor, application of more efficient
management practices, use of genetically more productive plants and animals, liberal applications of plant food to the soil, improved tillage practices, control of plant diseases and pests, feeding properly balanced rations to animals, control of animal diseases and parasites, and development of more favorable marketing procedures for farm products.

Farmers responded willingly to appeals by the federal government to increase food production to meet national requirements for the war effort. Higher prices and the removal of restrictions on production encouraged farmers to produce to the limits of their capacities. Even though industrial production was diverted principally to the manufacture of war materials, sufficient farm production materials were made available to farmers to help them to overcome the shortage of labor. The pressures imposed by the war made farmers very much aware of the importance of research in developing the information and materials which enabled them to increase production efficiently. Before the end of the war, farmers had developed need for still more research information and were demanding more research than the limitations of war permitted.

The state agricultural experiment stations and the USDA were aware of the accumulating demand for research and developed proposed legislation which was presented to Congress. A bill known as the Research and Marketing Act of 1946 was passed by Congress and approved by the President. Title I of this act is an amendment to the Bankhead-Jones Act and authorizes the appropriation of additional money to the state agricultural experiment stations. Section 9 (b) of the act authorizes allotment of up to 25 percent of the total appropriated for any one year to support cooperative research by the experiment stations, on a regional basis. This was the first time federal funds had been designated for use in support of inter-state cooperative research. Many state experiment stations had been conducting cooperative research for a number of years, the costs being paid from funds which were available to the individual stations. The 9 (b) funds recognized the value of cooperative research and encouraged the experiment stations to expand this work when it is justifiable. The bill requires that not less than 20 percent of the funds included in 9 (b) must be used for cooperative marketing research.

Title II of this act is known as the “Agricultural Marketing Act of 1946.” Funds appropriated under this title are designated to support research in marketing and distribution of agricultural products. Title II funds are administered by the Secretary of Agriculture. He is authorized to allot funds to a member of different research agencies, including state agricultural experiment stations. The funds from the Research and Marketing Act first became available for fiscal 1948.

The several acts of Congress appropriating federal funds to state agricultural experiment stations included a variety of rules and restrictions which required detailed records which were burdensome to station administrators. In 1955 ESCOP and the Office of State Experiment Stations developed a bill which consolidated the essential provisions of all the federal acts and eliminated most of the objectionable details. Congress approved the bill, designated the Consolidated Hatch Act in 1955. The act provides the $90,000 formerly included in the original Hatch, Adams, and Purnell Acts will be allotted to each station without the requirement of matching funds. Allotments of all other funds are made on a dollar for dollar matching basis.
In 1945, the Missouri General Assembly increased the amount appropriated to the Experiment Station to $105,176 and has continued to increase the amounts each year since. During the first 45 years, 1901 (when the first state appropriation was made) through 1944 the total amount appropriated was $2,459,129. In the 10 years, 1945-1954, the total was $1,882,993 and during the 10 years, 1955-1964, the total was $7,279,749. The appropriation in 1960, $1,105,085, was the first one in excess of one million dollars. The state appropriation for 1968-69 is $3,852,104.

In addition to the funds appropriated by the General Assembly and the funds obtained from the Hatch and other federal laws which appropriate funds for state agricultural experiment stations, the Missouri Station received substantial support in the form of grants made by industry, foundations and by federal agencies other than USDA. Income to the Station from grants was small until about the end of World War II; it has increased rapidly since 1946.

Industries related to agriculture made little use of research for many years. Fertilizer companies were among the first to recognize the value to them of soil fertility research. The fertilizer companies became aware of the value of soil fertility research by an indirect route.

Fertilizers which were offered to farmers contained small amounts of plant food and they were applied with little regard to fertility levels of soils or to the plant food requirements of the crops being grown. Soil fertility research indicated the kinds of plant foods which were most effective on different soil types and the kinds and amounts of plant foods required by each kind of crop plant. This information was given to farmers by experiment station publications and by agricultural extension workers. As farmers became aware of the greater value of high-analysis fertilizers, they demanded higher quality goods of the manufacturers.

Fertilizer manufacturers who were alert to market demand produced the higher grade materials which farmers called for. The fertilizer control program, which was conducted by the Agricultural Experiment Station, protected farmers from exploitation by distributors of poor quality materials and assured manufacturers of high-analysis fertilizers that the value of their products would be recognized.

Although recognition by industry of the value of agricultural research developed slowly, many companies eventually came to appreciate its value to them. Probably the first industrial grant in support of agricultural research at Missouri was made by a fertilizer manufacturer to the soils department in 1925. Not many industrial grants were made until after World War II. In 1955 industrial grants totalling $70,000 were made in support of research in five departments. A total of $104,144 were made to 12 departments in 1960 and in 1968 grants from industry to 15 departments totalled $270,437.

Some of the companies which offer to make grants expect to receive the results of the research before it is released to the public. This privilege cannot be permitted by the Experiment Station, which is an institution supported principally by public funds and all research results must be made available to everyone who can use them. Grants from industry pay only a part of the cost of research projects to which they are made. The laboratories, equipment, and other facilities are paid for from public funds, and the major part of staff salaries and operation for most research projects are also supported by public funds. The same situation holds with
respect to patent rights on any inventions which may be made in a research project financed in part by grants from industry.

The College of Agriculture sometimes is accused of neglecting farmers and selling out to business. This charge is made by individuals who fail to recognize the evolution from self-sufficient farming to agribusiness. Farm operators must be well informed concerning the uses of numerous inputs which are available and the economics of their uses. They also must be aware of the effects on farm production of marketing, processing, transportation, and distribution of farm products. The College directs a substantial part of its efforts to the research, resident teaching, and extension programs which are required by farm operators and by industries which supply inputs to farmers and handle the marketing of farm products. Grants received by the Experiment Station from industry represent less than five percent of the total expenses of the Station.

Grants received by the Experiment Station from federal agencies other than USDA have become a substantial source of support for research. The principal agencies are the Atomic Energy Commission, Department of Health, Education and Welfare, the U. S. Public Health Service and the National Science Foundation. Most of the grants from these agencies are made to support specific projects upon requests made by staff members directly to the federal agencies.

The Herman Frasch Foundation began a series of grants, in 1926, in support of the research on growth and development of domestic animals which was conducted under the leadership of Dr. Samuel Brody. This was the first grant made by a foundation in support of research by the Missouri Agricultural Experiment Station. The Frasch Foundation continued to support this research program for about 20 years. In the intervening years a number of foundations have made substantial grants to support research projects in several departments of the Experiment Station.

The attitudes of former students and alumni toward the college or university which they attended vary widely among individuals. A few of them are adversely critical of their alma mater because they believe they did not receive the benefits from their college which they anticipated and to which they felt they were entitled. The majority of this group show no interest in the college programs, but a few of them actively oppose the work of the college.

At the other end of the list are many alumni who recognize the value of the programs which are conducted by the college, to themselves and to the development of the human and material resources of the state. Most of this group are active supporters of the current programs of the college and assist in the development of additional services by the college to the state. A minority of the group think of the college as it was when they were students and some of them have the chauvinistic opinion that their alma mater was superior in all respects to all other colleges. Anyone who points out deficiencies in their alma mater or suggests possible improvements in programs or organization is summarily condemned. The Missouri College of Agriculture alumni include representatives of all the varieties of attitudes mentioned above.

The evolution in agriculture which became quite evident during the 1940's and has proceeded at an accelerated rate until the present time, has been discussed in more detail in other sections of this history. The effects of this agricultural
evolution upon the research, resident teaching, and extension programs of the College of Agriculture also have been related elsewhere.

Appropriations by the Missouri General Assembly to pay the costs of the programs of the College of Agriculture had been increased slowly before 1940, were reduced during World War II, and were not sufficient to pay the costs of maintaining the programs after the war ended. The state appropriation for the Agricultural Experiment Station in 1948 was $173,890. The salaries received by resident staff members were below those received by the resident staff members of comparable rank in all other Midwestern states. This placed Missouri in a poor competitive position to employ qualified staff and to retain those already members of the faculty. Average salaries for county extension agents ranked 45th among the 48 states.

Obviously, the financial condition of the College needed to be improved if its services were to keep pace with the rapid changes which were being made in agriculture. The matter was discussed at length by the administrative staff of the College, including the Agricultural Extension Service and department chairmen. All agreed that a strong and sustained effort must be made to secure substantial increases in state appropriations. Previously the low level of state financial support for the College of Agriculture, compared with the financial support in other states with comparable agricultural industries, had not been publicized. Despite some objection, especially by the agricultural extension administration, the decision was made to give wide publicity to the financial situation relative to other states.

A number of meetings were held with alumni and friends of the College of Agriculture in all areas of the state. At the meetings the discussions included the College programs and financial needs. Generally favorable response was obtained. The idea of a state-wide advisory group was discussed and because the idea was well received the College of Agriculture Advisory Council was organized.

In November, 1952, a publication "Research—An Investment in Farm Progress" was distributed throughout the state. The introduction to the publication read, "This is a brief outline of the organization of the Division of Agricultural Sciences, of the activities of the College of Agriculture and its subdivisions, and of the School of Veterinary Medicine. A statement of some of the accomplishments of the College and their estimated values to Missouri agriculture is included. Tables show the total income to individuals of all the states, net agricultural income for all states, and the position of Missouri with reference to state appropriations for support of the Experiment Station, and average salaries of county extension agents.

"This report is to inform Missouri citizens of the work which the College of Agriculture is doing to assist in the development of Missouri’s greatest industry, agriculture. It points out some of the accomplishments of the College and the value of these to Missouri. Some of the problems and financial needs for this program also are stated."

Copies of the publication were sent to each member of the General Assembly. The information included in the publication was used by many citizens, who recognized the value of the services of the College, to urge their respective members of the General Assembly to support the requests for increased appropriations needed by the College to increase and improve the programs which the College was conducting for the agricultural industry of the state.
The University administration, including the president, business manager, comptroller, and the Board of Curators were informed of the increased financial needs of the College of Agriculture. The University included substantial increases for the College of Agriculture in its requests to the Governor and General Assembly for appropriations.

The response by the General Assembly was slow for the first few years but gradually improved. In 1960, the appropriation to the Agricultural Experiment Station was more than one million dollars. Comparable increases were made in appropriations for resident instruction and extension work. Alumni of the College, individually, through the College of Agriculture Alumni Association and the Advisory Council, were quite effective in supporting the appropriation requests.

Although the large majority of alumni who were interested in the College recognized the value of publicizing the bad financial condition of the College, a few of them were upset considerably. The latter were alumni who believed the Missouri College of Agriculture had always been the best one in the nation. To them the publication of the small financial support of the Missouri College through the years, compared with that of other state agricultural colleges, served only to ruin the fine reputation of the College. Some of them stated that the reputation of the College had been reduced to such a low state that they were ashamed to admit having graduated from it.
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Institutes, Conferences, and Short Courses

Cooperation between the College of Agriculture and the Missouri State Board of Agriculture in establishing farmers’ institutes appears to be the first adult education activity to be conducted by a division of the University. Norman J. Colman, editor of Colman’s Rural World and for many years a leader in developing educational programs for farmers, became a member of the State Board of Agriculture in 1867. He proposed that the board conduct meetings at which successful farmers and others who had useful information would speak to groups of farmers. Despite Colman’s continued urging the board took no action on the proposal.1 Kansas State Agriculture College, in 1868, was the first land-grant college to conduct farmers’ institutes.2

Dean J. W. Sanborn of the College of Agriculture became secretary of the State Board of Agriculture in 1882 and agreed with Colman’s proposal.3 He and Colman developed plans for implementing the idea. The plans provided that Dean Sanborn would arrange the place and time of each meeting and for speakers. The State Board of Agriculture paid the necessary expenses. The first meeting was held in Higginsville in December, 1882.4 Farmers at first showed little interest but Sanborn continued to hold meetings and by 1886 interest among farmers had become so great that requests for institutes exceeded the number for which the board could pay expenses. Colman, as president of the board, urged the General Assembly to appropriate sufficient money to meet these costs but without much success.

Speakers at the institutes included Colman and other members of the Board of Agriculture, Dean Sanborn and faculty members of the College of Agriculture, farm leaders from other states, and successful farmers in the areas in which the institutes were held. In time, the value of information which College staff members presented became recognized with the result that farmers demanded College faculty members as principal speakers at institutes.

Although the Agricultural Experiment Station was not established until January, 1888, and money was not available to pay the costs of research, Dean Sanborn conducted some investigations in crop rotations and livestock feeding.5 This work by Sanborn and other research by staff members developed information which was presented to farmers who participated in the institutes.
By 1895 the Agricultural Experiment Station had produced results which convinced many farmers that the College was conducting programs that were helpful to them. Dean Mumford stated, “It was about this time that important emphasis was placed on lectures by college men at farmers’ institutes. Each winter every teacher in the College of Agriculture was encouraged, even required, to lecture from four to six weeks at farmers’ meetings. This policy was important. It was not only necessary to serve farmers by scientific research, but it was very important that the widest possible extension of this knowledge be accomplished if the farming practices of the state as a whole were to be influenced.”

The farmers’ institute program was an activity of the College from which evolved several other important adult education programs. These include short courses, Farmers’ Week and the Agricultural Extension Service.

**Short Courses**

Some of the farmers who attended farmers’ institutes indicated to College faculty members their desire for more detailed information about specific improved farm practices. In order to meet these expressed needs of farmers most effectively, the faculty began offering a short course of one month’s duration in January, 1886.

Dean Sanborn said regarding the short course, “The object of this short term in agriculture, horticulture, and veterinary science is to place the advantages of the teachers and equipment of the Agricultural College at the services of the farmers, young or old, as feel unable to attend a full course in agriculture and at a season of the year when they can best be spared at home.”

As the faculty gained experience and as farmers became aware of the short courses, the length of the short courses was increased, in some instances to three months, and the subject matter covered was arranged to meet the requests made by farmers and to offer instruction on subjects in which the staff were best qualified and for which College facilities were best suited. In 1895 a three-month short course in horticulture was given in addition to the one in general agriculture. This first specialized course was followed in 1901 with an eight-week course in creamery work and in 1902 a 12-week course in plant production and another in animal husbandry were given. These courses were continued until 1909.

**Two-Year Winter Short Course**

The College faculty decided in 1909 to consolidate all short courses into a two-year winter course. The course for each winter included two terms of seven weeks each. The first term opened about November 1 and closed before Christmas; the second term started after January 1 and continued through February. A wide variety of courses were offered covering all phases of Missouri agriculture. The University catalog of 1911-12 stated: “The winter course gives the largest possible amount of practical instruction in judging, breeding, and growing corn; in soil fertility, farm crops and farm buildings; in livestock judging, stock feeding, animal breeding, and livestock farming; in breeding, feeding, and handling dairy cows; in making butter and cheese and handling milk products; in diseases of farm animals and their treatment; in injurious insects; in farm carpentry and blacksmithing; in poultry raising, in farm management and the keeping of records.” Students who
completed the work offered in two winter short courses of 14 weeks were awarded certificates. Many successful Missouri farmers during the last 60 years were former course students.

The two-year short course was discontinued in 1933. During the 23 years it was offered 4,359 students were enrolled in it. The highest post-World War I enrollment of 322 was in 1920-21. Thereafter, the number declined until 1933 when only 17 enrolled. Probably the depression prevented many young farmers from attending. In addition, county extension and high school vocational-agriculture programs were by that time providing much of the kind of information that the short course had included.

Proposals are made from time to time that short courses, similar to the former two-year short course program, be revived. The suggestions come from a variety of sources, including breeders of purebred cattle who want the College to train herdsmen, rural electric associations who need skilled electrical technicians, and farm machinery dealers who employ maintenance and repair men.

The College conducted statewide inquiries among county agents in the 1950’s to learn the degree of interest and probable participation by young people in short courses. Very little interest was found. Since 1960 the need for skilled mechanics and technicians has grown. The desirability of providing technical and vocational training for young people who, for various reasons did not continue through college, has been discussed widely. Expansion of vocational programs in high schools and establishment of more junior colleges which would offer vocational work have made some progress in Missouri. But these programs do not fill the need for post-secondary school work.

The regular undergraduate and graduate programs offered by the College have taken the full time and use of the classrooms, laboratories, and other facilities for teaching. Before 1965 available housing for students limited the number of students that could be admitted to the University. The College has not decided whether to add short courses of this type to the teaching program.

The proposal has been made that the College proceed with the following steps:

1. Form a state-wide council which would plan, review, and approve or disapprove programs.

2. Establish at an early date a two-year technical program in the College at Columbia. The unit would serve the following purposes:
   a. Identify proper programs of study.
   b. Serve as a training laboratory for teachers in this area.
   c. Perform development research in the areas of courses, curricula, student sources, student population, and student goals and objectives.

Special Short Courses

In addition to the former two-year winter short course the College of Agriculture has continued to conduct short courses for groups of people who wish an intensive course in a specific subject. The special short courses increased considerably in number after 1930 and since World War II have become quite numerous and highly specialized. As farmers become better informed in the technology of agriculture, they ask for more detailed information on specific
subjects. These short courses usually are one to five days long and may include lectures, laboratory work, and discussions on the special subject.

About 1930 the first short course away from the Columbia campus was conducted. These district short courses have increased in number and at the present time constitute a substantial share of the total short course program.

The Agricultural Extension Service conducts these short courses on a county or multi-county basis. Agricultural extension specialists and county extension workers are responsible for planning and conducting these short courses.

A prospectus of the short courses which will be offered during the ensuing year, starting September 1, is prepared under the direction of the associate dean of agricultural extension. For 1968-69 the prospectus included 35 courses which were offered in seven different subject matter departments. Each of the courses may be conducted in one or several counties or multi-county areas, as determined by local interests. Short courses in additional subjects may be conducted when requests are made by a group of people.

When the two-year winter short course was started in 1909-10, A. J. Meyer was appointed superintendent of short courses. In 1914 he became secretary of the Agricultural and Home Economics Extension Service. His duties in this position grew, and when he was appointed director of extension in 1917, required his full time. In 1917 E. H. Hughes of the animal husbandry department became assistant to the dean and superintendent of short courses. Hughes resigned in 1920. Sam B. Shirky was appointed to succeed him in 1920, and in addition to his other duties, continued to direct short courses in agriculture until 1960. At that time administration and financing of short courses in agriculture were transferred to the University Extension Division. Agricultural short courses which are held on the Columbia campus are planned and conducted by committees which are appointed by the dean of the College of Agriculture.

Annual Farmers’ Week

The annual Farmers’ Week was an important activity of the College of Agriculture which developed in association with farmers’ institutes. In 1896 the College held the first farmers’ meeting on the campus. The Board of Agriculture supported the meeting as a part of the farmers’ institute programs. The meetings were held annually thereafter and in January, 1904, the meeting was called Farmers’ Week for the first time. Farmers’ organizations were invited to hold their annual meetings during Farmers’ Week and some groups held their initial organizational meetings on the campus during Farmers’ Week.

Dean Mumford stated: “From the beginning, the College of Agriculture adopted a policy of extending its influence beyond the classroom to the farmer and his family actually engaged in the business of farming. So it was quite natural for the College of Agriculture to invite farmers and their organizations to hold their annual meetings at the College.”

Various types of programs were offered to Farmers’ Week audiences, but in 1909-10 the program was reorganized to provide several different short courses such as animal husbandry, dairy husbandry, farm crops, home economics, and soils.
This plan was very popular and attendance of men and women increased considerably. For many years Farmers' Week attracted 1,500 to 3,000 farm men and women annually.

Attendance at these meetings was accomplished under hardship conditions, viewed from 1970. All travel was by rail, and farmers who came from distant parts of the state rode trains most of one day, often with several changes, arriving in Columbia at 10:00 p.m. or later. From the Katy or Wabash station the arrivals walked, carrying their baggage, to the Agricultural Building (Waters Hall). Here they registered and were assigned rooms in private homes. Again they walked, carrying their luggage, often one-half mile or more to their lodging.

All classes in the College of Agriculture were dismissed during Farmers' Week. Faculty members were all busy with the numerous lectures, discussions, demonstrations, and meetings of organizations. The students also participated in numerous activities. Students helped with demonstrations and exhibits, with registration, and as guides for the visitors to the various meeting places. Arriving farmers were met at the railroad stations by students who helped with luggage and escorted the farmers to the Agricultural Building. After the farmers were registered, student guides accompanied them to their places of lodging.

The Farmers' Week Banquet was held the last evening of the four-day event. Guests were not charged for this banquet, all costs being paid by the College of Agriculture and the State Board of Agriculture. Attendance at the banquets ranged between 800 and 1,000.13

Dr. Perry F. Trowbridge, chairman of the agricultural chemistry department was chairman of the banquet committee. The banquet was held in Rothwell Gymnasium. Forty to 50 long tables, each one seating 20 people, were set up. All the food except the meat was prepared in the kitchen of Lathrop Hall, the dormitory for men on south 6th Street. The meat that was served consisted of the standing ribs and loins from prime steers which had been produced by the animal husbandry department. The cattle were slaughtered in December and the cuts hung in the refrigerator to ripen until the day before the banquet. No oven in Columbia was sufficiently large to roast all of the cuts at one time. Prof. Trowbridge made arrangements with housewives in the vicinity of the campus, each of whom roasted one of the cuts in her kitchen stove. Students collected the roasts shortly before the banquet and took them, in wagons, to the gymnasium.

After the guests were seated at the tables, the food was served, family style, by students. A boy and a girl served the food at each table. The students, dressed in white coats, entered the dining room in a column of pairs, the boy carrying the roast for his table on a large tray. At the ends of each table were seated a faculty member and his wife, the host and hostess for the table. The roast was placed before the host who carved the meat. Accidents sometimes occurred. One year as the column of students was entering, one student dropped his tray and roast, the roast sliding several feet along the floor. Fortunately an extra roast was available to replace the one that had been dropped.

Often the governor of Missouri spoke at the banquet. In the latter half of the 1920's most of the farmers drove to Columbia in cars and left for home before the banquet. Because of the decline in attendance the last Farmers' Week banquet was held in January, 1928.
During World War II restrictions on travel reduced attendance at Farmers' Week very substantially. In 1945 a program was developed and a number of lectures on topics of current importance to farmers were prepared. Only representatives of news media were invited to attend and the lectures were given wide publicity throughout the state.

The last Farmers' Week was held in 1946. The Agricultural Extension Service had personnel and active programs in all counties and much of the information of value to farmers was available through the county extension offices. The faculty, somewhat reduced in numbers because of the war, was now confronted with the enrollment of large numbers of servicemen just released from the military services. For three years, 1946 to 1949, no program similar to Farmers' Week was held.

Farm Forum on Public Policy

By 1949 the large number of World War II veterans had completed college, the number of faculty members had been increased, and the faculty believed that the College should conduct a program on the campus which would provide valuable information to Missouri people. This was not to be a renewal of the Farmers' Week which had consisted of short courses in a number of specific subjects. The agricultural extension programs and numerous short courses, field days, demonstrations, and exhibits which were being conducted by the College were filling the need for information in technical areas such as crops, soils, beef cattle breeding, feeding and management, dairy production, and soil conservation.

The extensive economic, social, and political changes which were related to the evolution from self-sufficient farming to agribusiness were causing thoughtful farmers to ask for more information on these subjects. After extensive discussion by resident and extension staff members, the decision was made to plan and conduct a program which would include discussions of public policies which concerned farmers. The fact was recognized that this kind of program would appeal to a much smaller number of people than programs which presented techniques by using exhibits and demonstrations. The program was to include presentations by speakers and discussion and questions by the audience. The intention was to assist farmers attending the program to form their own conclusions by presenting as authentic and complete information as possible on the subject under discussion. No formal conclusions were made and no resolutions drawn by those in attendance.

Because the program was to deal with public policies of interest to farmers, the name was “Farm Forum on Public Policy.” The first Forum was held June 8-9, 1949, and the general subject for discussion was “Will Industry, Labor and Agriculture Cooperate to Preserve Our American Economy.” Speakers included nationally known representatives of industry, labor, and agriculture. Attendance at this first Forum was about 600 and was composed of representative farm leaders from the entire state. Interest in the subject was high, as indicated by the close attention and participation in discussions by those present.

Response by farmers to the first Forum encouraged the College faculty to continue a second year. Since June is a busy season on farms, the Forum was held November 20-21, 1950. The subject was “Missouri River Basin Improvement and National Farm Programs.”
The Forum was continued in Columbia for 12 years. Each year a subject of general interest such as "Frontiers in American Agriculture," "What Health Program for Missouri," "Farm Surpluses," and "Financing State and Local Governments," was presented and discussed.

Following the 10th, 11th, and 12th Forums, 1958, 1959, and 1960, in Columbia, faculty members presented a similar program in other towns, well distributed around the state. By this procedure many more people participated in the Forum programs than when it was held in Columbia alone.

Beginning in 1960, the Forum was not held in Columbia but was held in other cities. This was continued through 1964.14

**Agricultural Science Week**

In 1964 a new type of program called Ag Science Week was initiated. This program extends over four days and includes a variety of activities. Included are one-day forums on subjects such as "Problems Associated with Expansion of the Urban Centers into Rural Areas" and "Community Water Supplies." In addition, seminars in specialized subjects such as animal nutrition and annual meetings of associations such as the Missouri Seed Improvement Association and Missouri Terracing and Conservation Contractors are held. An address by an outstanding speaker on a subject of current interest is included. The morning of the fourth day College staff members make brief reports on specific research, resident teaching, and extension activities. At noon on this day the Agricultural Alumni Association holds a barbecue dinner where individuals who have made substantial contributions to agriculture are given special recognition.

**Bibliography**

1. Lemmers, George L., Norman J. Colman and Colman’s Rural World, 1953, University of Missouri, pp. 75-76.
3. Lemmers, p. 76.
7. Ibid, p. 163.
10. Ibid, p. 163-165.
DEANS OF THE UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE

G. C. Swallow 1872-1882

J. W. Sanborn 1882-1889

E. D. Porter 1889-1895

H. J. Waters 1895-1909

F. B. Mumford 1909-1938

M. F. Miller 1938-1945

E. A. Trowbridge 1945-1948

J. H. Longwell 1948-1960

E. R. Kiehl 1960-
Prof. P. F. Trowbridge demonstrating meat cutting in Schweitzer Hall around 1914.

A summer school session in Switzler Hall, about 1903.
The first Experiment Station building stood on Hitt Street at present site of Whitten Hall. (1896)

Jackson County group in Columbia for 1914 Farmers' Week.
Part of Farmer Parade, 1905. The first Farmers' Fair was held the following year.

Follies cast for 1919 Farmers' Fair.
Farm machinery lab class, 1903.

Home Economics cooking class, 1909.
First data from erosion losses under cropping in the U.S. came from these plots east of Medical Center.

First livestock building, built in 1904, is now Agricultural Engineering Building.

Livestock Center completed in 1968.
A dairy lab scene about 1895.

The dairy lab in 1970.
Switzer Hall, the original home of the College of Agriculture, was built in 1872.

Agriculture Building completed in 1960.
Sanborn Field, established in 1888, is one of the oldest experimental fields in the United States.

Touring Bradford Farm, newest experimental farm, established east of Columbia in 1959.
Delta University of Missouri Center, Portageville.

Southwest University of Missouri Center, Mt. Vernon.
Agriculture class in Switzler Hall about 1900. Prof. F. B. Mumford is the lecturer.

Classroom in 1970.
Cattle in crossbreeding experiments, North Missouri Center, Spickard.

Beef Cattle Facilities Day at Weldon Springs Center.
Gardening class about 1900 in general area where Physics and Botany buildings now stand.

Scene from present site of Schweitzer Hall taken shortly after Jesse Hall (center background) was built in 1896.
Ag Pond, east of the dairy building, was filled in early 1950's, ending a custom of dunking engineering students.

Dean Mumford crowns 1920 Barnwarmin' Queen.
Dairy barns and dean's residence about 1900.

Entrance to Farmers' Fair about 1920. The arch is across Rollins street at College with Sanborn Field at left.
First dean's residence.

Horse shows were staged in the center of the football field as part of the program for commencement.
Physical Facilities

Land

Under the terms of the Morrill Act, Missouri, with two senators and nine representatives, was entitled to 330,000 acres of land. Paragraph 5 of Section 5 of the act provides that land which was double the minimum price of $1.25 an acre, because it was adjacent to railroad grants, would be computed at the maximum price. Hence, Missouri received about 275,000 acres of land under the act.¹

Nearly all of the desirable farm land had been transferred from public to private ownership during the 50 years since Missouri had become a state in 1821.² The public lands which remained were in the Ozarks and had little agricultural value. As noted earlier, excellent timber stood on much of it but at that time the lumber industry had not developed in the area and the timber had little market value. Most of the land was sold at a low price. About 34,000 acres are still owned by the University, mostly in separate small tracts. The University and United States Forest Service arranged an exchange of 8,777 acres so that areas located in Butler and southern Wayne counties, and within a relatively small area, are used by the School of Forestry for research and teaching.

Section 8 of the law, passed by the general assembly and signed by the governor February 24, 1870, reads:

"That in consideration of the permanent location of the Agricultural and Mechanical College in connection with the State University, the county of Boone shall donate, not less than thirty thousand dollars in cash, to be used in erecting such buildings and making such improvements as may be needed for such college, and also for buying stock for, and making improvements on a model or experimental farm of not less than six hundred and forty acres of land, located convenient to the present University grounds, and to be donated by said county of Boone in addition to said sum of thirty thousand dollars in cash. The title to said land to be clear and indisputable to be bought without any charge whatever to the state or to the Agricultural College fund, and to be conveyed to the State of Missouri by deed of general warranty, the consideration expressed therein, being the location of said Agricultural and Mechanical College in connection with the State University, and that the same shall be held for the uses and purposes of said Agricultural and Mechanical College.³"
The land which was purchased included 32 acres east of the campus which became the horticultural grounds and later the east campus. East of College Avenue and south of Bouchelle Avenue were an additional 183 acres. On this land stood the “Hudson Mansion” which became the home of the dean of the College of Agriculture. Later, on this land, were located Sanborn Field, all college barns, Connaway Hall, Eckles Hall, agricultural engineering buildings, and the Livestock Pavilion. South of Rollins Street and east of Providence Road, 424 acres completed the land purchased for the College.4

In 1880, a tract of 120 acres located about eight miles south of Columbia was purchased.5 This land lies near Bonne Femme creek and is quite hilly with stony soil. It has never been used by the College of Agriculture but is still owned by the University.

In 1891, the Board of Curators set aside about six acres of the college farm, south of Rollins Street and east of Maryland Avenue, for a football field.6 This was named Rollins Field. In 1906, Rothwell Gymnasium was located on a part of the college farm, east of Rollins Field, at the corner of Rollins and Hitt Streets.7 An irregularly shaped area of about 10 acres lying south and west of the present Medical Center site was developed into a nine-hole golf course in 1901.8 The area of about 20 acres lying between the athletic field area and the golf course was used for many years as crops and soils experimental plots. Defoe Hall was built on part of this land in 1939.9 Crowder Hall, the ROTC armory, was constructed on a part of this area in 1940.10

The continued encroachment on this land by the University eventually brought about a sharp controversy which threatened to develop into another attempt to separate the College of Agriculture from the University.

At the close of World War II the University took over all the area which was being used by the field crops and soils departments as the site for temporary housing for veterans. The administration of the College of Agriculture agreed to that use of the land but with the understanding that the University would secure other land suitable for experimental plots. In 1952, the Medical Center was located on a part of the area and permanent dormitories built on another part. Location, in 1952, of KOMU-TV on College of Agriculture land, without consulting the College administration, aggravated the situation.

The College administration continued to press the University administration for a decision on replacement of this land with other land equally suitable for research and teaching. Land suitable for particular uses is equally as important as laboratories and classrooms for much agricultural teaching and research. The University also was reminded of the clause in the act of the General Assembly of 1870 which says that the land given by Boone County “shall be held for the uses and purposes of said Agricultural and Mechanical College”.

The College of Agriculture recognizes the necessity of expanding into contiguous land as the growth of the University requires more campus area. It also recognizes that the title to all land owned by the University is held by the Board of Curators and that the Board has authority to designate the use to be made of any of this land. The College does not oppose absorption into the campus of land which the University needs for expansion. The College does hold that when the University
takes over land which the College is using for special purposes, the University should replace the land with another area equally suitable.

Several leading farmers in Missouri were aware of the situation and in 1952 a group of them became active in attempting to find a solution. They talked with University administrators, members of the Board of Curators, and members of the General Assembly.

The responses which they received were not encouraging. They next talked seriously of initiating a move to separate the College of Agriculture from the University. This idea was discouraged by the College administration and was dropped.

When he became president, Dr. Elmer Ellis recognized the situation and took action for its relief. In 1955 he arranged for the purchase by the University of the Rollins farm which is west of Providence Road and south of the Outer Loop. He asked the College of Agriculture to select all of this land which it could use. All departments in the College were informed of this offer and entomology and field crops selected about 90 acres along Hinkson Creek. The land which entomology selected was used by them until 1962. That year the University included this land in the Research Park, but other land was made available to entomology. The animal husbandry department converted the dairy barns and lots and the milk house into laboratories in which to conduct animal nutrition research.

In 1959, a farm owned by Alex and Mary Bradford was offered to the University. The University agreed to make an annual payment to the Bradford family during the lifetime of the then surviving members. Upon the death of the last survivor the title to the farm will be transferred to the University. One-half the annual payment is made by the Agricultural Experiment Station, the other half by the University. This farm contains 524 acres, is located about 7.5 miles southeast of the campus and is an excellent farm for research and teaching uses.

At this time the University took over all the land south of the Outer Loop except about 60 acres in the Hinkson Creek bottom.

The livestock barns, lots and other facilities which were constructed before 1910 on the farm southeast of the campus were obsolete and had deteriorated substantially by 1950. Acquisition of the south farm land permitted construction of new barns and lots and relocation of parts of the herds. Animal husbandry and dairy husbandry staff members believed that parts of the herds should be retained near the campus where they were more readily available for teaching and research. The bad condition of the old structures required their replacement if the herds were to be retained there. Accumulation, through the years, of disease organisms and parasites caused increasing difficulty in maintaining the health of animals. Objections were made by people who lived near by to the presence of animals. The decision was made to move all the herds from the vicinity of the campus; this was completed and most of the old barns were razed by 1965.

Extensive damage to the old dairy barn by fire in March, 1958, made it necessary to relocate the dairy herd, which includes the Holstein and Jersey cattle. The dairy department had decided previously to move these cattle to a location near the Foremost Farm. Agricultural engineering released the Midway Farm, which they were using, to dairy and moved their research to land which dairy vacated on the South Farm. New barns were built for the herd at the Midway Farm and 160
acres of land lying north of the farm were bought to provide sufficient pasture for the herd.

In 1914, 87.77 acres of land northeast of Columbia were purchased and a laboratory building constructed in which anti-hog cholera serum and virus were produced and sold at cost to Missouri farmers. The Missouri Agricultural Experiment Station was the first of the state experiment stations to put to an extensive and practical test anti-hog cholera serum and demonstrate its effectiveness in the field in protecting swine against hog cholera. This work ended in 1936 when production of serum and virus by private industry under government supervision assured farmers of an adequate supply of standard high quality products. The land is used by the School of Veterinary Medicine for research.

The first unit of the South Farm, a 220-acre farm, was purchased from Sarah E. Beazley in 1932. This farm is located about three miles southeast of the campus. Subsequently, 10 additional contiguous tracts were purchased to make a total of 1,483.32 acres in this area. Most of the money paid for the purchase of this land came from Experiment Station sales funds and fertilizer fees. No state appropriations were spent for this land. In 1952, the television station, KOMU-TV, and accompanying relay stations were located on 1.75 acres on the southwest corner of the South Farm.

The east campus was originally designated for use for gardens, orchards, and vineyards by the department of horticulture. But the location of Whitten Hall, Waters Hall, and other buildings in the area made necessary the use of other land for the department. In 1911, an 84-acre farm was bought near Turner Station and designated the University Fruit Farm. This farm did not prove to be entirely satisfactory and in 1938 a 160-acre farm was bought nine miles west of Columbia on Highway 40 and called the University Midway Orchards. Members of the soils department advised against the purchase and use of this land by the horticulture department. Much of the soil was Putnam with the characteristic hard claypan which resists penetration of plant roots. Apple trees which were set out in 1938 on this land had grown to about the size of eight-year trees by 1952, according to estimates by members of the department.

Because of the unsatisfactory nature of this farm for horticultural use another farm was bought in 1953 near Franklin, Howard County. This is a Missouri River hill farm with deep loess soil and includes 235 acres. An adjoining area of 77 acres, about 40 acres of which are in a lake, were bought from the MKT railroad. The 235 acres were paid for with money obtained from the sale of the Turner Station farm and a transfer of funds from the agricultural engineering department which took over the Midway farm. The 77 acres which includes the lake were paid for by a generous grant made by the Missouri Horticultural Society.

The Foremost Farm and excellent herd of Guernsey cattle were given to the University by Mr. J. C. Penney. Mr. Penney established the Foremost Guernsey herd in 1920 in southeastern New York about 40 miles north of New York City. In 1937 Mr. Penney founded the Foremost Guernsey Association, Inc., with assets when founded of 1,000 acres of land near Hopewell Junction, N. Y., 352 head of Guernseys, buildings and equipment, and an endowment of about $300,000. The articles of incorporation provided that all the assets of the corporation would be transferred to the University of Missouri not later than 1996. About 1945 Mr.
Penney decided that the transfer would be made as soon as arrangements could be worked out by the University. Professor A. C. Ragsdale, who was a director of the Foremost Guernsey Association, arranged for the purchase of land on which the herd would be located. Three adjoining farms were purchased, located 10 miles west of Columbia on old Highway 40. This farm, known as the Foremost Farm, includes 622 acres.

Houses for the superintendent, herdsman, and farm workers, and barns and other structures required for the cattle were constructed and the herd was moved to the farm in the fall of 1952. The total value of this generous gift by Mr. Penney was approximately $850,000.

John Schnabel, a business man in St. Louis, and his wife gave the University 80 acres of land in southern Boone County in 1954. This is Missouri River hill land and has an excellent stand of virgin timber. This forest is used by the School of Forestry for teaching and research.

Miss Julia Rocheford, for many years a member of home economics extension staff, was greatly interested in helping young people with limited means to attend college. When she retired she gave her 160-acre farm, located about eight miles northeast of Columbia, to the University. Her original intent was that the College of Agriculture would operate the farm and employ students to work part-time on it. This was not practical because of the distance of the farm from the campus. The poultry department makes use of the farm for research work with turkeys. The Experiment Station makes an annual payment to the University student employment fund, thus accomplishing Miss Rocheford’s intent to provide employment for students.

A 300-acre farm near McCredie in Callaway County which was owned by the federal government, was transferred by act of Congress to the University in 1954. On this farm a cooperative research program in soil and water management had been conducted by the Soil Conservation Service and the Missouri Experiment Station. The Experiment Station continues to conduct soil and water management research on the farm, which is called the Midwest Claypan Experiment Station.

Congressman William H. Hatch owned and lived on a farm west of Hannibal. The farm was given to the State of Missouri by his daughter in 1923. Responsibility for operation and maintenance of the farm was assigned to the dairy husbandry department of the University. Some research has been conducted on the growth and development of dairy heifers. This is a small hill farm of 110 acres and its value for research use is quite limited. On April 9, 1963, a program was held at the farm at which the contributions of Congressman Hatch to agriculture were recognized as was the 75th anniversary of the act which bears his name.

During World War II the federal government purchased a tract of about 15,000 acres of land near the village of Weldon Spring on which a munitions manufacturing plant was established. After the war the plant was closed and all of the area, except the 2,200 acres on which the munitions plant was located, was declared surplus property. The University, in 1948, secured possession of 7,920 acres of the area for use as an agricultural research center. The Surplus Property Administration placed a value of $250,000 on the land. The University was credited with $12,500 a year for 20 years. In December, 1968, the University received full title to the land. The Agricultural Experiment Station agreed to expend a minimum of $100,000 in
developing research facilities on the area. This amount has been exceeded. The area includes 500 acres of Missouri River bottom land; the remainder is hill land. More than 4,000 acres of the hill land are in timber and about 3,000 acres are in pasture and meadow.

The area is known as the Weldon Spring Center. The principal research which is being conducted on the center includes breeding, management, and feeding beef cattle. Some crops and soils research also is being done. For several years the School of Forestry conducted research on the production and marketing of Christmas trees.

Dr. George Drury, formerly a dentist in Trenton, provided in his will for the gift of 1,240 acres to the University of Missouri to be used by the College of Agriculture “for agricultural experimental purposes.” An additional 360 acres adjacent to the 1,240-acre tract were given to the University by Frank and Lucille Drury. The 1,600-acre tract is seven miles west of Spickard in northwest Grundy County. The University obtained title to the 1,240 acres in 1955 and to the 360 acres in 1958. Research which is conducted on this station includes field crops, soils, and crossbreeding of beef cattle.

Outlying Fields

Since the beginning in 1888 of research programs by the Agricultural Experiment Station the research has been centered at Columbia. Under the terms of the Hatch Act the Agricultural Experiment Station was established as a department of the College of Agriculture. The faculty members of the College planned and conducted the research work. Here were the laboratories, land, and equipment with which staff members could carry out research. Faculty members traveled in the state, met with groups of farmers, talked at farmers’ institutes, and learned which problems were most in need of solutions.

The early research work was mainly practical in nature, intended to find immediate answers to pressing problems. Measured by today’s standards, the research 75 years ago was quite simple. Venturing into new and unfamiliar fields, the staff members had much to learn about methods, procedures, effects of variable environmental conditions, and experimental control. Gradually they learned that recommendations to farmers based on results obtained under the environment of central Missouri were not always valid under conditions found in other parts of the state. They became aware of the seasonal and annual variations in amounts of rainfall, temperatures, length of growing season, soil types, and levels of fertility, in the same locality and in different areas of the state. In order to secure information under the various conditions, arrangements were made by the station director with individual farmers in selected areas to establish plots on which soil fertility and crop variety trials were conducted. These were called cooperative fields by the Experiment Station.

The next step was the establishment of outlying fields. These were selected areas, ranging from 10 acres to 100 acres, in the principal farming areas of the state. The areas were leased by the Experiment Station from the owners. Long-term leases, 10 years or longer, were usually made. On the outlying fields plots were laid out on which extensive long-term trials were conducted with soil fertility and crop varieties.
Physical Facilities

For many years cooperative fields and outlying fields served the needs of the Agricultural Experiment Station quite well. They enabled the Agricultural Experiment Station especially the departments of entomology, field crops, horticulture, and soils to conduct research under the wide variety of conditions which exist in Missouri. The annual cost to the Experiment Station was not great. In addition to the valuable research information obtained on these fields, their accessibility to farmers of the areas in which they were located enabled the farmers to follow the progress of the work by attending field days and making informal visits. County extension workers usually encouraged farmers to attend field days on the fields and to make use of all research information which was applicable to each farmer’s individual operation.

The operation of research on outlying fields became restricted by limitation of time of staff members and inadequate physical facilities. These limitations became more important in time as the demands of farmers for more research increased and the nature of the research which was required became more complex.

Staff members who were responsible for the research on outlying fields encountered increasing difficulty in scheduling their time to do their teaching and research at Columbia and to give proper supervision of the research on outlying fields. Increasing complexity of the research required the use of specialized machinery and equipment and inclusion of considerable laboratory work in the research programs. Adequate use of these facilities required the construction of substantial and often highly specialized buildings on the research area. The Experiment Station could not pay the substantial costs of constructing permanent buildings on leased land over which it had limited control and on which the lease could be ended in a few years. In some cases, the research on outlying fields was disrupted because the land owner did not want to continue the lease.

Pressures which developed during World War II stimulated demands for unlimited food production and greatly accelerated many changes in agriculture which had been developing slowly before the war. Fortunately for the United States and its allies, research had developed applications of technology and many principles of science to agricultural production which, when necessity required, were of tremendous value in enabling farmers to increase food and fiber production. Even though military needs limited the availability of production goods to farmers and farm labor supplies were reduced, farmers in this country made effective use of knowledge acquired from research to increase production.

Establishment of Research Centers

The rapid acceleration of the applications of technology to agriculture during World War II was made possible by the research work conducted by state experiment stations, USDA, and industry. Missouri farmers turned increasingly to the Experiment Station for useful information. The necessity of developing expanded research programs in major areas of the state which have characteristic climatic conditions and soil types became evident. The limited kinds of research which were possible on outlying fields were not adequate to meet the needs.

Discussions were held by resident and extension personnel, and with groups of farmers and business men in several major areas of the state concerning the need for and suitable locations of research centers. Some of the important factors which
were considered were: (1) the development of agricultural research programs within areas with distinctive topography, soils, and climatic conditions; (2) the designation of specific areas; (3) ownership of land, buildings, and facilities by the University; (4) desirable location of land within each area, with topography and soil types representative of the area; (5) costs of buying land, constructing buildings, equipment and maintenance; (6) developing research programs which would be most effective in each area.

Delta Research Center

The director of the Agricultural Experiment Station appointed a committee of faculty members, September 18, 1956, and instructed them to develop a recommended research program for southeast Missouri. The committee was asked to include in its recommendations:

1. A comprehensive outline of broad areas of needed research, with proper integration of related areas.
2. The amount and kind of land needed on which to conduct research.
3. Proposed buildings and equipment.
4. A liberal but sound estimate of costs of establishment, development and operations.

The committee submitted its report in November, 1956. Copies of the report were distributed throughout the seven counties of southeast Missouri and college staff members discussed the report with a number of groups in the area. The committee recommended the acquisition of 640-acres of land.

The proposal was approved by President Ellis and the Board of Curators. A House bill was introduced in the General Assembly in 1957 to authorize the establishment of the Delta Research Center as a branch of the Missouri Agricultural Experiment Station and to be administered by the director of the Station.

Some representatives of the Missouri Cotton Producers Association objected to the bill and attempted to have a substitute bill introduced to establish an independent experiment station in the Delta area, but they were not successful. The bill authorizing the establishment of the Delta Research Center was passed and became law July 6, 1957.

The Board of Curators included an item of $225,000 for the purchase of land for the Delta Center in the University request for appropriations which was presented to the General Assembly in 1958. The House appropriations committee, upon the recommendation of a Representative from a southeast Missouri county, reduced the amount, which was appropriated to $75,000. The appropriation was approved and signed by Governor Blair April 30, 1958.

The Director of the Experiment Station appointed a committee on May 2, 1958, with instructions to search for a suitable location for the Research Center. The committee prepared a list of criteria to use in judging the suitability of proposed farms. The criteria included: (a) soil types representative of the area, (b) topography, (c) location, and (d) acreage. A farm of about 640 acres was considered as most desirable. Only a few of the many sites which were proposed and inspected were found to be suitable by the committee. Prices for land in the area at that time started at about $350 an acre and ranged upward to $450 or higher. The $75,000 fund which was available was much too small to pay for
suitable land with the desired acreage. The site selection committee of the College suggested that a group of interested people underwrite a substantial part of the cost of buying land but the suggestion was not followed.

As time passed without a site for the Center being secured, the voices of discontent and protest became louder in the Delta area. A number of land owners who had been informed by the site selection committee that their farms were not suitable objected vigorously. Several area newspapers attacked the University for failure to act. In January, 1959, the representative from Scott County, who was chairman of the House Appropriations Committee, introduced a bill to repeal the law passed in 1957 authorizing the establishment of the Research Center. A request by the Board of Curators for an additional $140,000 to buy and equip land for the Center was denied by the General Assembly.

During World War II staff members of the horticulture department had given valuable assistance to the owners of a farm near Portageville. The owners, Mrs. Margaret Marsh and Mrs. Matilda Cavanaugh, were producing vegetables under contract with a canning company in Memphis. In 1946 the owners discussed with Prof. T. J. Talbert and Dr. R. A. Schroeder, of the horticulture department, their intent to bequeath their property to the University. They prepared their wills designating the University as beneficiary to receive the farm. The farm consists of 666 acres and lies near the Mississippi River five miles southeast of Portageville. The farm is in Pemiscot County.

In March, 1959, the site selection committee and the director discussed with the owners the proposal that the University lease the farm during the lifetime of the owners. The owners agreed to the proposal and the lease was signed by them and the Board of Curators effective January 1, 1960. The University agreed to pay the owners $20,000 rent annually during the remainder of their lives. The University purchased from the same owners 10 acres of land adjoining Portageville, on which the headquarters building, laboratories, and greenhouses were located.

Announcement by the University of the lease agreement resulted in the eruption of a storm of objections and protests from several disappointed landowners and area newspapers. Editors accused the University of wasting the citizens money by paying the annual lease and predicted that the General Assembly would refuse to appropriate money for the development and operation of a research center on the site.

During the ensuing 10 years the General Assembly has made generous appropriations to pay for necessary buildings, equipment, and operations. A comprehensive and productive research program has been developed and is being conducted by the competent staff. The majority of people who are concerned with agriculture in the Delta area recognize the value of the research being conducted and are appreciative of the useful results being obtained.

The Center was developed initially as the Delta Agricultural Research Center. Organization of the University Extension Division in 1960 resulted in the establishment of a number of extension regions in the state. The Delta area is one of the regions and the Delta Center is headquarters for the Delta area extension program. The Center is now designated the University of Missouri - Columbia Delta Center.
Mrs. Marsh and Mrs. Cavanaugh have made a contribution to southeast Missouri that will become increasingly important each year. It will be a memorial to their generosity for which Missourians will always be grateful.

Southwest Missouri Center

Farmers and businessmen worked closely with the College in the establishment of the Southwest Center near Mount Vernon. A limited program of research in soil fertility and field crops had been conducted on a small piece of land near Pierce City for a number of years.

Most of the farms in the area are relatively small and the level of soil fertility is generally low. Several years with below normal rainfall were climaxed with a severe drought in 1954. Many farmers were in serious financial trouble and a number of them abandoned their farms. The economy of the entire area was affected adversely and business and industrial people, who realized the importance of agriculture in the area, were interested in the establishment of an agricultural research program in the area.

The problems of the area were discussed by farm people and business people and by groups composed of rural and urban representatives. Agricultural college staff members participated in the discussions. From the discussions the belief emerged that an agricultural research center, which would conduct investigations of the problems of the area, would develop valuable information which would help solve some of the major problems. An areawide committee with a representative from each of the 22 counties was formed, with Mills H. Anderson, a Carthage banker, as chairman. The committee requested the Agricultural Experiment Station to develop a research program for the area.

The director of the Experiment Station appointed a committee of College staff members January 23, 1957, and directed the committee to develop a research proposal and to consider the establishment of a research center in the area. The committee moved rapidly and submitted the proposed plan, which was approved by the director. The Board of Curators approved the proposal and a bill was introduced in the General Assembly providing for the establishment of a research center in southwest Missouri. The bill was passed and became law July 6, 1957.

The Board of Curators included in the University appropriations request for fiscal 1958-59 the amount of $75,000 for the purchase of land. The amount requested was approved by the General Assembly.

On May 2, 1958, the director appointed a committee of staff members to conduct a search for a suitable location for the center and make recommendations to the director. The site selection committee established criteria to be used in making the selection. More than 50 suggested farms were proposed and members of the committee inspected about 25 of them. Two farms lying on opposite sides of Highway 166, about 2.5 miles southwest of Mount Vernon were chosen as the most desirable location. The two farms have a total of 530 acres and were bought for $70,000. The Southwest Research Center was officially dedicated November 5, 1959.

The General Assembly has appropriated funds to pay for necessary building, facilities, equipment, and operations. A comprehensive research program has been developed and results of value to the agriculture of the area are being obtained.
Physical Facilities

Since 1965 two adjoining tracts totalling 297 acres have been bought and included in the area.

The center has been designated the University of Missouri - Columbia Southwest Missouri Center and serves as the headquarters for the area extension program as well as the research center.

In contrast with the difficulties encountered in Southeast Missouri the establishment of the Southwest Center proceeded expeditiously and with a minimum of opposition.

North Missouri Center

The Thompson Farm in Grundy County, acquired by the University in 1955, was designated the Northwest Missouri Research Center in 1956. About 800 acres of the farm are river bottom land; the remainder is hill land. The 360 acres which were added in 1958 is hill land. The entire area of 1,600 acres had not been well managed for several years. The slopes on the east section were badly eroded, extensive areas of brush had grown up, fences were in bad condition, and a large part of the bottom land required drainage.

At about the same time that the University acquired this land the U.S. Army Engineers announced plans to construct a dam on the Thompson River south of the farm. When it is completed the reservoir area will include all of the river bottom land composed of the entire west section and the west fourth of the east section. Loss of this river bottom land will reduce the value of the farm as a research center for the area and tentative plans which were developed for its use as a research center have not been carried out.

The research which is being conducted at the center includes a beef cattle cross-breeding project and soil fertility and crops research. A headquarters building contains the superintendent's office, meeting rooms, and a machinery repair shop. The building also serves for regional extension meetings.

The name of the Center has been changed to the University of Missouri - Columbia North Missouri Center.

Weldon Spring Center

The area at Weldon Spring was the first Center to be established for agricultural research. Timber covered more than one-half the area. A substantial part of the timber stand included trees suitable for lumber and veneer logs. The forestry department surveyed the timber and established a management and rotational cutting program. A research project on the use of several chemical preservatives on a number of species of trees for fence posts was conducted. Christmas tree production and marketing also was investigated.

Research on pasture production, including studies of fertilization, grass varieties, and irrigation was conducted. A herd of beef breeding cattle was established and the calves produced in the herd were used in pasture and dry lot feeding research. A levee was built around the 500 acres of river bottom land and danger of flooding was practically eliminated. Corn for silage for the breeding herd and for experimental feeding is produced on the bottom land.

A large frame building which was used by the munitions plant as a warehouse was remodeled to provide offices, meeting rooms, machinery service, and storage.
Groups who attend meetings at which reports of research are made and regional extension meetings use the facilities of the building.

An advisory committee has been established for each of the University centers. The committee members are individuals who represent the area which each center serves and who are interested in the research and educational programs which are conducted at the centers. University staff members at each of the centers keep members of the respective committees informed concerning the work being conducted or planned. Each committee meets at the center once or twice each year; the programs are discussed by committee members and staff and suggestions and recommendations for further programs are made.

In 1960, through the will of Charles L. Timmons, a 320-acre farm near Wheeling, in Livingston County, and a sum of money were left to the University for the use of the College of Agriculture. Under the provisions of the will the heirs of Mr. Timmons receive an annual payment from the income from the farm during their lifetimes. This farm has not been particularly useful for research work.

Hugo Wurdack, a former St. Louis businessman, bequeathed 1,200 acres of land in Dent County to the University in 1961. The farm includes both hill land and river bottom land and is valuable for research work under typical Ozark conditions.

In 1966 the University leased a farm composed of 1004 acres in Linn County from the Cornett family. The surviving members of the family indicated their intent to give the land to the University when the last survivor dies. The land is rolling hills typical of north central Missouri. The Cornett family indicated their desire that the Agricultural Experiment Station use the farm for research and as a demonstration of good soil conservation practices.

The initial research project to be conducted on the farm consists of studies of the production, management, and utilization of forages in a beef cow and calf production program.

Buildings

The first building in which the new College of Agriculture was housed, Scientific Hall, was paid for from the $30,000 cash which Boone County had contributed in support of its bid for locating the College in Columbia. The cornerstone for this building, renamed Switzler Hall in 1909, was laid at commencement time, 1871. The College administrative offices remained in the building until 1909, when a new agricultural building, named Waters Hall in 1925, was built on the east campus.14

The Missouri State Fruit Growers' Association was founded in 1859, largely through the efforts of Norman J. Colman, who was the association's first president. In 1863 the name was changed to the Missouri State Horticultural Society. The society took an active interest in the College of Agriculture from the time of its establishment. The new College included two departments, agriculture and horticulture.

One of the early projects which the State Horticultural Society promoted was the construction of a greenhouse for the department of horticulture. In 1878 a greenhouse was constructed, located on University Avenue, in front of the present site of Waters Hall. A second greenhouse was erected in the same area in 1881. The
report of the Board of Curators for 1882 states that these were quite satisfactory structures and gave the horticulture department the facilities to do first-class teaching. Evidently the greenhouses aged rapidly and were short lived. The report of the Board of Curators for 1890 says, "The cyclone that swept over the country January 12, 1890, struck the greenhouses of the horticulture department and practically destroyed them. They were old and badly out of order and twenty years behind times."

Included in the land which Boone County purchased for use by the College of Agriculture was a tract of 183 acres once owned by William W. Hudson, third president of the University. President Hudson had built a house which was locally known as the "Hudson Mansion". In the University catalog for 1885-86 is a picture of the house, with the name "The Agricultural Farm House," and a descriptive statement: "There are twenty rooms, besides two cottages, two barns with stables, ice-house and other outbuildings. It is a large and excellent house, and beautifully located within less than half a mile from the campus. By appointment of the Board the dean of the Agricultural College now occupies this home, and takes direct charge and control of all the operation of the farm. ...the dean of the Agricultural College is required to live in the main dwelling on the farm, and to act the practical farmer. A reasonable rent is charged, and a portion of the house is reserved for business and class purposes." This house burned in 1897 and was replaced by another, less pretentious, one on the same site.

The second house burned in 1909. Another house, substantially constructed of native limestone and finished throughout with solid oak, was constructed on the same site. This was at the time when H. J. Waters left the deanship and F. B. Mumford succeeded him. Dean Mumford's family occupied the house during his term of 29 years. M. F. Miller, appointed dean in 1938, continued to live in the home which he had owned for a number of years. During this time the dean's house served as a dormitory for girls.

E. A. Trowbridge lived in the dean's house while he was dean and J. H. Longwell was the last dean of the College of Agriculture to live in the house.

When Elmer R. Kiehl was appointed dean in 1960, the Board of Curators decided not to continue furnishing the dean of agriculture with a house. For a number of years the dean had not been in direct charge of College farming operations. Chairmen of the departments which were concerned with farm operations had been given responsibility for farm supervision.

In 1961 the dean's house was torn down and the Bingham group of student dormitories was erected on the area.

The first dairy laboratory was in a small frame building which was constructed and equipped in 1890 by Dean E. D. Porter. The building was located about where the southeast corner of the Veterinary Clinic building now stands. In 1902 the Dairy Building, now the east section of Eckles Hall, was built and all dairy work was transferred there. The west wing of Eckles Hall was added in 1937.

Establishment of the Agricultural Experiment Station in January 1888 emphasized the need for a building in which to place the necessary laboratories and offices. An Experiment Station building was erected in 1888 near the corner of Hitt Street and University Avenue, and near the site of the west end of Mumford Hall. The office of the dean of Agriculture, who was also appointed director of the
Agricultural Experiment Station, was moved from Switzler Hall to the new building. The building was used until 1902 when the horticulture building, now Whitten Hall, replaced it.

In 1887 a building with the unusual designation of the Horticultural Barn and Veterinary Laboratory was erected. It was located near the present site of the northeast part of the Memorial Union. Dean Mumford points out that horticulture and veterinary medicine were subjects of considerable interest to farmers during the early years of the College of Agriculture. The Missouri State Horticulture Society was quite active in promoting horticultural teaching and research in the College. Livestock men of the state experienced heavy losses from animal diseases and were very anxious to secure help from veterinary research. The two groups, by combining their support, had much more effect on the General Assembly in securing appropriations for a building than they could have had by separate action.

In 1904 the barn was moved to the present site of the Livestock Building and used as a sheep barn. In 1966, when the barn was in a bad state of repair, it was demolished to make way for the Livestock Building.

In 1903 the first building to be constructed of native limestone was erected on the east campus. This was originally called the Horticulture Building and was renamed Whitten Hall in 1922. The building is now headquarters for the University Extension Division.

The department of dairy husbandry is unique in being the only department in the College of Agriculture that owes its establishment to a special act of the General Assembly. The 41st General Assembly in 1901 passed a law establishing the department and appropriating funds to construct a dairy building. The building was remodeled, a new wing was added, and the name was changed to Eckles Hall in 1938. Dr. C. H. Eckles established the dairy department in 1901 and was department chairman until 1919.

Between 1903 and 1911 barns were constructed for beef cattle feeding, swine, the beef cattle breeding herd, and dairy cattle. In 1923 a new beef cattle barn was constructed, and the old beef barn was remodeled and used for a horse barn. Actually the old barn had been used as a horse barn since about 1912 and the beef cattle breeding herd housed, during winter time, in the cattle feeding shed, commonly known as the “long shed.” In 1958 the dairy barn was badly damaged by fire and the ruins were demolished. The horse barn is the only one remaining of the original barns. The beef barn which was built in 1923 is now part of the University maintenance department warehouses.

A building which provided offices and classrooms, including a small judging arena, for the animal husbandry department was erected in 1901-02. When Waters Hall was built in 1909 the animal husbandry offices were moved into it. The agricultural engineering department has occupied the former animal husbandry building since 1916. A shop and laboratory building for farm mechanics was built in 1904. This building is still used by agricultural engineering.

The veterinary science department did not have suitable quarters until 1911 when a building known as the Veterinary Building was erected. This building was named in honor of Dr. John W. Connaway in 1939.

The agricultural chemistry department, in addition to its teaching and research programs, also analyzed the fertilizer samples for the fertilizer control work. To
provide the necessary facilities for the department a new building was constructed in 1911. This building was named Schweitzer Hall in honor of the first chemist on the College staff, Paul C. Schweitzer.

Dr. P. F. Trowbridge became chairman of the agricultural chemistry department in 1907. In addition to teaching and research in chemistry, he conducted the meats work for the College. A meats laboratory with refrigeration rooms was included in Schweitzer Hall. Dr. Trowbridge used the small frame building which Dean Porter had built for the first dairy building as a slaughter house. This structure continued in use as a slaughter house until 1952 when the new modern slaughter house was built. Laboratory work with meats was moved to the Agriculture Building in 1952.

The increasing student enrollment in agriculture and expansion of research work required more building space for effective operations. In 1909 a new agricultural building was constructed. The name of this building was changed to Waters Hall in 1925, in honor of former Dean Henry J. Waters.

The Board of Curators, in 1898, authorized the establishment of a department of domestic economy. The department was actually established with the name of household economics in 1900. In 1906 the department name became home economics.

Despite inadequate housing for the department, enrollment steadily increased. The General Assembly appropriated $75,000 for a home economics building in 1919. Because of restrictions in the State’s finances only $40,000 of the amount was released for construction of the building. In the meantime, Joseph K. Gwynn, once a school teacher at Versailles, provided in his will for a gift of $50,000 in memory of his wife, Mary Louis Hewer Gwynn, a native Missourian. The building was eventually completed in 1935 and was named Mary Louise Gwynn Hall.

A new agricultural building was completed and occupied in 1924. This building was named Mumford Hall in 1930, honoring Dean F. B. Mumford.

A brick beef cattle barn was built on land south of the campus in 1923 and continued as headquarters for the beef cattle breeding herd until 1961. At that time University General Services converted the building into a warehouse. The beef breeding herd was moved to the South Farm where new quarters were constructed.

In 1939 the Rockefeller Foundation granted funds to pay for the construction of a building to house the genetics work, which was developed by Dr. Lewis J. Stadler. This building was named Curtis Hall, honoring Dr. W. C. Curtis, long-time chairman of the zoology department.

The psychroenergetic laboratory was built in 1945 with funds granted by USDA, the National Research Council, Office of Naval Research, and the Atomic Energy Commission. In this laboratory Dr. Samuel Brody studied the influence of climatic factors on physical reactions and productivity in farm animals.

Except for a few minor structures no other buildings were constructed for the College of Agriculture from about 1930 until after the close of World War II. Because of the immediate need for housing and classrooms for the large numbers of service men who enrolled after the War, the University secured a large number of frame buildings from army camps. The buildings were taken apart in sections at the camps, moved to Columbia, and reassembled on the campus. Most of them were dormitories and apartments but part of them were constructed for use as classroom
buildings. Three of the latter were erected for use by departments of the College of Agriculture. These were designated “temporary” buildings but remain in use at this time. They are T-12, agricultural engineering; T-14, poultry; and the Veterinary Science building at the corner of Rollins and Williams Streets.

The General Assembly appropriated money for the construction of the first unit of a new agricultural building in 1950. The structure, a laboratory section of the Agricultural Building was completed in 1952. The building includes laboratories for agricultural chemistry; laboratories and refrigerators for food science, including fruits, vegetables, and meats; entomology; horticulture; and soils. The spectrographic laboratory is located in the building.

On January 24, 1956, voters in Missouri approved a bond issue for $75,000,000 to finance construction of buildings at a number of state institutions. From the portion of the money received by the University, funds were made available to pay for construction of the first section of the new Agriculture Building and the addition to Gwynn Hall. The addition is named Stanley Hall in honor of Dr. Louise Stanley, head of the home economics department from 1910 to 1923. The Agriculture Building houses the administrative offices of the College and provides offices, classrooms and laboratories for the entomology, food sciences and horticulture departments and the School of Forestry.

In 1966, a small building was constructed, east of the Livestock Pavilion, which houses a low level whole body counter. The counter measures the total emissions from isotopes present in the bodies of animals. The emission counts serve as indices of body metabolism.

A Livestock Center Building was completed in 1968 at the southeast part of the campus. The building includes a large show ring with seats, used for class work and animal shows, a sale ring, and extensive quarters in which to hold animals for classes and sales.

The greenhouses which several departments used for teaching and research in the 1950’s were quite old and provided insufficient space. Requests for appropriations to construct new greenhouses with modern facilities and more space were made during several years, starting in 1955. Funds to construct the first units of the greenhouses which were needed became available in 1958. The buildings were finished and the horticulture department moved into them in 1960. The old greenhouses continue in use at this time. Additions have been made to the new greenhouses.

The building which houses the low level counter and the Livestock Center Building are located in the area which has been designated the Agricultural Research Park.

Construction of the Animal Research Center building was started in 1969. More than $2,000,000 from state and federal sources are available for this first unit. The completed complex which has been planned will cost about $10,000,000.
Bibliography

5. Record in University Business Office.
10. Ibid., p. 580.
11. Ibid., p. 633.
12. Record in University Business Office.
15. Ibid., p. 79.
Agricultural Extension Service

Dean F. B. Mumford stated that the Missouri Agricultural Extension Service began in the years between 1895 and 1900. During these years every teacher in the College of Agriculture gave lectures at farmers' meetings during four to six weeks each winter. Most of the meetings were farmers' institutes in which the State Board of Agriculture cooperated with the College.¹

Lectures by College faculty members before farmers' institutes served a number of valuable purposes. Knowledge gained from the research which was conducted by the Agricultural Experiment Station was presented and interpreted in terms that were understood by farmers. Subsequent application of the information by many farmers to their farming operations led to greater appreciation by them of the value of research to agriculture. Faculty members became more familiar with the wide variety of conditions which affect agriculture throughout the state and with the problem with which farmers had to deal. Some of the more important problems became the subjects for research by the Experiment Station.

The effectiveness of the research and teaching programs of the Missouri College of Agriculture is due in large measure to the close relationships, which began in these early years, between the College faculty, the farmers, and other citizens whose respect for the College was greatly enhanced through the programs. The exchanges of information, experiences, and recommendations for solving problems developed attitudes of mutual respect among the participants and a realization by the College men of their opportunities and responsibilities to extend the services of the College to people of the entire state. The policy of extending the services of the College beyond the campus to include the entire state is a basic principle which is practiced by land-grant colleges of agriculture.

Participation by College of Agriculture faculty in farmers' meetings was supported by Dean H. J. Waters. President R. H. Jesse not only approved the activity, he attempted to develop a University-wide program of extension work. A University standing committee on extension was appointed in 1897. No clear plan of organization existed and faculty members other than agriculture apparently had little interest. President Jesse proposed that a force of about 10 lecturers should be appointed and assigned to lecture throughout the state. Critics opposed the idea as being a scheme to promote the interests of the University. Lacking a plan of organization and money to pay costs, the suggestion did not materialize.²
Dr. A. Ross Hill became the first dean of the Teachers College, established 1903. Hill was a strong proponent of an extension program which would be conducted in Kansas City, St. Louis, and several other cities to provide instruction which would permit school teachers to qualify for promotion. The extension center in St. Louis was formed in a cooperative effort between the University and the St. Louis School of Philanthropy to conduct classes in social work. All of these extension programs included regularly scheduled classes conducted by University staff, or local teachers approved by the University, and courses were accredited by the University.

After he became president of the University in 1907, Hill urged the establishment of a University Extension Division and a request was made for an appropriation for its support. The appropriation was not made and several years passed before appropriated money was available. The Board of Curators authorized the establishment of the University Extension Division in 1910. Correspondence courses were first offered by the Extension Division in 1912, administered by a committee. The first appropriation, for $25,000, for the Extension Division was made in 1913 and a secretary of the Division was appointed that year.

The University Extension Division continued operations, its name being changed to the Adult Education and Extension Service in 1946 and the Division of Continuing Education in 1958. Until 1946 it offered extension courses for credit at various locations in the state, the courses being taught by University staff or by local teachers who were approved by the University. Correspondence courses, at the high school level and college level were offered. In 1946 the new Adult Education and Extension Service added a program of education for World War II veterans under the G. I. Bill.

Dean F. B. Mumford supported the concept of University extension and was a member of the committee which administered the program. But his principal interest was with agricultural extension. He participated actively in farmers' institutes and agricultural trains and was thoroughly convinced that the College of Agriculture must conduct a statewide educational program for farmers. He was aware of the extension work started in a number of southern states by Seaman A. Knapp in 1904 and with the development of the agricultural extension concept in a number of states. The Land-Grant Association appointed a standing committee on extension work in 1905.

The Board of Curators approved Dean Mumford's recommendation to establish an Agricultural Extension Service in 1912. This was a cooperative service which provided for the employment of a representative of the College of Agriculture, to be known as the county farm adviser. In counties which participated in the program the adviser would locate in a county and there devote all of his time to the upbuilding of the agriculture in the county. A fourth of the salary of the farm adviser was paid by USDA, a fourth by the College, and half by the county. The county sponsoring organization has been responsible for all costs of county extension work, except salaries, since the start of extension work in 1912. These costs include office space, equipment, secretaries, supplies, local travel, and other costs of conducting the program.

Pettis County organized a "Bureau of Agriculture" and employed Sam M. Jordan as "farm agent," effective April 12, 1912. The Cape Girardeau County
Court, on June 15, 1912, approved the appropriation of $1,500 a year for three years to support agricultural extension work. C.M. McWilliams was employed July 1, 1912, as the first county farm adviser.4

The Smith-Lever Act, which authorized the establishment of cooperative extension work in agriculture and home economics, was passed by Congress and approved by President Wilson May 8, 1914. The act provided for the payment of $10,000 annually to each state which established a cooperative extension service. Section 3 of the act states: "...No payment out of the additional appropriations herein provided shall be made in any year to any State until an equal sum has been appropriated for that year by the legislature of such State, or provided by State, county, college, local authority, or individual contributions from within the State, for the maintenance of the cooperative agricultural extension work provided for in this act." The cooperative extension work must be administered and conducted by the land-grant college in each state.5

The first federal funds for extension work in Missouri became available July 1, 1914, for the fiscal year 1914-15. The Missouri General Assembly approved the appropriation of funds for the purpose of conducting extension work through federal, state, and county cooperation early in 1913 and appropriated $25,000 for the support of extension work during the biennium. The legislation also authorized county courts to appropriate funds for a county farm adviser to act "in cooperation with the Missouri College of Agriculture in aiding and encouraging the agricultural development of a county."4

The exact title of the Smith-Lever Act reads: "An Act to provide for cooperative agricultural extension work between the agricultural colleges in the several States receiving the benefits of an act of Congress approved July second, eighteen hundred and sixty-two, and of acts supplementary thereto, and the United States Department of Agriculture."

Section 2 of the Act states: "That cooperative agricultural extension work shall consist of the giving of instruction and practical demonstrations in agriculture and home economics to persons not attending or resident in said colleges in the several communities, and imparting to such persons information on said subjects through field demonstrations, publications, and otherwise; and this work shall be carried on in such manner as may be mutually agreed upon by the Secretary of Agriculture and the State agricultural college or colleges receiving the benefits of this act."

D. Howard Doane, a graduate of the College of Agriculture, who had established the department of farm management in 1910, was appointed state leader of county agent work in Missouri in 1913. The first step in establishing extension work in a county was the organization of a countywide group which was known as the county farm bureau, with local supporting groups known as township and district farm bureaus. Doane stated, in the first annual report of the Missouri Agricultural Extension Service that, "The best results have been accomplished in these small organized groups. In these organizations, farmers meet for the purpose of discussing subjects of local significance. Each farm adviser, with this type of organization behind him, has found it possible to carry this work to all parts of his county through the cooperation of local leaders who can be counted on for effective service in the cause of better farms and farm homes."
With the establishment of the Cooperative Extension Service in 1914, A. J. Meyer was placed in charge, first as secretary, later as director of the service. Development of the extension programs was rapid during the first years. Federal programs to increase food production to meet the needs of World War I stimulated expansion of extension work. Federal funds were made available to employ county agents in most of the better farming counties and the majority of these counties continued to support extension work after the war ended. At the end of the first 10 years of extension work under the Smith-Lever Act Missouri had 54 counties in which county agents were working and 10 in which home demonstration agents were employed.

The experiences of the first 10 years of agricultural extension work in Missouri led to several changes in the organization and operation of the program. The first enabling act passed by the General Assembly authorizing agricultural extension work in counties named the county government as the local cooperating group. At first the county funds for extension work appropriated by county courts were turned over to the University for disbursement. This did not work well and the state law was revised to provide for a county farm bureau composed of at least 250 members to be the cooperating group to whom the county court would appropriate funds and with whom the University would sign agreements. The law was revised later to change the words “farm bureau” to “farm organization” because of the changes that had been made in farm bureau organization.

By early 1915 farm bureaus had been organized in 13 Missouri counties. While they were originally established for the purpose of sponsoring extension work, many of the members, who were leading farmers, were concerned about economic and social problems confronting agriculture. They saw in the county farm bureaus the possibility of forming a statewide organization which could apply the combined efforts of all county farm bureaus to support all the programs of the College of Agriculture and at the same time develop cooperative marketing and purchasing programs which would benefit farmers economically.

In March, 1915, representatives of 10 of the 13 county Farm Bureaus met in Slater and organized the Missouri Association of County Farm Bureau Boards, later renamed the Missouri Farm Bureau Federation. The first activity of the state organization was the appointment of a legislative committee which proposed legislation which would provide improved credit facilities for farmers. In 1919 representatives of the Missouri Farm Bureau Federation were active in establishing the American Farm Bureau Federation.

At this first meeting of delegates representing 31 state farm bureaus, a sharp difference of opinion appeared regarding the major functions of the proposed national organization. The main point at issue was whether the organization was to be primarily educational or designed specifically to work toward improved business and economic conditions for agriculture. Strong support developed for each of the proposals and at times the controversy threatened to disrupt the meeting. The new organization was established but without resolving the controversy. Eventually the American Farm Bureau Federation evolved into an organization which is concerned primarily with commercial and legislative activities which affect agriculture.

Determination of the duties and responsibilities of county agents during the early years of cooperative extension work became a matter of considerable
importance to the success of the program. The College considered the county agent a teacher who had the duty to teach farm people, individually and in groups, the practices and methods which would enable farmers to improve the efficiency of their operations. The subjects included in the teaching program ranged widely from techniques such as culling laying flocks, testing the germination of seed corn, or dehorning calves, to the formation of a cooperative livestock marketing association, or holding one week schools of home economics.

Teaching techniques and new practices was done most effectively with community groups, where demonstrations with participation by farmers were conducted. Plans for organizing a cooperative association usually were developed in group meetings which were attended by the majority of farmers who were interested.

Many farmers believed the county agent should function principally in a service capacity, since each Farm Bureau member paid dues which helped pay the county agent’s salary. Rather than learning to do many of the practices, such as selecting seed corn or treating seed oats to control smut, they believed that farmers should expect the county agent to perform these tasks when called by them.

The county agent usually was expected to serve as the administrative officer for cooperative associations. As secretary-treasurer of a fertilizer buying association, for example, he had to convince a number of farmers that they should use commercial fertilizer, secure their orders, place the order with the distributor, supervise its distribution to the buyers, collect payment from each buyer, and pay the distributor. Obviously a county agent who became involved in numerous service activities had little or no time for educational work.

Other farm organizations objected to the close relationships between extension workers and Farm Bureau members. Livestock dealers, whose business was affected by cooperative marketing, and retailers who sold farm supplies and whose sales were reduced by cooperative buying, objected vigorously to the extension-Farm Bureau program. The situation was not restricted to Missouri and became quite acute nationally after the organization of the American Farm Bureau Federation.

A number of conferences were held between officials of the Federal Extension Service and the Farm Bureau and in April, 1921, the True-Howard Memorandum was signed by Dr. A. C. True, director of the Federal Extension Service and J. R. Howard, president of American Farm Bureau Federation. The memorandum pointed out that county agents and home demonstration agents were employees of the state colleges of agriculture and included the statement: “The county agents will aid the farming people in a broad way with reference to problems of production, marketing and formation of farm bureaus and other cooperative organizations, but will not themselves organize farm bureaus or similar organizations, conduct membership campaigns, solicit memberships, receive dues, handle farm bureau funds, edit and manage the farm bureau publications, manage or take part in other farm bureau activities which are outside their duties as extension agents...”

This statement of policy was not binding on state farm bureaus or colleges of agriculture. In a number of states the extension-Farm Bureau relationships were quite close and practical considerations in continued operation of county extension
work required more than voluntary separation of the two programs which were proposed in the True-Howard Memorandum.

The original Missouri law authorized county courts to appropriate funds to support extension work but this was not mandatory and some county courts did not support extension work. Continuing extension work in such counties necessitated securing the county share from other sources. Usually the county agent solicited Farm Bureau memberships and contributions of money from farmers and business men to raise the necessary funds to meet the county's share. In the end this amounted to the county agent soliciting money to pay his own salary and in turn obligated him to render special services to the contributors.

The plan of paying county extension workers which began in 1914 was continued until 1924. At that time the University began paying a larger share from federal and state funds and in 1930 the University began paying all of the county workers salaries from the two funds. This change made possible the employment of extension workers in more counties and enabled the University to give more effective supervision to county agent work.

The title of the Smith-Lever Act states that the cooperative agricultural extension work would be between the state agricultural colleges and USDA. The last statement in section 2 provides that the work shall be carried on in a manner to be mutually agreed upon by the Secretary of Agriculture and the state agricultural colleges. The first annual report of Mr. Doane, referred to previously, suggests the most effective manner of conducting extension work at the county level through organization of community and county groups of farmers with which the county agent could work.

Development of agricultural extension work on an organized basis at this time was due in large part to the expressed desire by many farmers, who had attended farmers' institutes, short courses and Farmers' Week programs, to have a readily available source of the new information which research work by the agricultural experiment station was producing. Many progressive farmers in a number of Missouri counties had found that the new information, when adapted to their individual farm operations, enabled them to increase the efficiency of their operations. A number of organizations including the Missouri Bankers Association, the Federation of Missouri Commercial Clubs, and various farm organizations supported the farmers who promoted the early efforts to develop extension work.

The term "cooperative extension work" attained a broader meaning within a few years after it was first used to designate cooperation between the College and USDA. The county Farm Bureau, originally composed of farmers who were eager to have a county agent who would be a teacher of the new information which research developed, became the group who discussed with the county agent farm problems believed by them to be most important. The discussions soon developed into meetings at which annual programs of extension work were planned. This participation by farm people became an integral part of the extension program and for many years the cooperative extension work has included USDA, the College of Agriculture, and farm people as essentially equal partners in the program. The inclusion of farm people, who indicate their needs for educational assistance and participate in planning the program, is a unique element which is lacking in most
adult education programs and is in large measure responsible for the program's success.

County agents at first relied extensively on resident staff members in the department of the College for the information which farm people needed. During the first years of extension work resident staff members attempted to provide the help which county agents requested, but the time required soon increased to the point that resident staff could not fill all the requests that county agents made. This led to the appointment of subject matter specialists by the departments of the College, whose principal responsibility was to serve as teachers of county agents. Specialists also assisted county agents with conferences and short courses in the counties.

Miss Carrie Pancost was appointed home economics specialist in 1915, the first extension specialist to be appointed in Missouri. She organized home economics extension work in a number of counties and later became state leader of home economics extension in the state. By 1920 extension specialists had been appointed by most of the departments of the College.

The development of methods and procedures which were effective in carrying out successful extension programs was worked out by farm people and extension workers by trying various approaches and adopting those which proved most useful. The first few years the work was done on a county and community basis and dealt principally with problems as they arose. Following World War I about three times as many counties had extension work as before the war and, with the larger number of extension specialists available, regional and statewide extension program planning became possible. By 1940 a system of long-time county program planning, worked out on a county basis by farm people, the county agent, and specialists, had been developed. The long-time county program, brought up-to-date each year, included the principal problems of the farm, home, and community, the objectives to be worked toward, and the known solutions which must be applied in order to reach the objectives."

Home Economics Extension

Extension work in home economics began in 1915 when two workers were employed. The work at first was conducted mainly through extension schools of two to five days duration. Subjects covered in these early schools included meal planning, cooking, sewing, house planning, household conveniences, and health. Early in the program community extension clubs were organized by homemakers and extension workers conducted programs with the clubs. The workers found that, by holding county-wide meetings which were attended by one or two representatives of each community club, they could reach much larger numbers of women than by meeting with each community club. The representatives who attended the short courses became teachers for their respective clubs.

The World War I slogan “Food Will Win the War” gave great impetus to home economics extension work. In 1917 Atchison and Dunklin counties organized for home demonstration work and became the first counties to employ full-time home agents. Employment of home agents progressed slowly for a number of years. In 1933 only 14 counties had home agents; the number increased to 44 in 1936 and to 68 in 1939. The great emphasis placed on better nutrition during World War II
stimulated much more interest in home economics extension work and by 1945 nearly all counties employed home agents.

Home economics extension work has been conducted in urban as well as rural areas from its beginning. Since World War II the work has been greatly increased in towns and cities. In addition to the long established work in such subjects as foods, clothing and home management the program has been developed to include consumer education, market information, and human relations.

4-H Club Work

Boys and girls clubs were active locally in rural communities for a number of years before the Smith-Lever Act was passed. The clubs worked with corn, forestry, gardening, and similar programs and were sponsored by one or more local leaders who were interested in youth work. The State Board of Agriculture in 1907 conducted camps for farm boys at which board representatives and College of Agriculture staff members gave lectures and demonstrations.

These early youth activities were popular among boys and girls but usually had no well-planned programs or objectives. Boys and girls club work began, as a regular part of the cooperative extension program, in 1914. R. H. Emberson, who previously had conducted some club work, was appointed state club leader. The name “4-H Club” was not adopted until 1927.

Many thousand Missouri boys and girls have participated in 4-H Club programs. Before World War II 4-H Club work was limited to rural boys and girls. The extension of suburban areas beyond city limits, especially since World War II, has brought about changes in the organization and programs of 4-H Club work. Many clubs now are composed of both farm and urban boys and girls, and membership of a number of clubs is entirely urban in some of the larger cities.

Planning County Extension Programs

Establishment of the Agricultural Adjustment Administration by the federal government in 1933 involved the Extension Service in carrying out the educational work which the various programs required. The emergency program which the disastrous drought of 1934 made necessary was an added responsibility for the Extension Service. In all of these programs far more detailed information concerning Missouri agriculture was assembled than had been available before. The information, assembled by county committees of farmers, included land use, management practices, production records, farm family income, and similar subjects which affect the success of farm operations.

The information and experience obtained by the Extension Service emphasized the need to revise the method of planning and conducting extension work so that it would be more effective in assisting farm families to plan complete programs for farm operations and family activities which enabled the family to make the most desirable uses of its resources. Each farm family must plan a program for the farm, making use of the abilities and interests of each family member and the capital, soil, labor, equipment, animals, and other facilities which are available.

Prior to this time each extension subject matter specialist had conducted educational work within the limits of his specialty without relating it to other subject matter areas. Administrators and staff members at the state level studied the
situation carefully and developed a procedure for coordinating the work of the subject matter specialists into a program which would assist individual farm families to develop farm and home programs which were best suited to enable each family to meet its needs most effectively. This program was designated “Balanced Farming”.

Farmers found the program very effective and it was applied by large numbers of them. Some subject matter specialists resisted the program because they feared their programs would be submerged in the broader plan. A number of farmers and representatives of industry who had benefited in special subject matter areas also opposed the program because they feared it would restrict the value of extension work to them. Eventually the opposition virtually ended and the balanced farming program proved quite effective for a number of years.

During World War II the Agricultural Extension Service was concerned mainly with the all-out effort to increase food and fiber production which the nation required to meet the domestic and armed services needs and to help allied countries. Extension personnel worked closely with state and county war boards in this program.

Farmers responded whole-heartedly to the call for greater production. Wartime restrictions on tractors, machinery, fuel, fertilizers, and other production materials imposed limits on the expansion of production and extension workers assisted farmers to work out alternate methods of farm operation to secure increased production.

Following the close of the war, demand for farm products continued at a high level and price ceilings were removed. Industry reconverted to production of civilian goods and farm production materials became available. The technological revolution in agriculture proceeded at an accelerated rate. Changes included rapid increases in mechanization of farm operations, much greater use of fertilizers, chemical control of insects and weeds, replacement of open pollinated corn with hybrid corn, rapid increase in soybean production, great increase in production of beef cattle, and declines in dairy, poultry, and sheep production. Directly associated with increased application of technology were sharp increases in capital and operating costs and more competent management capacity of farm operators.

The rapid and extensive developments in agriculture required the Extension Service to make changes in state and county extension programs and to revise considerably the educational preparation for extension workers.

County extension workers were increasingly expected, by farmers, to provide detailed information concerning new technology and management problems. The great amount of detailed information in many different subjects was beyond the capacity of a single county extension worker. The first effort by the Extension Service to solve the problem was to place specialists in subject matter areas, such as agronomy, livestock, and farm management, in a few counties which had special needs. The majority of counties cannot use the full time of specialists but farmers in many counties need such help. This situation is resolved, in part, by locating specialists in several subjects in one center and they work in several adjoining counties.

The Extension Division started a pilot area extension program in seven southeast Missouri counties January 1, 1961 to provide specialized agents to meet
the rapidly-expanding needs of people. At that time there were 29 extension agents at work in the seven counties. As a result of the area staffing 20 of the 29 agents were given specialized assignments involving more than one county. Each county had an extension director that worked full time in his own county.

During the next seven years adjustments were made in the area staffing pattern. This area staffing has met with wide approval in the Delta area (the Missouri Cotton Producers Association passed a 1969 resolution commending this approach to extension work). In 1968 and 1969 other Missouri areas were being organized into extension districts, with the goal of having the entire state organized into areas by January 1, 1970. Various staffing patterns have been used from area to area to achieve the greatest degree of specialization as needed by area residents.

The Extension Service, for many years, selected subject matter specialists at the state level by promoting county extension workers who had developed especially good county programs. This practice was believed to encourage county workers to perform well because of the prospect of being selected as state specialists. The county experience and familiarity with state extension policies which county workers learned were considered valuable qualifications in state workers. Present day demands by farm operators for up-to-date technical information requires subject matter specialists to be much better qualified. Requirements for appointment as extension subject matter specialist now include completion of graduate work and all recent appointees have earned the Ph.D degree.

**Development of County Extension Sponsorship**

The opposition to relationships between the Extension Service and the Farm Bureau continued to increase in Missouri, as well as nationally. In several states the law which authorized agricultural extension work named the Farm Bureau as the sponsoring organization. Despite the True-Howard agreement the law in some of these states was not changed.

In 1933 the Missouri General Assembly changed the words “Farm Bureau” to “farm organization” as the county sponsor for extension work. In 1939 the agreements for cooperative extension work were signed in 43 counties by the Farm Bureau, in 26 counties by county extension associations, in 44 counties by county extension boards and in one county by the Missouri Farmers Association.

The State Grange and the Missouri Farmers Association advocated amending the state law concerning county sponsorship of extension work to prohibit sponsorship by any recognized farm organization. In a number of counties in which the Farm Bureau sponsored extension work the county extension office was located in the Farm Bureau office building.

The National Farmers Union and the National Grange continued to oppose the relationships between the Extension Service and any farm organization, particularly the Farm Bureau. In 1946 a joint committee was appointed by USDA and the Association of Land-Grant Colleges and Universities, to study and make recommendations on the programs, policies and goals of the Cooperative Extension Service. The report of the committee, published in 1948, covered many phases of extension work, including relationships with general farm organizations. The section of the report concerning farm organizations included the statement: “The
committee is further convinced that it would be in the public interest for any formal operating relationships between the Extension Service and any general farm organization such as the Farm Bureau to be discontinued at the earliest possible moment."

"It is appreciated that this is a matter involved in the field of States rights. However, this committee is convinced that the best interests of extension work, the Farm Bureau, and farmers themselves will be served when all legal connections and exclusive operating arrangements between farm bureaus and the Extension Service are discontinued. It is recommended that Extension Service officials and Farm Bureau leaders in the States concerned take the initiative in this matter. The Extension Service can function most effectively only when it is recognized as a public agency available to and operating in the interest of all on an equal basis."

The University administration agreed with the recommendation of the committee that extension sponsorship should be separated from all farm organizations and informed the officers of the farm organizations in Missouri. The General Assembly, in 1955 amended the law separating county extension work from farm organizations and authorizing county extension councils as sponsors of county extension work. The county council was composed of one man and one woman elected from each political township in the county. The function of the county extension council was sponsorship of the county extension work and it was prohibited from engaging in commercial or other private enterprises or legislative programs and giving preferred service to any individual, group, or organization. 11

County council members were elected for two-year terms. Terms of half of the members expired each year so that continuity of council business was provided for.

The establishment of the University of Missouri Extension Division in 1960, with the Cooperative Extension Service in Agriculture and Home Economics included as a division, required revision of the state law. The law was amended by the General Assembly in 1961 authorizing the establishment of a University of Missouri Extension Council in each county. Members of the council are elected by citizens of the county, at least one member to be elected from each district, to be delimited by the University. In addition the county council membership includes one member of the county court, one member from each general farm organization having a membership of 25 or more persons, one member from each incorporated town or city in the county having a population of 10,000 or more, and in counties with no town of 10,000, one member to be appointed by the mayor of the town which is designated by the elected council members.

Each county council is the official agency with which the University contracts to conduct extension programs in the county. The county council cooperates with the county court and the University in developing the annual budget covering the county's share of carrying on the county extension program.

Cooperative Extension Finances

The Smith-Lever Act authorized payment of $10,000 federal funds annually to each state to initiate and support the Cooperative Extension Service. The law required each state to provide an amount of money equal to the federal grant to pay for the extension program. 12 The Missouri General Assembly appropriated $25,000 in 1913 for the support of extension work during the biennium.
In 1924 Congress passed the Clarke-McNary Act, authorizing allotment of federal funds to help state extension services pay costs of forestry extension work. Specific allotments of federal money were not made to states. The payment to any state was limited to the amount equal to the money spent by the state during a fiscal year.

The Capper-Ketchum Act, passed by Congress in 1928, authorized the payment of $20,000 additional federal money to each state for the support of extension work, the federal funds to be matched with equal amounts by the states. Additional increments of federal funds were provided in succeeding years.

The University adopted the policy of paying all of each county agent's salary from state and federal funds in 1930. Each county continued to pay all local costs of the extension program from funds appropriated by the county court or received from local contributors.

Section II of the Bankhead-Jones Act, passed by Congress in 1935, authorized substantial increases in federal funds for cooperative extension work. The law continued the established policy of requiring the state to expend an amount of money equal to the amount received from the federal allotment.

The additional federal and state funds, which the Bankhead-Jones law provided, enabled the Extension Service to increase its program of information to farmers at a time when they were in great need of assistance. The majority of farmers who survived more than five years of depression and the severe drought of 1934 needed information and encouragement. The federal emergency programs were of great assistance but their success depended heavily upon the Extension Service organization and educational programs.13

The Cooperative Farm Forestry Act, also called the Norris-Doxey Act, was passed by Congress in 1937. The act authorized appropriation of federal funds for the purpose of supporting a program of farm forest planting.

Additional federal legislation which authorized payment of federal funds to support cooperative extension work are:

- The Act of 1939 to provide further development of Agricultural Extension work.
- The Bankhead-Flannagan Act of 1945.
- The Agricultural and Marketing Act of 1946.
- In 1962 Congress passed the Consolidated Smith-Lever Act, which combines the provisions of the Smith-Lever Act of 1914 and the later supplementary acts relating to extension work. The consolidated act eliminates many of the details relating to services of extension work in specific areas and consolidated all of the federal funds into a single account.

State and County Finances

The requirement that all allotments of federal funds be matched with equal amounts of state funds usually has been helpful in securing appropriations by the General Assembly but at times it has caused problems. Members of the General Assembly usually are aware of the valuable educational programs which the Extension Service provides and most of them support appropriations for extension work. For many years county courts were allowed discretionary power in
appropriating money for extension work. At times county courts made no appropriation or appropriated less than the amount required to meet the county share of costs. In 1955 the General Assembly amended the law to make appropriation of funds by the county courts mandatory. The amounts which were required were stated for each of the four classes of counties, the maximum not to exceed one dollar per capita of rural population. After the University Extension Division was established, the General Assembly, in 1961, amended the law, which now states the amounts to be appropriated by county courts for each of six classes of counties, based on the assessed valuation of property in the county.

Individual legislators sometimes believe citizens who benefit from extension programs at times attempt to exert undue influence upon legislators in behalf of the Extension Service. The belief includes the assumption that extension workers prompt the people to exercise their influence. The resentment which this belief develops among legislators results in opposition to extension work and to appropriations for the Extension Service.

The recent charge made in the General Assembly that the Extension Division is a political agency of the University is reminiscent of the same objection which was raised to the establishment of a University extension service proposed by President Jesse in 1897.

Special Contributions

Business organizations at times contribute money to support specific extension activities. In the early 1950's one of the railroads which operates in Missouri gave money to pay the expenses of a week-long short course for volunteer local leaders. These were leaders of home economics extension clubs, 4-H clubs, and similar extension activities. Business firms often contribute money to pay expenses of boys and girls, with their leaders, who are delegates to national 4-H meetings. The costs of establishing county soil testing laboratories usually are paid from contributions made by banks, merchants, and others who are interested in developing the agriculture of the county. Funds received for activities of this kind are not included in the extension budget but do assist materially in conducting extension programs.
Bibliography

1. Mumford, F. B., History of the Missouri College of Agriculture, Missouri Experiment Station Bulletin 483, 1944, p. 43.
10. Ibid. p. 38.
15. Ibid. p. 15.
16. Ibid. p. 23.
The great changes which developed in rural-urban relationships following World War II affected extension organization and programs. Large numbers of people moved into suburban areas, most of them within a few miles of city limits but many of them lived 50 miles or more from the places where they worked and commuted round-trip each work day. The majority of them had lived and worked in towns or cities and moved their residences to the cleaner, quieter, less congested suburban areas. Some of them were farmers who worked in town but continued to live on the farm and do part-time farming.

These new suburban and rural circumstances introduced unfamiliar economic and social conditions. People with urban backgrounds who continued to work in towns now lived in the same communities with neighbors with rural backgrounds who continued to farm full-time or in some cases did part-time farming and worked in town.

Agricultural and home economics extension workers who previously had worked entirely with farm people were now called upon by the urban-oriented people for assistance. The help which was asked for included advice on landscaping the home grounds, developing community recreational facilities and programs, home management, and many other subjects. Dwellers inside city limits learned from their suburban acquaintances the kinds of assistance which extension workers offered and also asked for help. Many extension workers who formerly worked only with farm people now spent a substantial part of their time working with suburban and urban people.

Requests were received by the University from a number of communities around the state for assistance in a wide variety of subjects, including studies of the economic and industrial capabilities of the community, planning recreational facilities and programs, studies of the probable effects on the area of the construction of reservoirs on rivers, and many other problems which concerned urban and rural areas.

Many of the requests came to the College of Agriculture and staff members of the Agricultural Experiment Station and Agricultural Extension Service conducted the necessary studies and supplied the information which was requested. Other divisions of the University also received requests for help. The Adult Education and Extension Service received many requests for help in community planning and
development and employed a specialist to work in the state. The College of Engineering, the School of Medicine, the School of Business and Public Administration, and other divisions responded to requests for assistance in many part of the state.

Part of the off-campus work which was done by the several divisions of the University was administrated by the Adult Education and Extension Service; part was conducted independently by the different divisions. Each division which did off-campus work established its own policies and procedures and at times conflicts and duplication developed between two or more divisions.

When the University Extension Division was reorganized in 1946 and the name changed to the Adult Education and Extension Service, the possibility of combining all University extension programs, including the Agricultural Extension Service, was discussed. Dr. T. A. Brady, vice president of the University and executive officer of the Adult Education and Extension Service, stated: "There were several administrative obstacles to be overcome, of course, but we finally agreed, about 1947, that we would have to wait on it largely because we thought it better to move when new personnel at the top had to be added and try to secure a man who was interested in doing what we thought should be done—combine the services."

During the 1950's the expansion of off-campus programs by several divisions of the University progressively increased the desirability of combining all University extension work in one division. Dr. C. B. Ratchford became director of the Agricultural Extension Service July 1, 1959, succeeding J. W. Burch who retired. Dr. Ratchford came from North Carolina State University where he had been assistant director of agricultural extension. He was interested in the proposal to unite all off-campus educational programs conducted by the University in one division. Following Dr. Ratchford's appointment in 1959, informal discussions were held among representatives of the Agricultural Extension Service, Continuing Education, and President Elmer Ellis.

President Ellis asked Dean J. H. Longwell to meet with representatives of the two extension services and develop a plan for uniting them in one division. The first meeting was held in November, 1959. Present at the meeting were:

*Dr. T. A. Brady* - Dean of the Extra Divisional Administration (under which the Division of Continuing Education was included)

*Dr. Amos J. Snider* - Director, Division of Continuing Education

*Dr. Elmer R. Kiehl* - Chairman, Department of Agricultural Economics

*Dr. C. Brice Ratchford* - Director of the Agricultural Extension Service

*Dr. R. A. Schroeder* - Chairman, Department of Horticulture

*Dr. R. L. McNamara* - Chairman, Department of Rural Sociology

They agreed to develop a plan for a University Extension Division that would include the Agricultural Extension Service and Continuing Education. A drafting committee was appointed, composed of:

*Walter Heidlage*, State Agent (District Supervisor, Agricultural Extension Service)
The proposal which was drafted was discussed by the same group and Dr. Ratchford on December 30, 1959. The group made some changes and agreed to approve the amended proposal. A drafting committee, composed of Dr. Ratchford, Dr. Elmer Kiehl, Dr. R. A. Schroeder and Professor Stirling Kyd, was appointed and instructed to draft a recommendation to be sent to President Ellis. President Ellis approved the recommendation and asked the Board of Curators for authority to establish the University Extension Division, to include all off-campus educational work conducted by all divisions of the University at Columbia and Rolla. The Board approved the recommendation May 13, 1960, to become effective July 1, 1960.

Action taken by the Board of Curators held on May 13, 1960, was as follows: "Be it resolved that there be and is hereby established a Division of the University to be designated as the 'University Extension Division' and located at Columbia and that the Administrative officer responsible for the operation of the University Extension Division shall be a Dean responsible to the President as other Deans; that the University Extension Division shall consist of the present Agricultural Extension Service and the Division of Continuing Education and such activities of this nature conducted at present by any division of the University at Columbia and Rolla and such as may be established in the future in any division of the University. Hereafter all departments and divisions of the University shall channel all activities of an extension nature, both teaching and service activities, through this division and all teaching and research departments as funds are made available shall appoint staff members through proper channels to furnish professional knowledge and advice for programs directed by or to be established and directed by the University Extension Division."

Administrative Structure

The integration of the Division of Continuing Education and the Agricultural Extension Service was accomplished by the Board of Curators naming the director of the Agricultural Extension Service also dean of the University of Missouri Extension Division.

The pattern of operation that was established in the College of Agriculture of subject matter specialists being used to train extension workers and to participate in other informal teaching situations was extended to all other academic divisions of the University including the School of Mines at Rolla.

County agents were made administratively responsible for all University of Missouri extension educational programs in their respective counties.

State agents who had been district supervisors for the Agricultural Extension Service were made district directors for the University Extension Division.
The director of the Continuing Education Division was given the title of assistant dean of the University Extension Division.

Director C. B. Ratchford was appointed dean of the University Extension Division.

When the University of Missouri - St. Louis and the University of Missouri - Kansas City were established, the off-campus educational work conducted by both divisions was included in the University Extension Division. Dr. Ratchford was named vice-president for extension, with headquarters at Columbia. A dean of extension was appointed for each of the four campuses.

Establishment of the University Extension Division has involved extensive reorganization of the Agricultural Extension Service at the state and county levels. All agricultural extension work is administered from the College of Agriculture. The administrative officer, Dr. Schell H. Bodenhamer, is associate dean of agriculture for extension. He is responsible to the dean of the College of Agriculture for all agricultural extension programs and for the appointment of all agricultural extension personnel. He coordinates agricultural extension programs with the extension programs of other divisions of the University through the office of the dean of extension on the Columbia campus.

At the county level the former title of county agricultural extension agent has been changed to the University of Missouri county extension director. All extension work conducted by any division of the University on each of the four campuses clears through the office of the county extension director.

The University of Missouri was the first land-grant university to establish a university-wide extension service. As the pioneer in the field it has been necessary to work out the plan of organization and programs which are most effective under Missouri conditions and to make adjustments as experience indicates.

The new Division has been well accepted by the majority of people with whom extension has worked. The changes which were made at the county level led some farm people to believe that the agricultural extension program was being down graded. One small group, composed mainly of one-time extension employees who had left the Extension Service, attempted to arouse opposition to the University Extension Division. The reasons which the group stated for their attack on the Division were that the agricultural extension program, especially balanced farming, was being neglected and that one of the extension specialists was being treated unfairly.

Several members of the group, while they were with the Extension Service, had been leaders in promoting the controversy with the Soil Conservation Service. Because of the abatement of the controversy they accused the College of Agriculture of "selling out" to the Soil Conservation Service. When their attack on the College and on individuals in the College and Extension Service administrations did not bring about desired action by the Board of Curators, they carried their attack to the General Assembly. They made intemperate attacks before legislative committees upon the Board of Curators, President Ellis, Dean Kiehl, and Dean Ratchford. Their case was presented to the delegates of the Missouri Farm Bureau Federation. None of their efforts were effective, their ammunition was spent, and the disturbance has subsided.
Dissemination of Information
Beyond the Campus

Advocates for the establishment of agricultural colleges in the United States evidently thought of them only as resident colleges in which students would study agriculture, science, and related subjects. The concept of the college as an institution which would disseminate information to farmers was not a factor in the early movements for agricultural education. Agricultural associations, societies, and fairs were the principal means by which information was made available to farmers.

The American Philosophical Society, founded by Benjamin Franklin in 1744, published many articles on agricultural subjects.\(^1\) Out of this Society was developed the Philadelphia Society for Promoting Agriculture in 1785. Its object was to promote “a greater increase of products of land within the American states.” To accomplish the purpose the society would publish memoirs, offer prizes for experiments, improvements, and agricultural essays. Agricultural societies with similar aims were established in most of the original states.

The lyceum movement was founded in 1826 in Millbury, Mass. A principal object of lyceums was to promote “application of the sciences of agriculture and the other useful arts and for qualifying teachers.”\(^2\) College and university professors gave lectures at lyceums but the institutions of which they were faculty members did not conduct off-campus programs.

The Morrill Act of 1862 authorized the establishment of colleges “to teach such branches of learning as are related to agriculture and the mechanic arts.” No suggestion is made in the law that any educational work would be conducted outside the college campus. Michigan Agricultural College, established in 1856, was the first agricultural college to become a permanent one. But MAC staff members did not begin lecturing at farmers’ institutes until 1876.

The idea did exist that the new colleges could benefit farmers directly. Leading farmers who continued to believe the colleges were potentially valuable to them asked that college staff members lecture to farmers’ institutes. College administrators believed that faculty members could give farmers valuable information and at the same time improve the confidence of farmers in the colleges. Kansas Agricultural College, in 1868, was the first to initiate farmers’ institutes. Several other colleges followed during the next few years. The Missouri College held its first institute jointly with the State Board of Agriculture in 1882.
Presidents of many land-grant colleges were not yet ready to accept the idea that the colleges had responsibilities to conduct state-wide programs with farmers. The presidents believed that the primary responsibility of the colleges was the resident teaching programs on the campuses and that the development of state-wide programs would overshadow them. During the discussions which continued from 1871 to 1903, the presidents opposed the position of the college deans and staff members that research should hold a status equal to resident teaching in college organization.

Dean J. W. Sanborn encouraged his College staff members to write articles useful to farmers for publication in newspapers and farm magazines. Colman's Rural World obtained much of the information it published from College staff. Dean Sanborn and Dr. Paul Schweitzer wrote a number of reports on the research which they conducted which were published as College of Agriculture reports. Thirty-four of these reports were published before the first Experiment Station Bulletin was published.

Experiment Station Bulletin No. 1, published March 1888, was entitled “Announcement to Farmers; The So-Called ‘Hatch Bill;’ Assent of Governor; Plan of Organization; Work and Experiments Proposed; Personnel of Station.” Subsequent bulletins reported the results of research and were written in non-technical language which farmers could understand.

A second series called Experiment Station Circul ars was started in 1895. Circul ars gave practical information on specific topics. Circular No. 2, for example, contained information on the control of chinch bugs.

When more basic research was conducted, after funds from the Adams Act became available, a third series of publications was established in which research could be reported in technical language. This was the Research Bulletin series. The first research bulletin, published in April, 1910, contained the report of “An Experimental Study of the Rest Period of Plants. The Winter Rest Period,” by Dr. W. L. Howard, professor of Horticulture.

Soon after the Agricultural Extension Service was established the Agricultural Extension Circular series was started. Extension Circular No. 1, titled “Cooking Vegetables” was written by Louise Stanley and was published in January, 1915.

Extension circulars and Experiment Station circulars were similar in objective and in composition. Both publications were continued until about 1950 when the Experiment Station series was discontinued. The format of extension circulars varies widely from single sheets and folders which include information on a specific item to publications of 100 pages or more which cover a broad subject matter area.

Establishment of the Agricultural Extension Service in 1914 increased the need for information published by the college. Extension workers distributed printed material to farmers and the demand by the rural press for reports of research continued to increase. The amount of work involved in editing, publishing and distributing the information required the services of a full-time editor and on September 1, 1915, J. O. Rankin became the first agricultural editor. The position included the editing of Experiment Station and extension publications. In October the first issue of “The Agricultural Copy Service,” a mimeographed sheet primarily for the rural press, was published. This publication was continued until May, 1921.
A. A. Jeffrey became agricultural editor January 1, 1921, and continued to fill the position until June 30, 1951. Early in his term he replaced the Agricultural Copy Service with the Farm News Service, the latter, a clip sheet for newspapers, was issued weekly. It has been a very useful publication and continues in use at this time.

Staff members of the Agricultural Experiment Station report much of the information which they obtain from research work in journals which are published by professional societies. The reports are written by research workers with assistance by staff members of the agricultural editor’s office. Experiment Station staff members also write articles for publication in farm magazines and newspapers.

A radio news service was initiated in 1930. The service included brief items of news and timely information, written in a series of independent paragraphs. The information was sent to radio stations in Columbia, Kansas City, St. Louis, and Chicago. The radio service has been expanded to include numerous Missouri stations. It is now available in script and tape.

An assistant editor was employed in 1927. Mr. Jeffrey and his assistant carried all the work of the office until the end of World War II, when the staff was increased to four. One member was responsible for publications; the others were responsible for press and radio work.

Television was first included in the program of the agricultural editor in 1953. A regular television program was started in cooperation with WDAF-TV in Kansas City in 1953 with an associate editor responsible for the program. The University station KOMU-TV also began operating in 1953 and its facilities were made available to College staff members. Participation by staff members was quite limited for several years. The reluctance of staff members to use the new and effective means of disseminating information has gradually disappeared until television programs have become a regular part of the agricultural editor’s work. The use of cameras with which to make film for television programs has facilitated development of this program.

A four-year curriculum in agricultural journalism was started in 1921. This cooperative curriculum with the School of Journalism prepares students for a wide variety of occupations in newspaper and magazine work, radio, television, public relations, and advertising. Through the years the opportunities for employment of graduates in this area have exceeded the number of graduates. Members of the agricultural editor’s staff serve as advisers for students who major in agricultural journalism.

Mr. Jeffrey retired in June, 1951, and was replaced by Ovid Bay, who remained until 1953 when Elmer B. Winner became editor. Mr. Winner expanded the services of the editor’s office, especially in radio and television programs, assistance to resident and extension staff in the use of visual aids for teaching, and by offering a course in agricultural communications. In 1959 Mr. Winner resigned and was replaced by Richard L. Lee, who had been assistant editor.

Under Dr. Lee’s leadership the editor’s staff has continued to conduct programs which assist the resident and extension staff members to improve the reporting of research results and to prepare more effective methods of presenting information in the classroom and in off-campus extension programs.
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2. Ibid., pp. 31-32.
College Relationships with Industry

The wording of the original acts of Congress which authorized the establishment of land-grant colleges, agricultural experiment stations, and cooperative extension work in agriculture and home economics reflects the primary intent of the law makers, and supporters among the population, of public support of research and teaching programs for the benefit of farm people. Implicit in these acts is the concept, probably not clearly foreseen, that the institutions which the acts authorized would render services to segments of the population besides farm people.

The first Morrill Act of 1862\(^1\) provides that the land-grant colleges shall “teach such branches of learning as are related to agriculture and the mechanic arts—in order to promote the liberal and practical education of the industrial classes in the several arts and professions of life.” Obviously “mechanic arts” was intended to include something other than agriculture. But at first mechanic arts was included, if offered at all, in the courses offered in the colleges of agriculture. Only later did engineering evolve as separate colleges or schools of engineering in the land-grant institutions.

Morrill, Turner, and others who proposed and supported this legislation distinguished between the professional and industrial classes and pointed out the greater opportunity for higher education which was more readily available to the professional than to the industrial classes and indicated they meant the term “industrial” to apply to farmers and industrial laborers. Equal opportunity for higher education, regardless of social and economic status, is the objective which was emphasized.

Labor, the industrial class which Morrill and others hoped would participate in the establishment and development of the colleges, has had little to do with them. To be sure, the doors of land-grant colleges have always been open to the members of industrial laborers’ families, but labor organizations and leaders made no effective attempt to establish curricula and courses which dealt with social, economic, health, housing, political, or any other problems of industrial workers.

F. B. Mumford pointed out\(^2\): “that the land-grant college is perhaps the only institution of college grade which has come into being as the result of a deep-seated
and urgent demand of the common people, particularly farmers, for an education adapted to their special needs. The later history of these institutions and their relations with the federal and state governments seem to add force to the conclusion that the major influence in the progress and development of these institutions is to be found in the continuous support of farmers organizations, farmers, farm people and social and economic groups directly or indirectly dependent on agriculture.”

The Hatch Act of 1887 says: “to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigations and experiments respecting the principles and applications of agricultural science, there shall be established—a department to be known as an agricultural experiment station.” While the emphasis is on agricultural research, the diffusion of the information is “among the people of the United States,” not solely to farm people.

The act of 1914 providing for cooperative extension work, known as the Smith-Lever Act, says: “That in order to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics there may be inaugurated—agricultural extension work.” Section 2 of this act states: “That cooperative agricultural extension work shall consist of the giving of instruction and practical demonstrations in agriculture and home economics to persons not attending or resident in said colleges in the several communities, and imparting to such persons information on said subjects.” Agriculture and home economics are the subjects to be included, but no restrictions are placed on the people to whom the instruction may be given except those who are enrolled in land-grant colleges.

The difficult problems which the faculty met in attempting to develop curricula and courses in agriculture during the early years of the college are described by Dean Mumford in his History of the Missouri College of Agriculture. The term “agriculture” at that time meant farming and the objective of the college was to teach courses that were useful to farmers. A statement which appears several times in Dean Mumford’s History of the College of Agriculture is: “From the College point of view the ultimate purpose of all College efforts is to establish in Missouri a permanent and prosperous agriculture and a contented and efficient rural people.” But aside from some practical farm knowledge possessed by a few faculty members, no one knew what to teach. Slowly it became evident that higher education in agriculture must wait the development of methods of applying principles of science to farming. Dean Sanborn began some research in 1882 and when the Experiment Station was started in 1888 several pieces of research were being conducted.

Until 1901 anyone who applied for admission and paid the required fees was permitted to enroll in the College. In 1901 the faculty required applicants to present six high school credits and by 1906 this requirement was raised to 15 credits. In the meantime, information on the applications of science to agriculture obtained from research, which was conducted by Missouri and other experiment stations, had accumulated in sufficient amounts so that faculty members had organized agricultural courses which were of college level. These courses dealt
almost entirely with methods and practices which enabled farmers to increase production of crops and animals.

Research projects in the Experiment Station were planned to secure information which would help answer farmers’ problems of production. Beginning in 1907, research projects which were financed from Adams Act funds, while still of a practical nature, delved more deeply into basic principles of the sciences related to agriculture.

President R. H. Jesse and Dean H. J. Waters encouraged staff members to attend and participate in farmers’ meetings throughout the state. Farmers’ institutes were active and often called on College faculty members to speak. The major railroads which operated in Missouri conducted agricultural trains and College staff members presented the programs to farmers who attended at the scheduled stops.

Participation by College staff members in these meetings with farmers was valuable in a number of ways. Staff members gave to the farmers information which was useful to them in their farm operations. In discussions with farmers staff members became aware of problems for which solutions were known or, if not, they sometimes became the subject of research by the experiment station. Farmers who attended the meetings came to realize the value to them of the work being done by the College. This increased confidence of farmers in the College caused more of them to send their children to the College and to increase their requests for information from the College. The growing esteem for the College among farmers was reflected in the General Assembly, which became more generous in appropriating funds to support the College programs and for buildings and equipment.

College faculty members, whose duties included teaching classes on the campus and conducting research, eventually found that the increasing number of requests for them to speak at farmers’ meetings required them to be away from the campus so much that they could not give the required time to classwork and research. The work which was being done with farmers was entirely too important to neglect. In 1912 the Board of Curators, upon recommendation by Dean Mumford, authorized the establishment of the Missouri agricultural extension service.

States throughout the nation, with experiences similar to Missouri, had been carrying on discussions, principally within the Land-Grant Association, for a number of years. The association had a standing committee on extension work and this committee developed the recommendations which resulted in enactment by Congress of the Smith-Lever Act of 1914. It should be noted that this act initiated the federal policy of requiring each state to provide funds equal in amount to the allotment from federal appropriations.

Prior to about 1920 substantially all research and teaching work conducted by the College dealt with methods of increasing farm production and improving management practices. Farmers were eager to receive this information and made extensive use of it. Yet, farmers, for many years, had experienced serious economic problems. Prior to World War I the Agricultural College did very little research or teaching in the economic problems of agriculture. These problems included farm credit, high costs of machinery and other production materials, lack of competition in the markets where farm products were sold, and excessive costs of rail
transportation. A department of farm management was established in 1910, and beginning in 1915 the department added courses in rural economics, marketing, and cooperation. Many farmers had attempted with little success to deal with these problems through group action and government regulation.\textsuperscript{14}

The Missouri College of Agriculture, like most other land-grant colleges in the early years, carried on very little research or teaching activities which involved private industry. A few exceptions to this existed, such as the agricultural trains which railroads conducted and which were staffed by college personnel. But for the most part an attitude of mutual distrust, at times outright antagonism, existed between industry and the colleges.

The great majority of agricultural college faculty members were farm reared and held the viewpoint of many farmers that business and industry were largely responsible for the economic troubles of farmers. A few business firms did conduct fraudulent practices in dealing with farmers. Some materials which were sold as fertilizers at high prices actually were composed principally of inert materials and had little plant food content. In order to discourage this practice, the 37th General Assembly of Missouri passed a bill, in 1893, entitled "An Act to Prevent Fraud in the Manufacture and Sale of Commercial Fertilizers."\textsuperscript{15} Administration of this law was vested in the director of the Agricultural Experiment Station. This was done because, at that time, the Experiment Station laboratory was the only official one in the state with the staff and equipment necessary to do the analytical work. The question of the propriety of the Experiment Station acting as a regulatory agency has been raised many times but, as will be seen, there are good reasons for this service.

The Experiment Station and Extension Service published bulletins and circulars which gave farmers information about the use of barnyard manure and mineral fertilizers. Formulae for mineral fertilizers and instructions for their mixing and use were included in the publications. Farmers were advised to purchase the ingredients and mix fertilizers on the farm because they were surer of securing the quality of fertilizers they needed and because the cash cost was less than for ready-mixed fertilizers.

Manufacturers of commercial mixed feeds also sometimes included low-grade and inert materials and misrepresented the feeding value of their products. This led to legislation, usually supported by college faculties, regulating the manufacture and sale of commercial feeds. The state commissioner of agriculture administers the feed control law.

College staff members advised farmers against the purchase of commercial mixed feeds and provided them with formulae and information for mixing feeds on the farm. Farmers were advised to buy protein concentrates and mineral supplements and mix them with homegrown grains. It was pointed out that they sold their grain at whatever prices the market offered, then bought similar grain in mixed feed bags at considerably higher prices.

Farmers individually were often unable to buy the quality or amount of materials such as protein concentrates or fertilizer ingredients they needed at prices they could afford. This caused many farmers to form cooperative groups to buy in quantity and at lower prices. Faculty members often assisted these cooperative groups.
The activities of college staff members in helping farmers in the organization of cooperative associations for the purchase of production materials and in assisting farmers to promote legislation which would correct unfavorable marketing practices, caused business and industry to oppose colleges, at times quite vigorously. Opposition expressed by business to activities of colleges on behalf of farmers usually is based on the point that colleges are supported by taxes which are paid by private business, yet the colleges are interfering with their business. This argument overlooks the fact that farmers, also engaged in private enterprise, pay taxes in support of the colleges and other public services.

Antagonisms which developed during the first three or four decades of this century between agricultural college staff members, representatives of business and industry and, farmers often were deep seated and remnants of them remain at this time.

Development of the soil fertility program in Missouri illustrates quite well the development of relationships by the College of Agriculture, farmers, and industry.

Dean J. W. Sanborn began soil fertility research soon after his appointment in 1882. In 1888 he established the soil fertility plots in the area which was named Sanborn Field in his honor in 1924. Dr. Paul Schweitzer, chemist, was author of Missouri Agricultural Experiment Station Bulletin No. 19, October, 1892, and No. 20, January, 1893, both entitled "Soils and Fertilizers." In these he reports the results of chemical analysis of a number of samples of soils which were collected in different parts of the state and of a number of fertilizer materials which were on the market.

Since these beginnings, the research and teaching programs of the College staff in soils have contributed greatly to the development of Missouri agriculture. Sanborn Field, which has been operated continuously for 80 years with a number of plots under a variety of cropping systems, some with added plant food, some without, has provided soil conditions from which research has developed much valuable information on soil chemistry and physics. The isolation of streptomycyes aureofaciens, from which aureomycin is produced, from the soil of one plot in this field was an entirely unanticipated but very useful contribution.

The research project, which M. F. Miller established in 1917, to measure water and soil losses under different cropping systems has produced valuable information which has been used widely in developing water and soil management programs on Missouri farms. The project plans also have been used widely in developing water and soil conservation research throughout the nation.

In 1922 the extension staff in the soils department started a very effective program called "Clover and Prosperity." Through this program many thousands of Missouri farmers received useful information on soil fertility and crop production which had been produced by research and subsequent testing under practical farm conditions. Through this program farmers learned the value of soil tests then in use and of applying plant foods to correct fertility deficiencies. This program was continued, with improvements as indicated by additional research and experience, for a number of years.

During the drouth and depression years, 1930-1937, appropriation of money by the General Assembly was sharply reduced. The reduced income forced
reductions in numbers of staff and in operations in all three divisions: research, resident teaching, and extension of the College, thus limiting the work which the College could accomplish.

The establishment of action agencies by the federal government introduced new factors in assistance to farmers. Colleges of agriculture throughout the nation were severely criticized by some advocates of federal programs for their conservatism and failure to solve many farm problems. At the same time the colleges were asked to assist the new federal agencies to develop their programs.

The Missouri College of Agriculture did help the federal agencies by giving farmers necessary information and by assisting in the development of local and state organizations which were required to implement the programs.

The research and extension programs of the soils department were particularly useful to these federal programs. The Agricultural Adjustment Administration relied on the department’s recommendations for the kinds and amounts of limestone and fertilizers which farmers should apply. AAA payments to farmers who applied the limestone and fertilizers in accordance with recommendations encouraged much greater use of these materials. The Soil Conservation Service established a number of research projects in several areas of the nation which measured water and soil losses. These were patterned after the runoff measurement plots which M. F. Miller had developed in 1917.

In 1933 Congress approved the establishment of the Tennessee Valley Authority. The law which authorized TVA included among its many objectives the manufacture of nitrate fertilizers. TVA later expanded into production of high-analysis phosphate materials. The agency also established cooperative fertilizer research and demonstration projects with a number of state agricultural experiment stations, including the Missouri Agricultural Experiment Station. This further increased demand by farmers for high-analysis fertilizers. Farmers learned that high-quality fertilizers, applied according to recommendations based on soil tests, were more effective in increasing crop yields and more economical sources of plant food than the low-analysis materials. Increased demand for these materials caused private industry to increase substantially production of high-analysis goods.

Although fertilizer manufacturers at first objected to the fertilizer control law which the Missouri General Assembly passed, they eventually came to accept it. The annual report of the fertilizer inspection work in Missouri for 1920, by F. B. Mumford, states: “By reason of the success of the Experiment Station in properly correlating the investigational and educational activities of the Agricultural Experiment Station and the protection of farmers in the use of fertilizers through the inspection service, the manufacturers of fertilizers now consult the Experiment Station authorities before placing their brands of fertilizers upon the market. They have come to appreciate the fact that the ultimate success of their business depends upon pushing the sale of brands of fertilizer which are known to produce profitable crops on the soils of Missouri.”

This somewhat optimistic statement indicated that at least the reliable manufacturers realized that their continued success in business depended on the reputations which they established by producing the quality of product for which farmers paid and which they could reasonably depend upon to produce results. There continued to be individuals and companies who were principally interested in
quick profits with little regard for continued business based on dependable products. Some of these kinds continue to operate at this time.

Information which the soils department research program develops in plant nutrition is made available to farmers and to fertilizer manufacturers and distributors. Many farmers are well informed in the interpretation of soil tests, the effects of plant nutrients on plant development, and the economics of the use of plant foods in crop production. Fertilizer manufacturers and distributors are aware of the plant food requirements of the various crops produced in Missouri and of the elements which are needed as indicated by soil tests. Farm machinery manufacturers adapt fertilizer distributing machines to enable farmers to place fertilizers at the depths and spacing which are found by research to be most effective and in the amounts indicated by soil tests to be needed.

For many years the soils department accepted samples of soil which were sent in by farmers to have lime requirement tests made. After the tests were made by the department, reports were sent to the farmers with the lime requirements indicated. Following World War II the increasing use of lime and fertilizers by farmers indicated need for additional tests to determine the amounts of available nitrogen, phosphorus, and potassium in soils as a basis for determining the amounts of these elements that should be applied to the soils. A plan was developed in which soil testing laboratories were established in connection with the county extension offices under the supervision of the county extension agents. The program was started in three counties in 1946. In 1960 laboratories were being operated in 103 counties and more than 100,000 soil samples were tested. In some areas of the state two or more counties have combined laboratories at one location. Eighty-three laboratories were being operated, with more than 100,000 soil samples being tested in 1967.

The costs of equipping the laboratories were paid by local people, merchants, banks, farm organizations, or others. A local person was given instruction in operating the testing equipment and making the tests. Costs of operating the laboratories are paid from fees which are charged for samples that are tested. The county extension agent, who is familiar with the farms from which the samples come, interprets the results of the tests for the farmer and advises him as to the amounts of plant food required. In time many farmers have learned to interpret the tests and determine the amounts of plant food needed. In recent years soil fertility advisory services have been established by some fertilizer companies and by independent operators. These services test soils for farmers and advise them on uses of plant foods.

A number of fertilizer manufacturers and distributors have made grants of money and materials to support the soils research work. These grants are accepted only when the grantors agree that specific use of the money or materials will be determined by members of the soils department staff and that results of the research will be available to the public.

Fertilizers are marketed in several different forms. The three basic elements—nitrogen, phosphorus, and potassium—are available in materials which contain a single element. These are known as straight goods. Mixtures of these materials which contain two or all three of the elements in various proportions are known as mixed goods.
Fertilizer manufacturers developed a great number of mixtures which contained various amounts of two or all three of the basic elements. Careful quality control is required by manufacturers to insure the inclusion of minimum guaranteed amounts of the basic elements yet avoid costly excesses being included. These mixtures are sold under trade names, in bags. Fertilizer inspection staff often advise and assist fertilizer manufacturers with quality control problems.

During the 1950's a new method of mixing and distributing fertilizers, known as blending, developed. Local distributors carry stocks of straight goods and when a farmer orders an amount of mixed fertilizer, based on soil tests, the distributor calculates the quantities of straight goods required to supply the amounts of basic elements called for. These quantities of straight goods are mixed or blended in a mixer and loaded in bulk in trucks which are equipped with spreading attachments. The trucks haul the fertilizer to the field and spread it. This practice relieves the farmer of handling heavy bags of fertilizer, costs him less than mixed, bagged materials, and eliminates the cost to him of expensive spreading equipment.

Fertilizer manufacturers vigorously opposed this development on the basis of their having invested heavily in expensive equipment to insure quality control and having established market demand for their brands. But the lower cost to farmers and greater convenience to them developed increasing demand for blended materials. Eventually manufacturers accepted the situation and engaged in blending operations.

Production by manufacturers of fertilizer solutions has increased considerably in recent years. Local distributors usually own the expensive equipment used to store and distribute the solutions and apply them or lease the equipment to farmers who apply the solutions.

These developments, blended materials and solutions, have required extensive revision of procedures in the sampling and analysis of fertilizers which are required in the fertilizer control program.

The Missouri fertilizer control law provides that money paid by manufacturers and distributors as tonnage fees shall be used to pay the costs of the control program. The Agricultural Experiment Station director is authorized by the law to use all surplus money remaining, after the control costs are paid, to pay for research which will benefit Missouri farmers. This surplus is a substantial sum and supplements the Experiment Station budget quite effectively.

From the beginning of the fertilizer control program the director of the Experiment Station had delegated responsibility for its operation to the department of agricultural chemistry. The great increase in the sale of fertilizers following World War II placed an excessive burden on this department and in 1954 the responsibility was transferred to the director's office. The establishment of the Station chemical laboratories in the new laboratory building included the equipment and facilities required for the great increase in volume of work. Improved organization of the inspection and chemical analyses greatly increased the accuracy of analysis, the rate of handling samples, and reduced the time required to return reports to fertilizer distributors and users.

The General Assembly, in 1959, amended the fertilizer control law to authorize collection of penalties from distributors who sell fertilizers which contain less than the guaranteed amounts of nitrogen, phosphorus, or potash. Staff
members of the inspection service, working with representatives of the fertilizer manufacturers and distributors and with farmers, developed a proposed schedule of penalties, based on departures from guaranteed analyses as determined by the inspection service. The director called a public hearing at which representatives of the interested groups appeared and discussed the proposals. The amounts of the penalties were then established and all fertilizer manufacturers and distributors were notified.

At the public hearing the proposal was made, and discussed, that an advisory committee be established. The advisory committee was established and represents farmers, manufacturers, and distributors of the various forms of fertilizers, the Missouri Soil Fertility and Plant Nutrition Council, and the State Commissioner of Agriculture. The committee meets upon call of the director and at least once each year. The committee is helpful in working out solutions to problems and in keeping interested parties informed concerning the fertilizer control program.

Relationships which have developed between fertilizer manufacturers and farm operators illustrate a segment of agribusiness. Soil fertility research by the Agricultural Experiment Station produces information on the plant food requirements of crop plants, the forms in which plant foods occur in the different soil types, how they become available to and are used by plants, the chemical and physical forms in which they can be applied to the soil to be most effective in supplying the requirements of crops, and numerous other factors which are involved in plant nutrition. Information which is obtained by controlled experiments is tested under field conditions and recommendations for applying the research information are developed from results obtained under practical conditions. Accuracy of soil testing procedures in determining the plant food content of soils and improvement of testing methods are subjects of continuing research.

Recommendations to farm operators, based on research, are made principally by the Cooperative Extension Service through field demonstrations, published materials, and discussions. Fertilizer manufacturers also are familiar with soil fertility research results and the recommendations which are made to farmers. For some time manufacturers were reluctant to change from the grades of mixed goods for which their equipment was constructed and which their sales programs promoted; the increased demands made by farmers for more straight goods and for higher analysis mixtures induced manufacturers to produce the grades which were called for. In 1950 Missouri farmers purchased 482,123 tons of fertilizers of all kinds. This contained 99,553 tons of plant food or an average of 20.65 percent plant food. In 1966 Missouri farmers purchased 1,293,765 tons of fertilizer containing 512,214 tons of plant food, an average of 39.59 percent plant food.

Plant food manufacturers grant funds and materials to assist the soils research work and in support of graduate students. Each year several graduates of the College are employed by plant food companies.

Relationships of the College with the plant food industry extend over a longer time and involve more of the College programs than with any other phase of agri-business. A number of other farmer-industry relationships are included in College programs. Some of them are: livestock feeds, rural electrification, certified seeds, agricultural chemicals, food processing—including dairy products, poultry and meats, marketing farm products, and consumer education.
The production, marketing, processing, and distribution of chickens, eggs, and turkeys is an excellent illustration of agribusiness. The industry is described in detail by Dr. E. M. Funk in “Poultry Industry of Missouri,” Missouri Agricultural Experiment Station Bulletin 878, 1969.

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Soil Conservation

Deterioration of the soil, resulting in lowered crop production, was of great concern to observant farmers in the early years of this nation’s history. George Washington, Thomas Jefferson, and Patrick Henry were among the nation’s leaders who were disturbed over reduced fertility and erosion of farm soils.

Washington conducted tests at Mount Vernon on the use of manures in maintaining soil fertility. Many people accepted depletion of fertility and erosion of soil as inevitable and drifted into poverty. Others abandoned badly damaged land and moved to new farms which, in turn, were badly managed until their productivity reached a low level. Many settlers in the Midwest during the 19th century came in search of new, cheap land after abandoning once good land which had deteriorated under poor management.

The deterioration and permanent loss of soil was recognized by agricultural leaders as a serious threat to the economy of the nation. The need for experiments which would help farmers to prevent soil losses was a major factor advanced by Morrill in support of the Land-Grant Act. Although Morrill evidently believed research should be an integral part of the work done by land-grant colleges, research was not to receive official recognition and support until the Hatch Act, 25 years after Congress passed the Land-Grant Act.

During the early years of struggle and search for definite objectives, a few land-grant college staff members were attempting some investigations. Dean Sanborn started the soils research program on Sanborn Field in 1887. Information obtained from research on this field, which is still in operation, has been valuable in developing soil fertility programs and cropping systems for Missouri.

In 1886, Henry J. Waters lectured at farmers’ institutes on “The Relation of Grasses to Soil Conservation.” In 1892, Missouri Experiment Station Bulletin 19 reported research on “Soils and Fertilizers.”

M. F. Miller, H. H. Krusekopf, and F. L. Duley, in 1917, started the first experimental work to measure water run-off and soil losses under various tillage practices and cropping. This research developed much valuable information and became the basis for soil erosion and conservation research throughout the United States in later years.

Immediately following World War I, nationwide concern developed over the widespread decline in productivity of soils. The decline resulted principally from soil deterioration through erosion and depletion of fertility. A number of state
experiment stations and USDA expanded research which was planned to develop information on erosion control and maintenance of soil fertility.

Policies concerning the use of soil are an excellent illustration of attitudes of people toward natural resources. These attitudes may be illustrated by three different classes of people. One class practices the policy of extracting the greatest production possible from the soil without regard to deterioration through depletion of fertility or erosion. When the soil has become so badly damaged that its productivity has declined to a very low level, it is abandoned. Extensive areas of land in the United States have been subjected to this destructive kind of exploitation.

A second class of people includes those who believe the soil is our most precious national trust and must be preserved at all costs. These are the dedicated conservationists who believe all natural resources must be protected and maintained by people and all uses of resources must be secondary to their preservation.

The third class focuses on people and the resources which they may use to live with. The conservation of a natural resource, in this case the soil, involves its intelligent use for the production of food and fiber, at the same time protecting it from damage by erosion and maintaining or increasing its productivity. "The conservation of the land is really not an end in itself—the land needs to be conserved so as to contribute the maximum to human well-being over the years."5

Considerable differences concerning the meaning of soil conservation and the right methods for its accomplishment exist among the advocates of these classes. These differences have brought about extensive contention.

The destructive effects of soil erosion produce dramatic impacts on observers, and efforts to control erosion, whether by research, education, or direct action on a large scale, receive wide popular approval.

Dr. Hugh H. Bennett of the USDA's Bureau of Chemistry and Soils, following World War I, was in charge of the soil survey program, a cooperative program between USDA and state experiment stations. In this capacity he traveled widely and had observed and been greatly concerned about the extensive damage to land by water and wind erosion. He discussed this subject with experiment station directors and soils men throughout the country and in 1929 developed cooperative research programs with experiment stations in several states.

The cooperative program, as originally planned, included the establishment of 12 experiment stations which would conduct research into the principal causes of erosion and effective methods of erosion control. The research program which was planned for each of these experiment stations was adapted to the conditions which were characteristic of the area to be served by the station. Each of the stations included a series of plots, patterned after those which M. F. Miller had established and used at Missouri, in which the amounts of water runoff and soil losses were determined under several different systems of soil tillage and cropping.

One of the soil erosion experiment stations was established on a farm near Bethany.6 The research which was conducted at this station was cooperative between the Missouri Agricultural Experiment Station and the Bureau of Chemistry and Soils. It was started in 1930 and continued in operation until 1938. The information obtained from the research conducted on this station has been valuable in developing soil and water management systems on farms in northwest Missouri.
After six years work at the Bethany station, the Missouri Experiment Station and Soil Conservation Service agreed that a station located in the Putnam silt loam region of northeast Missouri was desirable. Three hundred acres of land were purchased by SCS in Callaway County near McCredie. A research plan was developed by the Missouri Agricultural Experiment Station and SCS. Plots were laid out, water management structures and other equipment installed, and research work started in 1938. Research work has been conducted on this farm until the present time. As specific projects have yielded useful information, they have been closed out and new ones started.

In 1949 SCS closed out active participation in research nationally. In May of that year all research planning and execution in Missouri were taken over by the College of Agriculture soils department and the McCredie farm was designated an outlying field of the Missouri Agricultural Experiment Station. SCS retained ownership of land and equipment but did not participate in the research work.

By act of Congress in 1954, title to the land and equipment of this farm was transferred from the USDA to the Curators of the University of Missouri. The act specified that the farm must continue to be used for soil and water conservation research. The department of soils, field crops, and agricultural engineering cooperate in the research program on this farm.

Relationships between the Missouri Agricultural Experiment Station and the research division of SCS were good during the years when SCS participated actively in research. By 1948 SCS had ended support of research and was giving all its attention to its action programs in soil conservation.

Soil Conservation Districts

Charles M. Hardin, in his book *The Politics of Agriculture,* discusses complexities of the soil conservation programs in the United States as developed and conducted by several federal agencies and the land-grant colleges. In this book the situation which developed between the Missouri Agricultural Extension Service and SCS is discussed. Since this situation has affected the agricultural extension programs and, to some extent, the resident teaching and research programs of the College, some discussion of it is warranted here.

The federal act of 1935, which authorized the establishment of the Soil Conservation Service, provided that the application of soil conservation practices be carried out through local districts, which were to be controlled by farmers.

In 1936, USDA drew up a “Standard State Soil Conservation Districts Act” and presented it to each of the 48 state legislatures for approval. The act was first considered by the General Assembly of Missouri in 1937, but no action was taken because several provisions of the proposed act were unacceptable to many farmers, farm organizations, and members of the General Assembly. Among these were: powers of taxing, land use regulation, and eminent domain which the proposed act granted the districts. The Agricultural Extension Service believed the act gave the SCS authority to conduct educational programs which would duplicate or possibly conflict with the programs provided by the College of Agriculture.

The SCS made a determined effort to induce the General Assembly to approve the act. Some of their advocates, sent by the regional office at Milwaukee, were more effective in antagonizing legislators than in securing support for the act. The
impasse in the General Assembly persisted during the sessions of 1937, 1939, and 1941. In 1943 a compromise bill was passed. It was agreed to, reluctantly, by the national SCS administration.

This bill was written by faculty members of the College of Agriculture, Dr. W. C. Etheridge being the principal author. It established a State Soil Districts Commission composed of three members appointed by the governor, the director of the Agricultural Experiment Station, and the director of the Agricultural Extension Service. The three who are appointed by the governor must operate farms as their principal business. The commission is authorized to establish regulations providing for the creation and operation of soil districts. The commission employs an executive secretary, full-time, who is the administrative officer of the commission.

Soil districts are established on a county or part of a county basis by a majority vote of the farmers within the area. Three farmers are elected by the farmers in each district to serve as a board of supervisors for the district. The county extension agent serves, ex officio, as secretary of the board. The establishment of the University of Missouri Extension Division in 1960, with the Agricultural Extension Service as one part, has resulted in reorganization of the extension programs in the majority of the counties. This has required some changes in the members of county extension services who serve as secretaries, but this has been worked out to the satisfaction of the Extension Service and soil districts.

The soil districts law makes no reference to participation by the College in the establishment of soil districts. Soon after enactment of the law, SCS and Extension Service personnel cooperated in helping farmers to organize districts. But in a short time the differences between the two groups, which had appeared during the legislative hearings on the bill, broke into the open and an extended and bitter controversy developed between them.

No good purpose can be served by attempting to relate all the charges and countercharges which were brought by representatives of the two groups. The principal points of difference and attempts to abate them will be presented and some of the principal bad effects of the controversy will be pointed out.

The law, as passed, included the provision that SCS representatives should be guided by recommendations of the College when making farm conservation plans. This section of the law became a focal point around which controversy developed between SCS and a number of extension personnel. Recommendations which were made, especially in engineering, field crops, forestry, and soils, by SCS personnel usually were obtained from handbooks issued by the Washington or Milwaukee office of SCS. Missouri Extension Service recommendations were developed in the departments of the College, based mainly on information obtained through the research programs of the Experiment Station. The College recommendations, developed and tested under Missouri conditions, were believed by College personnel to be better adapted to Missouri conditions than those included in SCS handbooks.

Extension Service recommendations were modified at intervals as the Experiment Station obtained new information from which more effective practices were developed. This was true especially in field crops, forestry, and soils. Water management recommendations made by agricultural engineering extension workers were developed on the basis of the best information available during the years
1938-1942. Once established, these recommendations were not modified for a number of years even though improved practices were discovered by research. Although numerous efforts were made to resolve the differences, adherents of each side refused to change.

Early in the discussions about developing the soil conservation program the subject of federal versus state control of the development of farm plans and recommendations for soil conservation was introduced, the former supported by SCS personnel and the latter by extension staff. SCS personnel held that because this organization operated on a nationwide basis it had more complete information and greater experience in soil conservation than the state extension service had. Extension workers maintained that they were as familiar with all pertinent information, through publications and personal contacts, as SCS personnel were. They believed programs which extension developed, based on specific information obtained by research under Missouri conditions, were more applicable than the more general SCS recommendations.

The SCS program, in the beginning, dealt entirely with soil erosion control measures. SCS farm plans omitted reference to the farm family and to production economics. Acceptance by the farmer of each farm plan, which included application of the land-use capability concept, imposed permanent restrictions on the use of all or parts of the farm and required considerable expense in applying specified erosion control measures. But farm management plans, the expense and income balance sheet, were omitted. Similarly the farm family, the people who lived on and from the farm, were not included in the plan.

The Missouri Agricultural Extension Service attempted, within the limits of its resources, to recognize and assist with all aspects of the individual farm enterprise. This included the farm family, effective use of the human and physical resources of the farm to the end that the farm produced the means for a comfortable living for the family while the productivity of the land was maintained or improved. The Extension Service was developed on the conviction that the measure of success of a farming system, whether on an individual, state, or national basis, is found in the production of the maximum amounts and quality of crops and livestock, while at the same time maintaining and improving the soil and water resources and providing a comfortable living for the people of the land.

The agricultural extension staff includes specialists in the subject matter areas which are represented by the departments of the College. Each specialist is responsible for the dissemination of information in his subject. He works with county extension personnel, with groups of people who are interested, and the public generally. Because each specialist deals with his own subject, with little or no relationship to other areas of agriculture, farmers have difficulty in coordinating the separate pieces of information for use in their entire farm plan. In time, the administration of the Extension Service realized the need to develop procedures through which information in the several subjects of concern to each farm family could be presented in a coordinated pattern. The balanced farming program developed from this background.

The balanced farming program, as first developed, included the services of a county extension worker known as a balanced farming agent. Each of these agents
worked with individual farm families. With his assistance the farm family prepared a
statement of their personal and physical resources. To this was added the family’s
personal development plans, the kind of home they wanted, and their interests in
crop and animal production. A complete farm plan was then worked out by the
family, with assistance and information provided by the balanced farming agent and
subject matter specialists. Development of the balanced farming program undoubt-
edly progressed more rapidly because of the controversy with SCS. In any case,
some SCS personnel believed that the Extension Service developed the program as a
countermeasure to the soil districts program.

Following World War II, some returned service men, who had gained
experience with heavy earth-moving equipment, became earth-moving contractors.
Some of them specialized in the construction of water management structures on
farms. The agricultural engineering department assisted them with information and
short courses in building water management structures. A number of these
contractors formed a state association with a member of the agricultural
engineering extension staff as their secretary.

The association established standards of competence to be attained before
admission to membership and standards of performance in the work for which
members contracted. Most of the members were strong supporters of the
recommendations made by agricultural engineering extension for water management
structures. They also were ardent supporters of the balanced farming program and
strongly opposed to SCS and soil districts.

Soil district supervisors organized the State Association of Soil District
Supervisors. This association strongly supported SCS and the soil districts program.
Within soil districts they often worked in opposition to county extension sponsors.
They also appeared before appropriations committees of the General Assembly in
support of appropriations to the Soil Districts Commission and in opposition to
appropriations to the College. In the 1953 session of the General Assembly a bill
was introduced in the House providing for changes in the Soil Districts Law which
would remove the Agricultural Experiment Station director and the Agricultural
Extension Service director from the commission and establish a commission of five
members all appointed by the governor. The bill did not pass.

The Missouri Soil Districts Law provides that responsibility for the establish-
ment and operation of soil districts is vested in the farm people of the area
involved, with the assistance of the State Soil Districts Commission. The law
imposes no duty on the College of Agriculture to participate in the formation of a
district. When College staff members participate in any way in district organization
or operation, their participation should include only information covering the
advantages and disadvantages of the soil district program. They are not required to
promote district establishment nor should they oppose district formation.

The Soil Districts Law is silent concerning participation by SCS in promoting
interest among farmers in establishing soil districts. Although SCS maintained they
worked only with farmers who were included in soil districts, SCS employees were
active in stimulating interest in the establishment of soil districts. This activity
aroused opposition to SCS and soil districts among extension workers, the Soil
Contractors Association, and numerous farmers and business people who were
supporters of the Extension Service. Opposition by SCS and soil district supervisors
Establishment of a soil district is initiated by presenting a petition to the Soil Districts Commission, signed by farmers in the proposed district area. The petition sets forth reasons for a soil district in the area and requests that a public hearing be held on the matter. If the commission believes a hearing should be held, approval is given and a date set. The hearing is held by a commission member and anyone who favors or opposes establishment of a district is invited to appear and speak. A report of the hearing is made to the commission, which may approve a referendum in which all landowners in the area may vote. The commission requires that a “substantial” number of the landowners in the proposed district must vote and two-thirds of those voting must favor the establishment of a soil district.

In most instances, little or no opposition was expressed at the public hearings; in others the opposition was expressed quite strongly. In the latter cases, the commission did not approve a referendum. After the commission approved a referendum, vigorous opposition sometimes developed and voters disapproved establishment of a district. In other cases no open opposition developed before the referendum; yet establishment of a district failed to receive the necessary majority vote.

In the latter instances, one or both of two activities by the opponents usually had been carried on. When no open opposition appeared before the referendum, opponents often had conducted an undercover campaign in which individuals had traveled through the proposed district area, talking with farm people and giving them printed materials. The conversations held and printed material distributed strongly opposed soil districts and SCS and usually misrepresented both. The second practice consisted of distributing packets of printed materials which were left at each farm mailbox one or two nights before the referendum. This material also opposed soil districts and SCS and usually grossly misrepresented the facts.

Advocates of soil districts and SCS personnel accused some Extension Service personnel and the Soil Contractors Association of carrying on these undercover campaigns of opposition. The evidence strongly supports some of these accusations.

It is difficult to understand why staff members of the Extension Service, which enjoyed a well-earned reputation for having conducted effective programs of education, should become involved in such strongly partisan and anonymous activities. The net result of the controversy between the Extension Service and SCS was to discredit both groups in the estimation of many thoughtful people.

In areas where soil districts were defeated as a result of undercover campaigns of opposition, farm people who were neighbors and long-time friends developed animosities toward each other that remained indefinitely.

In one county, in which a district had been established despite strong opposition, the opponents sought court action to have the district declared illegally established. The director of the Experiment Station, ex-officio member and chairman of the Soil Districts Commission, was subpoenaed as a witness by district supporters and the extension director, ex-officio member of the commission, was subpoenaed by the opponents. Although the two directors traveled to and from the trial in the same car and recognized the absurdity of the situation, the case did nothing to enhance the College of Agriculture in the minds of people.
The dean of the College pointed out to all College staff members that the College, Experiment Station, Extension Service, SCS, and Soil Districts all were authorized by laws enacted by the same legislative bodies, hence were all quite legally based. He also emphasized the fact that the College is an educational institution with the primary responsibility of conducting sound and effective programs of education which were planned to benefit the farmers and entire agricultural industry of the state. Participation in controversies with other legally authorized agencies interfered with the performance of their duties and detracted from their usefulness to the College and the farmers of the state. In an official statement the Board of Curators states: “Any participation by the College or its staff members in the educational or organizational phases of the establishment of soil conservation districts shall be in accordance with the policy of the College to make available to all interested people all pertinent information in an objective and unbiased manner.”\(^\text{11}\) This eventually abated considerably the intensity of the controversy. A few individuals in both groups have not changed their belligerent attitudes.

Since about 1960, the Extension Service and SCS have developed improved working relationships. The retirement of many of the individuals who were most active in the controversy, in both groups is in part responsible for the improvement in relations. Continued operation of an aggressive, effective extension program has reestablished the high regard in which farm people had previously held the extension program. Even though many soil districts have been established in Missouri, many people who feared SCS domination of the extension programs now realize this fear was unfounded.

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3. Missouri Experiment Station Bulletin 598, 1953, p. 3.
7. Records in University of Missouri Experiment Station Office.
Effects of Wars on College

The major wars in which the U.S. has been involved have greatly affected the establishment and operation of the Missouri College of Agriculture. The General Assembly passed a joint resolution March 17, 1863, in which the Morrill Act of 1862 was accepted and its provisions agreed to.\(^1\)

President Lathrop and the Board of Curators immediately presented a proposed plan to the General Assembly indicating the steps to be taken to secure the grant for Missouri.\(^2\) But problems arising from the Civil War occupied the attention of the General Assembly and the University and action to implement the University plan was delayed. Following the war, unsettled political conditions and a prolonged controversy over the location of the College of Agriculture further delayed action until 1870. The legislative act authorizing the establishment of the College became effective February 24, 1870.

Entrance of the U.S. into World War I was followed with quick action by the University. Seniors who entered a branch of the armed services were given full credit for the semester’s work and received degrees at the June Commencement. In addition, the College of Agriculture students who were needed on their home farms were permitted to go home and were granted credit for the semester. Enrollment in the four-year curricula in agriculture exceeded 600 for the first time in 1914-15. In 1917-18 enrollment dropped to 360. The evening of April 7, 1917, the Agricultural Club held a special meeting and a committee of students was appointed and instructed to construct a flag pole on the Agricultural Building (Waters Hall) and secure a United States flag to fly from it. The committee started work immediately and the flag greeted the rising sun the next morning.

Dean Mumford was appointed Missouri food administrator by the Governor in 1917 and M. F. Miller was made acting dean of the College. A number of the younger faculty members entered military service. The remaining faculty members were fully occupied with classes and research.

The Cooperative Extension Service, which started July 1, 1914, was quite effective in helping farmers increase food production. Dean Miller states: “The Extension Service was well under way by that time, and every effort was made through county extension agents to help farmers. The home economics extension workers threw themselves into the effort of making foods go a long way. They also developed new types of food for the table, such as substitute meats and coarse breads, in order to allow the better grades of food to go to the armies. It was most
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interesting to observe how all the College representatives, who were engaged in the immediate production and use of foods, performed their assigned duties."

After the war ended the federal government established a nationwide program in which war veterans who could not qualify for regular college work could enroll in a non-collegiate course of work in agriculture. This course was similar to the winter short course given by the College. In 1921-22, 210 were enrolled in the course. That year the total number of students enrolled, including the veterans, winter short course, and regular four-year students, was 1,025, the first time in the history of the College when more than 1,000 students were enrolled. Not until 1939-40, when 1,300 regular students were enrolled, did enrollment again exceed 1,000. The veterans’ program ended with the year 1924-25. During the six years the veterans program was offered, 964 veterans enrolled. A number of these students used the opportunity to take work which qualified them for enrollment in the four-year courses and they earned B. S. degrees after completing the requirements.

In 1938 M. F. Miller, who had served as acting dean and director during World War I, was appointed dean and director upon the retirement of F. B. Mumford. Recovery from the great depression was well advanced and all programs of the College were expanding. Student enrollment reached a new high in 1939-40. Again Dean Miller had the responsibility of directing the affairs of the College during war time.

The effects of World War II on the College were much greater and more lasting than were those of the first war. Enrollment dropped slightly in 1940-41, then much more sharply until 1944-45 when it was only 300. Many faculty members entered military service or war industry work.

Many farmers increased their demands for research which produced the information they need to expand food and fiber production. But with fewer research staff members, reduced funds, and difficulty of securing necessary equipment and materials, maintenance of the research programs became increasingly difficult.

The Cooperative Extension Service directed its educational efforts to the “all out” programs of increased production of food which was called for by the federal War Food Administration. This agency influenced the production of farm commodities through subsidies and price controls, and by purchase, storage, transportation, and disposal programs. Production materials, including tractors, machinery, fuel, and fertilizer were rationed to farmers.

A State War Board was established in each state, the State Agricultural Adjustment Administration Committee being the directing agency. Director J. W. Burch, of the Missouri Extension Service, worked with the State War Board in developing the educational phase of the program. State extension specialists and county extension staff gave most of their time to the programs of information relating to the changes in farm production and the promotion of good nutrition for farm families.

Dean Miller held many conferences with the local draft board attempting to convince the members that certain of the resident and extension staff were much more valuable in stimulating food production than in the armed services. The draft board had little concept of the functions of the Agricultural Experiment Station.
The definition of an agronomist which the State Selective Service Board sent Dean Miller is a classic of a sort. It reads: "Agronomist—makes qualitative analyses of soil samples to determine presence of acid or other injurious chemicals and recommends treatments, such as cutting and burning undergrowth, cutting overhanging and drooping tree branches so sun may reach the diseased ground; carries out experiments in cereal, cotton, forage, or other crop development and improvement; conducts research in irrigation, fertilization, culture and genetics of a particular plant, takes soil samples and places in a vial adding a chemical solution—compares resulting color with standard color to determine soil substance."

In June 1944 Congress passed the act, known as the G.I. Bill of Rights, authorizing federal financial aid to assist veterans secure college educations. Enrollment in the College rose to 975 in 1945-46 and continued to increase each year until 1947-48 when 2,230 students enrolled in agriculture. The problem of securing sufficient staff, student housing, and classrooms to provide for this large and rapid increase was quite serious.

The majority of faculty members who were on leave during the war returned. Although individual teaching loads were considerably larger than was desirable, additional staff was required. Because many other universities and colleges faced similar needs, the competition made it very difficult to secure the quality of new staff members needed.

These were adjustments which were required to meet the emergency generated by the rapid increase in student enrollment. All programs of the College—research, resident teaching, and extension—were soon to be extensively modified.

Research work before World War II by state agricultural experiment stations, USDA, and industry had developed information and materials which enabled the agricultural industry to meet the tremendously increased demand for food and fiber which the war engendered. Application of research results had moved slowly following World War I and especially during the depression of the 1930's. The increased demand and higher prices for farm products, which developed after 1941, stimulated farmers to apply new information and materials at a much more rapid rate than ever before. Increased use of improved crop varieties, higher rates of fertilization, replacement of animal power by mechanical power, and the beginning of the use of pesticides on animals and plants were among the applications of technology which accelerated substantially during the war.

The increased demand by farmers for more information, materials, and equipment exceeded their availability because of the limitations on funds and materials imposed by the war. Farmers came to realize during the war, far more generally than ever before, the value of the applications of science and technology to secure the most effective use of their resources. When the war ended the requirements for military uses declined and the needs of civilians began to receive attention.

Farmers increased demands for more help from the College of Agriculture. The demand for farm products continued at a high level. Farm production goods such as tractors, machinery and equipment, and fertilizers and pesticides became more available. Farmers called upon the College for information: especially in farm
management, adjustment of their operations to power equipment, effective use of fertilizers, and marketing of their products.

The Agricultural Extension Service, the statewide educational division of the College, carried direct responsibility for providing farmers with the information they called for. The soil testing service, planned and supervised by the soils department and directed locally by county extension agents, was developed at this time. This helped farmers solve their soil fertility problems. The balanced farming program was developed at this time. This program included especially farm and home management and soil and water management assistance for farmers.

The controversy between the Extension Service and SCS, discussed earlier, developed and reached its most heated stage between 1946 and 1955. An undue amount of the time and effort of the Extension Service was consumed by this controversy. The planning and execution of the educational programs of the Extension Service were reduced substantially and numerous farmers and business people who were involved in the controversy became unfriendly toward the College. The intensity of the situation began to abate about 1955 and is no longer a serious problem.

Before and during World War II agricultural research workers had developed large amounts of information which was valuable to farmers. Much of this information was used by farmers during the war to produce large increases in food and fiber. But wartime restrictions on manpower and materials imposed limits on the applications of the new information. The easing of restrictions following the war permitted farmers to use the new technology more extensively.

Numerous farmers recognized and used the new technology and many of them understood the principles of the sciences sufficiently well to enable them to discuss and advise with research workers concerning specific problems to which research should be directed. A large number of Experiment Station personnel had completed graduate work and were prepared to plan and conduct more sophisticated research than had been carried on previously. The development of procedures and techniques which use electronic equipment, radio isotopes, and spectrographic instruments enable research workers to conduct more precise research and to work in areas which could not be reached with older methods.

In 1958, replies were received from 4,383 alumni of the College in which each person indicated his occupation. Of these about 50 percent were engaged in business or industry other than farming, about 15 percent were operating farms, and most of the remainder were in agricultural administration, teaching, research, or extension. Although a large portion of the graduates were engaged in business or industry, not much effort was made to recruit graduates by companies until after World War II. Recruitment has increased since the war ended; since 1960 numerous representatives of business and industry interview all seniors who are interested in employment. The number of graduates of the College who enter graduate school has increased considerably in recent years.

The rapid changes which are developing in the amount and variety of technical knowledge relating to agriculture, development of new teaching techniques and the different qualifications which are required in the many occupations available to graduates of the College of Agriculture have required extensive changes in the curricula and courses which the College offers.
The years since 1946 have seen the development of a technological revolution in American agriculture which already has produced extensive changes in the industry and will modify agriculture much more extensively than it has at this time. The revolution in agriculture has been developed through use of information and materials which have been produced by basic and applied research conducted by state agricultural experimental stations, USDA, and industry. The information is disseminated among farmers and industries related to agriculture, principally by state cooperative extension services, the information services conducted by industries, and the action programs of USDA.

The term “agriculture” originally designated the cultivation of the soil and production of crops. The meaning of the term was extended to include all production and distribution of crops, animals, and their products; and the term was synonymous with farming.

Davis and Goldberg point out that: “The concept of agriculture as an industry in and of itself or as a distinct phase of our economy was appropriate 150 years ago when the typical farm family not only raised crops and livestock but also produced its own draft animals, tools, equipment, fertilizers, and other production items; processed its own food and fiber; and retailed in the community most of the excess above family needs. Then virtually all operations relating to growing, processing, storing, and merchandising food and fiber were a function of the farm. This being the case, it was appropriate to think of all such things as within the scope of the meaning of the word agriculture.”

Production by industry of the equipment and materials used by farm operators developed slowly but at an increasing rate during the 19th and early 20th centuries. Similarly the industries which process and distribute food and fiber developed at a gradually increasing rate during the same time.

Since 1946 these industries have expanded at a tremendous rate. Commercial farmers rely almost entirely on industry for power machinery, equipment and fuel, fertilizers and other chemicals, certified seeds of improved varieties of crops, feed supplements and mixed feeds, and many other materials used in farm production. Products go directly from the farm to the processing and distributing industries. The relationships between farm operators and the related industries have become quite complex. The production of crops and animals on the farm is rapidly becoming a highly specialized business and constitutes a limited segment of “agribusiness,” the term which designates the entire complex of the operations which produce food and fiber for the nation.

The annual costs of operating Missouri farms, including credit, feed, fertilizer, chemicals, labor, machinery, petroleum products and tires, transportation of products to market, and utilities amount to about one billion dollars. The cash value of products sold by Missouri farmers is about $1.25 billion, of which about $420 million is received from the sale of crops and $830 million from animals and their products. Processing and distributing the products of Missouri farms add about $2.6 billion to the gross income for the state, a total of about $3.85 billion is received for the agribusiness of the state.

Between 1945 and 1964 the number of farms in Missouri decreased from 242,944 to 147,315. Operators of small farm units who lack management capacity, technical knowledge, or are short of capital usually are unable to compete. Many of
them sell their farms to operators of larger units. Between 1950 and 1964 the number of farms of less than 200 acres decreased from 211,399 to 118,555 while farms of more than 200 acres increased from 18,646 to 28,760. The average value of land and buildings in 1950 was $9,720; in 1964 the average value was $33,451.

During the same 15 year interval extensive changes have taken place in patterns of crop and animal production. The acres of corn harvested for grain decreased from 3,743,000 to 2,832,800, but the yield increased from 129,968,000 to 149,474,000 bushels. Soybeans yielded 16,738,400 bushels on 885,800 acres in 1950 and the yield increased to 53,465,600 bushels on 2,600,600 acres in 1964. Soybeans are the number one cash crop in Missouri. Corn is the principal grain produced in Missouri, but most of it is fed to animals instead of being sold.

The number of beef cattle on Missouri farms increased from 611,400 in 1950 to 1,550,100 in 1964, while milk cows decreased from 933,300 to 460,850 during the same time.

These illustrations represent changes in major crop and animal enterprises of Missouri. Many other adjustments have been made in production patterns and extensive changes continue to be made.

The majority of people who have moved from small farms have gone to cities expecting to find employment and to improve their living conditions. Many of them do not have the knowledge and skills to qualify for work in better paying activities and do not live as well as they had hoped. They also are not accustomed to many restrictions which are imposed in urban areas and often have difficulty adjusting to urban living.

The foregoing examples indicate the nature and extent of the changes which have taken place in Missouri agriculture. On the one hand, the research and teaching programs of the College have contributed extensively to the development of the revolution in Missouri agriculture; on the other hand, the extensive modifications in the agriculture of the state have required the college to make great changes in its programs of research and teaching. The research, resident teaching, and extension programs of the College during the last 30 years, with special attention to the program changes since World War II, will be discussed in some detail.

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Participation in International Education

During the years between the Civil War and World War I a number of University of Missouri faculty members studied in European universities. These were from agriculture, arts, humanities, and sciences. The University of Missouri catalog for 1908-09 lists all faculty with their academic records. A large proportion of them had studied in Europe, mostly Germany, between 1880 and 1905. The competence of each of these men undoubtedly was improved by his study abroad and therefore the level of instruction in University classes was higher than it would have been without the foreign study. The viewpoint of each person was broadened by his foreign experience.

There was no indication of any effort in these earlier days to develop an awareness among the faculty or in the University administration of an institutional relationship with a foreign university. This development was destined to wait many years and to begin under much different circumstances.

A few American universities began development of educational programs with universities in other countries after World War I.

Changes in Attitudes Following World War II

The end of World War II introduced a number of factors which directed the attention of the University of Missouri and other universities toward educational developments outside the United States.

Provision by the federal government to pay the costs of college education for veterans of the armed services, under the G.I. Bill, resulted in the enrollment of many thousands of veterans who had served in countries around the world. They brought to the campus far broader viewpoints than the students who lacked service experience. Out of their maturity and their observations of people and conditions in other lands, they contributed ideas and viewpoints to other students and faculty which modified the subject matter and classroom practices in many courses.

The development of programs of education and technical aid in numerous nations by the federal government called several University of Missouri staff members for service abroad. Staff members who assisted in these programs returned with increased knowledge and appreciation of the people of the nations in which they worked.
A number of foreign aid programs have been established by the United States, many of them administered by separate agencies. Most of the programs have been placed in the Agency for International Development (AID). In addition, a number of foundations and other private organizations carry on programs of education in other nations. These agencies employ faculty members to take assignments in research or teaching in other countries. They also sponsor many foreign students who come to this country for one year or longer.

At first, foreign students attracted some attention on the University campus but as their number increased they became thought of as a normal part of the student population. Two of the larger national groups, the Indians and Arabians, have organized associations and conduct programs which acquaint faculty and students with customs and cultures of their countries.

Since the end of World War II many people from other nations have come to the United States to study some phase of agriculture or related industry with the assistance of the University of Missouri and other universities. Some of these people pay their own costs but most of them are sponsored by a foundation or by other private or government agencies. Most of them are sponsored by AID or the USDA International Agricultural Development Service (IADS), formerly Foreign Agriculture Service (FAS). They come in groups from many countries, ranging in numbers from one to 50 or more at one time.

For the first few years after the war the majority of these visitors were not carefully selected in their home countries and came, at our country’s expense, on sight-seeing and pleasure tours. University faculty members objected to taking the time to entertain these visitors and university administrators throughout the country objected to AID and FAS. By about 1952 arrangements had been made in most countries for American embassies or counsel-generals to screen prospective visitors and to approve only those who were qualified and who convinced our representatives that they were genuinely interested in studying subjects which would improve their services to their countries upon their return.

University of Missouri Participation in International Programs

The visitors who came to Missouri during the early years of these programs often arrived on the campus with little or no prior notice of their visits, and very few of them had clear ideas of what they wanted to learn or what the University could offer them. Eventually, arrangements were made for AID and IADS to develop tentative programs of study for the foreign visitors in cooperation with the campus contact officer.

Enrollment of foreign students and the sending of individual faculty members to help with educational projects abroad continued to expand at the University. In the meantime, a new development entered the picture in the mid-fifties, broad programs to help with education in specific areas of the globe.

The first and still the biggest contract program between the University of Missouri and AID was signed in 1957. It was an agreement to supply assistance in forming agricultural research, education, and extension services in four states of India.
Beginning of Aid to New Independent Nations

India and Pakistan gained independence in 1947, the first of the colonial nations to secure freedom following World War II. This ushered in a new series of programs of assistance by Americans. During President Truman’s administration the agency known as the Technical Cooperation Mission (TCM) was authorized by Congress with the objective of planning and conducting programs of assistance to nations that asked for help from the United States in developing educational services for their people. The governments of the United States and India signed an agreement in 1950 which provided for technical aid to India through TCM. Several American universities were invited to furnish assistance, among them the University of Wisconsin at West Bengal Engineering College, Calcutta, and the University of Illinois at the Indian Institute of Technology, Kharagpur.

The first report of the Joint Indo-American Team on Agricultural Research and Education states:

“A project for assistance to agricultural research, education and extension organization in India was developed under the technical cooperation programme between the Government of India and the Government of the United States, as Operational Agreement No. 28, signed by the representatives of the two governments on April 30, 1954.

“This project provides for various types of cooperative assistance in the agricultural research and education fields. As one major phase of the project, a joint team, consisting of five representatives of the Indian Government and their American specialists in agricultural research and education, was selected to make a comparative study of the organization, functions and operation of Indian and American agricultural research and educational institutions as a basis of developing recommendations for strengthening the program of research and education in India.”

The team recommended that India be divided into five areas and that an American land-grant institution be invited to provide assistance to the colleges of agriculture and veterinary science and the research institutes in each of the areas. The major objective of the program is to assist India to become self-sufficient in food production by developing agricultural research, resident teaching, and dissemination of useful information to farm operators. The proposal is based on the proposition that the principles of the program which have been developed and applied so effectively in the United States can be adapted to conditions in India and assist materially in solving the country’s food problems. The five land-grant institutions which accepted the invitations were in Illinois, Kansas, Missouri, Ohio, and Tennessee.

Missouri’s decision to participate came after thorough study. Dean J. H. Longwell and B. W. Harrison, of the Agricultural Extension Service, were sent by President Ellis to survey the situation, talk with TCM, the Government of India and state officials, and recommend whether or not to undertake the assignment. The two left Columbia August 28 and reached New Delhi September 6, 1955.

Conferences were held in New Delhi with staff members of TCM, the Indian Council for Agricultural Research, and the Indian Agricultural Research Institute. Visits and conferences were held with state officials and college faculties in Bihar, Bengal, Assam, and Orissa.
Upon returning to Columbia October 25, 1955, Dean Longwell discussed the information and impressions he had obtained concerning the proposed work in India with President Ellis and a number of College of Agriculture staff members. Upon President Ellis' recommendation the Board of Curators approved discussions preliminary to entering into a contract with TCM through which the University would send staff members as requested by the Indian institutions and approved by all parties concerned. Negotiations between the University and TCM were prolonged and a contract was not finally approved and made effective until March 7, 1957.

The reasons for the delay were the multiple and complex details in the proposed contract submitted by TCM. The contract, many pages in length, was far more concerned with fiscal and legal matters than with education.

**Duties of the University Under the Contract**

The original contract of the University with TCM included five principal segments of work.

1. The University of Missouri was to provide a faculty member to be located at each of the nine colleges in the four states. The Indian college initiated a request for a faculty member in a specific subject. The contract used the terms "technicians" to render "technical aid." The terms evidently derived from the aid programs in Europe immediately after World War II when mechanics, electricians, and other technicians were sent to Europe to render assistance in their areas of competence. The appropriate terms were "college faculty member" to assist in improving "programs of research and education."

   The faculty member located at an Indian college had the responsibility of assisting the department of his specialization in teaching, research, and extension work. He assisted staff members to plan and conduct research which would yield information of value to farmers and to assist them to plan programs in extension in which they worked directly with farmers.

2. Help was to be given to faculty members in selecting and placing orders for laboratory equipment and materials which would be of most value in the college courses. These were paid for from contract funds.

3. Assistance was to be given college administrators in making their libraries useful to faculty and students. This included indexing the publications, getting them properly shelved, keeping the library open and supervising and training a staff member to serve as librarian. Needed publications were chosen, ordered, and paid for from contract funds.

4. The contract provided for selecting members of Indian college faculties, called participants, to be sent to the University of Missouri for a year of graduate study. Upon recommendation by the University and approval by the Indian college administration, TCM, and the Indian government, a participant's time could be extended to enable him to complete requirements for a master's or doctor's degree. The University staff members located at the Indian college assisted in selecting participants.

5. The University staff member was to acquaint the Indian college administrators and appropriate state officials with the principles which have been developed in the land-grant system. These principles include: (a) coordination of
research, resident teaching, and extension under one administrator; (b) making the resident teaching program available to all young people who have the ability, desire, and persistence to do college level work; (c) giving responsibility to each college teacher for the entire conduct of the courses which he teaches, including all assignments, class activities, examinations, and final grades; (d) assisting in developing extension programs in which college staff work directly with farmers who assist in planning extension work which they believe is most useful to them.

In case the state and college officials were sufficiently interested, University representatives were to help them in working out modifications of the land-grant system by which it could be adapted to conditions in the Indian state.

Dr. Arnold W. Klemme, first chief of party, did an outstanding job in directing the programs at the several colleges. He also worked closely with state government officials in Bengal and Orissa in developing legislation which authorizes development of rural universities.

Bengal and Orissa moved to establish this type of University. For several reasons Bengal has not carried through. Orissa has proceeded with the program and has established the Orissa University of Agriculture and Technology. Assam and Bihar have not made any change.

**Program Concentrated at Bhubaneswar**

The Orissa Legislative Assembly enacted the bill which established the Orissa University of Agriculture and Technology in 1961. The bill became effective with the governor's approval November 3, 1961. Already in existence on the same campus were two colleges, Agriculture and Veterinary Science, but they were independently administered. They became the first academic divisions of the University, which was officially dedicated in August, 1962.

Dr. Ide P. Trotter, University of Missouri staff member, arrived in India in January, 1960, at Bhubaneswar. He was very effective in assisting government officials in working out plans for the organization and administration and in securing approval of the Orissa University bill. Dr. Arnold W. Klemme, chief of party for the University of Missouri from October, 1957, to January, 1962, had done effective preliminary work in Orissa before Dr. Trotter arrived and gave his support to enactment of the bill.

The original University of Missouri contract with AID has been rewritten to provide for concentration of all work at Orissa University. The contract provides for the University of Missouri to assist Orissa in developing a land-grant type of university which is adapted to the conditions and needs of the state. In addition to agriculture and veterinary science, consideration is being given to establishing divisions of agricultural engineering, education, and home economics.

The India program is administered on the University of Missouri - Columbia campus by the dean of the College of Agriculture, and all policy matters clear through him. In charge of detailed administration is his assistant, the campus coordinator. All matters relating to appointment and service of faculty members who go to India, budget preparation and control, participants and their programs, contacts with AID, and other details are handled by the campus coordinator. Joseph C. Caldwell, who was appointed to handle programs for foreign visitors in 1952, was named campus coordinator for the India contract program in 1957.
Caldwell retired in 1965, and Dr. Walter Wilkening became campus coordinator in 1966. Mrs. Margie C. Miles was appointed administrative assistant in the coordinator’s office in 1957 and has rendered excellent service in managing the business affairs of the office.

The foreign student adviser, in the office of the dean of students, assists foreign students in many ways. He gives them information on requirements for admission to the university, assists them with problems of housing, finances, immigration office requirements, personal problems, and many others.

Problems Experienced in Operating the Program

In the beginning, considerable difficulty was encountered in developing a working relationship with government agencies. The legal and financial representatives of TCM who conducted contract negotiations at the start of the India project apparently believed that the University saw an opportunity to secure some easy money from the federal treasury and that they must guard the government’s interests against this scheme; hence their insistence on provisions in the contract with which the University felt it could not comply. The University’s long experience in handling federal funds in the agricultural research, teaching, and extension programs meant nothing to the TCM staff. Nor were they aware of the relationships through the Land-Grant Association by which the five universities maintained exchanges of information, but assumed they were dealing with five unrelated institutions which were unaware of each others interests in India.

Recruiting staff for the positions in India, difficult at best, has been made much more difficult by the procedures required and by the way in which they have been applied. The first problem is that of finding a staff member who is qualified for a particular position, is interested in foreign work, is willing to go for a two-year term, can adjust his personal and family situations satisfactorily, and who can arrange to leave his teaching and research work without excessive disturbance to either. Obviously, it is not possible to merely select a qualified person and assign him to the position.

Then, after a person has agreed to go, he is approved officially by the University and recommended to AID (formerly TCM), which is given detailed information concerning his qualifications and competence. He must receive clearance by the FBI for foreign service. He must be approved for the position by AID/Washington, AID/New Delhi, the government of India, the government of the state in which he will work, and by the administration of the institution where he is assigned. This takes time and in the early years the program almost ended because of the undue delays which these numerous clearances caused. In several cases, after long delay, one of the numerous agencies would disapprove the person. In one case final approval was made by all agencies 13 months after the initial recommendation. At one time or another each of the five universities notified AID it would make no further effort to recruit staff until the situation was corrected.

Each year representatives of the five universities hold a conference on one of the five campuses, with representatives of AID in attendance. Through this and other conferences among the universities and with AID, considerable improvement in working relations has been effected and many of the problems which have threatened to end the program have been reduced to levels which can be tolerated.
The contract which the University has with AID has been renewed and revised several times and now gives the University much greater opportunity to render assistance to research and educational programs than was possible under earlier contracts.

Difficulty is also encountered in selecting and getting approval of Indian faculty members for graduate study at the University of Missouri. These "participants" are selected from a college faculty by the college administration and University of Missouri staff members. The principal factors considered in making the selections are:
1. The subject matter areas which are most in need of strengthening.
2. Capabilities of the staff members in the departments concerned.
3. Desire of staff members to do graduate work in the United States.

Candidates for selection are interviewed by University of Missouri staff members and must be approved by the chief of party. Before a candidate is approved he must reach agreement with the dean of his college and the chief of party concerning his course of study and the degree, M.S. or Ph.D., for which he will be a candidate at Missouri. This information, together with the participant's academic record, is sent by the chief of party to the campus coordinator, who refers the information to the dean of the Graduate School, the department in which the participant will do his major work, the foreign student adviser and the office of admissions. The chief of party also informs AID/New Delhi and AID/Washington. The dean of the Indian college informs the proper officials in the state government, who inform officials of the central government in New Delhi. If all these officials approve, the participant is cleared to go.

A candidate may be disapproved by any of these officials. Occasionally, a state government or Indian government official may substitute a person of his preference for one of the recommended candidates. The chief of party has authority to refuse approval of such substitutions.

Eventually, participants receive final approval. Upon arrival in this country, their expenses are paid from AID contract funds. In addition to travel, this includes a per diem from which room, board, and other expenses are paid. Each participant has a special allotment, with a maximum limit, which pays for books and other necessary classroom costs. University enrollment and other fees are paid from AID contract funds.

The contract with AID does not provide payment of costs to the University incidental to the participant program. These costs include purchase of special equipment and materials required in the research and teaching programs of participants and additional time required of staff members to direct research and teaching programs.

Participants usually arrive in Columbia by September 1. This allows time for them to find living quarters, meet the campus coordinator, their advisers and other faculty, and to work out study programs for their graduate work.

Foreign students who are admitted to the University of Missouri Graduate School are required to satisfy the same requirements as graduate students from institutions in this country. In addition, foreign students must become sufficiently proficient in English to enable them to carry on classwork in that language.
In many countries college work is substantially different from that in the United States. Many foreign students, most of whom are quite capable intellectually, are deficient in subject matter and ability to do independent work. Study habits often are not good and language difficulty adds to their problems. Usually the length of their leave and amount of money are limited. They are under considerable pressure to earn a degree within the limits of their time and budget. This causes them to want to carry heavier work loads than the majority of them are qualified to do.

Many University faculty members who serve as advisers to foreign students have had no foreign experience. They do not understand the limitations which foreign students have, usually due to no fault of the students. Research projects which are assigned to foreign students usually are not related to the conditions under which the student will work when he returns home. In some cases University staff members resent having foreign students to work with and give them less attention than they need. On the other hand, some faculty members develop great sympathy for foreign students and, in order to assure them of a degree, hold them to lower standards of accomplishment than they do students from this country.

This diversity of procedure suggests the need for establishing an office in which all international education programs of the University can be administered and which will establish policies governing all University-international education affairs. The dean of extra-divisional administration might give general supervision to this office. Each academic division which has a foreign program would be responsible for carrying on the details of its program.

Great differences exist between living conditions, customs, and habits in India and the United States. Similarly, wide differences exist between practices and procedures in Indian and our colleges. Hence some time is needed to enable participants to become adjusted to their new surroundings.

A hoped for development that Indians and American students would associate informally and come to understand and appreciate each other has not been realized to a desirable degree. Among the reasons for this situation, the following are evident.

American students, living in familiar and customary surroundings, are not aware of or much concerned with the need of foreign students to become acquainted with their new surroundings. Undergraduates are younger than the Indians and, therefore, less likely to take the initiative with the older foreign students. Graduate students who often associate in the same classes with foreign students and are the same age do intermingle to some degree with foreign students. Many American students retain some degree of reservation toward Indians because of their skin color, mannerisms, ways of speaking English, and the fact that they are from another country.

Indian students are not only older, usually, than their American classmates; the majority of them are not accustomed to associating freely with others whose social status is unknown to them. Also, they are faculty members in India and Indian faculty members do not associate informally with students.

Indians have a strong tendency to associate together, in housing, food preparation, amusement and recreation, and other activities.
The first participants to arrive under the contract were housed in University dormitories. This arrangement ended in less than one month by demand of both Indians and Americans. The Indians are quite reluctant to share bath and toilet facilities with others. They dislike sharing rooms with Americans. The food served in dining halls was so different from that to which they were accustomed they would not eat it.

American students objected to body odors which result from Indian customs that call for less frequent bathing and laundering. They also objected to the tendency of the Indians to assemble in rooms or hallways and talk loudly and at length.

The Indians were distributed around in private rooming and boarding houses after this. But in a short time they had congregated in low-cost housing where they could associate together and buy and prepare their own food.

Helping offset the lack of natural mixing with Americans a number of faculty members invite participants to their homes for meals and informal social relationships. The Cultural Association of India includes participants and all other Indian students. This group works with other international student groups and American students to conduct social programs, recreational activities, and exhibitions.

Other types of problems arose within the new university in India. The organization and administration provided in the legislative act for Orissa University are so different from the procedures to which Indians are accustomed that considerable difficulty is being encountered in establishing the institution.

Indian colleges have been developed principally along British organizational patterns. They provide college programs mainly for students whose families can afford to pay the costs of college education. The curricula and courses include mainly the arts and humanities with some science. Subject matter included in curricula is not intended to prepare graduates to work in a specific area. A college degree has great value as a status symbol.

Indian college administrators and faculty have difficulty in breaking away from the established fixed curricula and courses and replacing much of the program with elective courses which enable students to prepare for careers in specific subject matter areas. Each college faculty dislikes relinquishing its library for a central university library, or to permit registration through a university registrar’s office, or to permit teaching all basic science courses in a university science department.

The belief that the privilege of acquiring college degrees should be restricted to a select few is strongly held. The idea that making college education available to each person who is intellectually competent and willing to do the work required to earn a college degree will raise the level of competence and productivity of the population is difficult for Indian educators to accept.

The task of conveying the principles of land-grant education philosophy to Indians is a difficult and long-term one. It has to start at the present gross inadequacy of elementary and secondary education. Direct control of colleges by the state government is involved. The Orissa University bill provides for a board of management which includes state government officials and non-government citizens. Even this partial separation from government control is not acceptable to some of the state officials.
Because of the practice in Indian colleges of placing faculty members in subject matter departments other than those for which they are trained, the faculty member may lose much of the benefit of his graduate study and the institution is deprived of the most effective service of the faculty member. The rigid seniority system followed in Indian colleges usually prevents junior staff from suggesting changes or questioning their senior's policies or procedures. The foregoing practices often reduce the value of the participants' graduate programs personally and in the benefits which the colleges could derive from their increased competence.

Indian college libraries generally have been considered repositories where publications are preserved and protected. Usually the publications are not indexed or classified; they are often kept behind locked doors and very little access to them is permitted. Seldom is any staff member trained to operate a library. Missouri staff members have encouraged and assisted college staff members to develop some degree of organization and supervision of libraries, to delegate someone to be in charge of the library and to permit access by faculty and students. Some of the participants have received training in library operation while in the United States.

A university library building has been completed at Orissa University.

F. E. Rogers served as chief of party from July, 1962, until June, 1964. During his term the University-AID contract, under which the work was concentrated at Bhubaneswar, became effective. J. W. McKinsey followed Rogers as chief of party, serving from June, 1964, until June, 1969. Despite a number of discouraging obstacles which developed, Professor McKinsey and Missouri staff members established the basis for an effective university organization and program in Orissa.

Unsettled political conditions in Orissa and frequent changes in state administrative officers resulted in insufficient financial and administrative support of the University by the state government. Administrative officers of the University changed a number of times and firm or continuing policies were difficult to establish.

Representatives of AID in New Delhi were usually unsympathetic with and at times openly antagonistic to the plans of work which were attempted by the Missouri staff members at Bhubaneswar. Threats to cancel the University of Missouri contract were made by the New Delhi and Washington offices of AID. The problem was solved when the College and University of Missouri administrators presented the situation to the top echelon of AID officials in Washington.

Dr. Harold V. Walton became chief of party in June, 1969. He went to India in March, 1969, so that he could become familiar with the program before Professor McKinsey returned to Missouri.

More than 100 participants have come to the University of Missouri for graduate work in agriculture and veterinary medicine. Most of them have received M.S. degrees, about one out of six have received Ph.D. degrees, and a few have not received degrees. A number of these younger men are being appointed to positions in the Orissa University faculty and state government where they can introduce new and more effective practices in research and teaching.

In 1966 the University contracted with AID to assist in developing an agricultural extension program in Orissa. Five Missouri extension staff members are working with the program, cooperating with the Orissa Ministry of Agriculture and Orissa University. The objectives of the program are to assist Orissa in developing an
effective state extension service and to demonstrate, under field conditions, the operation of extension work.

Another University-AID contract, approved in December, 1967, provides for assistance by University of Missouri staff members to establish agricultural extension work in Bihar. The three Missouri men work with the Bihar Ministry of Agriculture and the Colleges of Agriculture at Sabour, Ranchi, and Pusa. The objectives of the program are to assist in establishing statewide programs of agricultural communications and information, agronomy extension, and insect surveys.

**Research, Teaching, and Development Program in Colombia, South America**

The Missouri College of Agriculture and the School of Veterinary Medicine participate in an extensive program of agricultural research and education which is administered by the University of Nebraska. After about two years of study and negotiations, agreement was reached between the University of Nebraska and AID to initiate the program. At the same time the Ford Foundation provided a grant to the University of Nebraska to develop a program in agricultural economics in Colombia and the W. K. Kellogg Foundation made a grant to the Institute Colombiano Agropecuario (ICA), to be administered by the University of Nebraska, to assist in developing a Division of Information and Development in ICA.

The objective of the program was to increase the competence of ICA and the National University of Colombia in research, resident instruction, and development and to enable them to meet their responsibilities in improving the agricultural industry of the nation.

In developing the plans for the program, the University of Nebraska discussed the proposal with a number of universities. Colorado State University, Iowa State University, Kansas State University, the University of Missouri and Oklahoma State University agreed to participate in the program. The subject matter areas included in the program are animal breeding, animal nutrition, beef production and management, poultry production, clinical pathology, ambulatory clinic and physiology, microbiology, general veterinary clinics, agricultural economics, rural sociology, extension, information, communications, weed control, crop physiology, soil fertility, and agricultural engineering. Forty-one staff positions to be provided by the six participating universities, were authorized in the contract. Dr. R. L. McNamara, rural sociology, and Dr. C. V. Ross, animal husbandry, have served in the program for two years. Several other staff members in agriculture and veterinary medicine have worked on short-term assignments of one to three months each.

Three Colombian universities are included in the program. They are: The National University at Bogota, The National University Branch at Palmira, The National University at Medellin.

**Land-Grant Association-AID Study of International Education Programs**

Beginning in 1955 the federal agency which was called successively the Technical Cooperation Mission, the International Cooperation Agency, and the
Agency for International Development contracted with a number of land-grant institutions to conduct programs of agricultural education in more than 30 nations in Africa, Asia, and Latin America. At first the majority of the assistance efforts consisted of work by individual subject matter specialists who helped counterpart staff members of host institutions improve their research and teaching programs. In time, the emphasis shifted to “institution building”, in which the United States University-AID contract provided for the university to plan and conduct a program, in cooperation with the host institution, which would help the host institution develop research and teaching programs that would strengthen the agricultural industry of the nation.

The degree of success of the programs varied between failure and substantial success. In 1965 the Land-Grant Association and AID initiated a study of the entire program with the objective of identifying the factors which contributed to the success or failure of the foreign educational programs.

The study was planned and conducted by nine state universities, including Illinois, Indiana, Minnesota, Missouri, North Carolina State, Ohio State, Purdue, Utah State, and Wisconsin. Each of the universities accepted responsibility for a specific segment of the study. The University of Missouri made the field study of the institutions which were involved in Central and South America. The field work started in January, 1966, and was completed in August, 1967.

The department of agricultural economics was responsible for general supervision of the University of Missouri part of the study. Dr. Melvin Blase was coordinator of the program and Dr. Phillip Wamken, with headquarters in Rio de Janeiro, was field director of the study. Other staff members who assisted in the study were Dr. Curtis Braschler, Dr. Harold Breimeyer, Dr. Robert Finley, and Dr. J. H. Longwell.

The report of the study, “Building Institutions to Serve Agriculture,” was published in 1968 by the Committee on Institutional Cooperation, Purdue University, West Lafayette, Ind.
Agricultural Students Activities

The number of students enrolled annually in the four-year curriculum in agriculture was below 100 until 1906-07 when the number was 105. The students who were enrolled during the years 1904 to 1908 included a number of men who started several student activities which were continued for many years afterward. The activities were:
- Missouri Corn Growers’ Association, the forerunner of the Missouri Seed Improvement Association
- Agricultural Club
- Farmers’ Fair
- Barnwarmin’
- The College Farmer
- The Missouri Chapter of Alpha Zeta
- The First Chapter of the Farm House Fraternity

All men students, who called themselves Farmers, enrolled in the four-year curriculum in agriculture were automatically members of the Ag Club. Students enrolled in the two-year winter short course, known as Short Horns, were not eligible for Ag Club membership. Girls enrolled in agriculture and in home economics were not admitted to the Ag Club. This exclusion of girls from the club sometimes occasioned heated discussions on the campus. The Farmers invited girls from any division of the University to attend the Barnwarmin’ but girls in agriculture and home economics could not invite boys.

All Farmers were required to participate in Ag Club activities. Each of the four classes was organized, with officers who were elected by members of the class. The officers of each class were responsible for checking attendance of class members at Ag Club meetings and for securing participation of all members in Ag Club programs. Students who failed to take part in these activities were subject to penalties, by action of the class or, in special cases, by the Ag Club.

Officers of the Ag Club were elected from the senior class. The Farmers’ Fair, Horse Show, and Barnwarmin’ required effective organization and planning. The plans and operation of these events were conducted through committees. Committee chairman were appointed by Ag Club officers from the senior class. Committee members were appointed by class officers. Freshman committee members were assigned to the working jobs such as constructing the booths for Farmers’ Fair, cutting and hauling brush for Barnwarmin’ and cleaning up after these events.
Penalties for minor infractions were moderate but when a club or class officer or committee chairman was the offender he would be sentenced to run the paddle line or to be thrown in the pond.

Farmers were self-appointed guardians of the White Campus. Anyone seen committing an offense, such as walking on the grass, was promptly caught and sent down the paddle line.

The agriculture-engineer combine was the strongest political force on the campus for many years. Each year the combine successfully supported candidates for election to the student government association. The slate of candidates included students from different divisions of the University and the combine secured wide support for its candidates. Law students, many of whom were politically inclined attempted, usually unsuccessfully, to oppose the combine. Their attempts to organize the arts and science students never succeeded.

Following World War II student attitudes changed, due mainly to the more mature character of the large number of veterans. The paddles were taken, in 1947, from the storeroom in Waters Hall and burned by a number of students from other divisions of the campus and this ended the paddle line. The “dunking pond” had become stagnant, overgrown with aquatic plants, and had broken bottles and other debris on the bottom. One summer in the mid 1950’s the dean of agriculture and the superintendent of buildings and grounds decided the pond should be eliminated. A bulldozer filled it in a few hours. The following fall some agricultural students were unhappy but to new students, who were unfamiliar with the tradition, the pond was unimportant.

The completion of the horse barn in 1905 provided the occasion for the first Barnwarmin’. This was an affair characteristic of the times. It included a corn shucking bee, with a few red ears included, cider and doughnuts, and square dancing. The Barnwarmin’ has continued each year until the present time. The barn became too small to accommodate the increased enrollment in a few years, and it was moved to Rothwell Gymnasium, where Barnwarmin’ has been held for more than 50 years. The event is held in the late fall and decorations include autumn leaves, pumpkins, and corn shocks. The queen’s throne is made of baled straw.

The Farmers’ Fair actually started in 1905 with a parade through town, ending at Jesse Hall in time for a University convocation. The students, dressed in farm work clothes, carried pitch forks, shovels, axes, hoes, and other tools and led farm animals and drove teams of horses and mules pulling farm machinery. When they entered Jesse Hall auditorium carrying their tools, President Jesse peremptorily ordered them to leave.

The following year the students held the first Farmers’ Fair. It included a parade similar to the one of the previous year but without going to Jesse Hall. The fair grounds were on the rectangle between the barns and the present agricultural engineering buildings. In the area were rows of booths, each enclosed in canvas, each bearing a sign inviting visitors to see the side show, admission one cent. Considerably ingenuity was shown by students in preparing the side shows. One year a booth bore the sign “See the Educated Hog.” Inside was a popular student named Bobby Hogg sitting reading a magazine. Another section of the grounds contained educational exhibits, including varieties of grains and laboratory equipment.
Two musical shows were included, the Minstrels and the Follies. Only Farmers participated in these events and each year a number of students with very good talent in music and humor took part. A faculty censoring committee previewed the shows and sometimes eliminated words or stories which they thought were objectionable. Sometimes the boys revised the stories or words so they were acceptable but arranged them so the audience understood what the censored parts has been.

Later a chute was constructed, down which a flat bottomed boat slid into the old “dunking pond” near the old power house. A ferris wheel, turned by a small stationary gasoline motor, also was constructed. Both these structures, made of wood, could be disassembled, stored and set up the next year. They were used for many years.

For many years a horse show was a popular part of the Farmers’ Fair. Most of the show horse owners in Missouri entered horses in the show and many of the top show horses of the country competed in the classes. The horse show continued for a few years after the Farmers’ Fair was discontinued.

In recent years students have organized a Little International Livestock Show and a class “A” horse show which are produced in the Livestock Center.

The College Farmer, started in 1904, was a magazine published by the Ag Club each of the nine months of the school year. The editor and staff were selected by club officers on the basis of experience and ability. The publication carried information on student activities and articles written by students or faculty members reporting research information. All Farmers were subscribers and copies were sent to high schools in the state. Local businessmen carried advertisements in the magazine.

The large number of students who enrolled after World War II were very anxious to complete their college work and had little interest in extra-curricular activities. The programs offered by Farmers’ Fair no longer appealed to students or other people so this activity was ended in 1950. The College Farmer continued publication until 1961. Subscriptions by students were low and income from advertising declined but costs of publication continued to increase. The agricultural editor’s budget included money to pay for several hundred copies which were sent to schools in Missouri. But mounting costs in excess of income eventually forced the publication to suspend operations.

The Agricultural Club continued as the principal organization for agricultural students until the beginning of World War II. Extracurricular activities were reduced or suspended during the war. Few students were interested in reviving the Ag Club after the war ended. Departmental clubs were of more interest to students who felt they could spare the time for such activities. The three agricultural fraternities attempted to maintain the Ag Club, but few other students participated. Some non-fraternity agricultural students organized the Independents Agricultural Club which provides an organization with which a limited number of students can work.

Each spring an annual Ag Club Recognition Banquet is held at which agricultural students who have excelled in scholarship, leadership, judging teams, and other student activities are honored.

In the spring of 1969 the University Student Council was organized on the Columbia campus. Each academic division has a divisional council, with officers
elected by the students of the division. The objects of the council are to encourage more students to participate in student government activities and to provide a channel through which students may work more closely with the faculty and the College and University administration.
Services

The resident and extension staff members of the College participate in a number of service activities which may include one, two, or all three of the divisions of research, resident teaching, and extension; but which are in addition to the regular activities of these divisions.

Each year several thousand requests for information about specific items are made by individuals or groups. The inquiries may be made by letter, telephone, or personal visit and may range in importance from quite minor details to questions which require considerable time and effort by one or several staff members to answer. The great majority of the inquiries are answered by several thousand letters and bulletins which are mailed to the inquirers.

A few of the inquiries made by groups eventually become the subjects of conferences or short courses in which the subjects are explored in considerable detail. The conferences may be held in Columbia or in another location in the state. Occasionally the group which participates in one of these discussions will form an association with the objective of providing a continuing organization in which the members can work together to develop their common interests. Many such associations ask College staff members, whose professional fields include the interests of the association, to serve as secretaries. This service by staff members usually includes advantages for the staff members and the association. At times some of the associations demand excessive amounts of time of the staff member or activities or policies of the association are in conflict with College policies. Eventually the College established the policy that staff members would not serve as secretaries for associations. Staff members did not receive additional compensation for their services as secretaries.

A wide variety of testing programs are supervised by several departments of the College. One of the last steps in the crop breeding research which the agronomy department conducts is the testing of the more promising new varieties of grain, forage, and fiber crops on a variety of soil types and under different climatic conditions throughout the state. Detailed records are kept on the agronomic characteristics, stages of development, and maturity of each variety, and the data are included in the determination of which varieties are sufficiently valuable to justify volume production of seed and release to farmers. Field days are held at the test plot sits and farmers are invited to see and discuss the varieties. Other new varieties which are being offered by commercial seed firms also are included in the tests.
A large number of varieties of hybrid corn seed are sold by commercial firms. Farmers and seed firms rely heavily on variety tests conducted by the College. The majority of varieties of hybrid corn have limitations in adaptability to soil and climatic conditions. It is important that they be tested under as uniformly controlled methods as possible throughout the state and that the tests be conducted under the unbiased supervision which the College can give. The time and cost of conducting hybrid corn testing is substantial, and because the results are quite valuable to seed firms, they pay fees into a fund from which the costs of conducting the testing program are paid.

Students in the College of Agriculture in 1903 organized the Missouri Corn Growers Association and at the first Farmers' Week in January, 1904, farmers in attendance followed the students' lead and established the association on a statewide basis. Farmers who were interested in the improvement of other crops proposed that the Corn Growers Association activities be expanded to include other crops. The proposal was approved and the name was changed to the Missouri Seed Growers' Association at the Farmers' Week meeting in January, 1910.

C. A. Helm, a graduate of the College of Agriculture, was appointed instructor in field crops in 1916. He was greatly interested in the programs of the Missouri Seed Growers' Association and became its secretary in 1930. Under his guidance the association developed an effective seed certification program and actively supported enactment by the General Assembly of laws which effectively restrict the sale of low-quality seed.

Tests of fertilizers are conducted by the agronomy department to determine the responses of different crops to different amounts and proportions of plant foods on a variety of soil types and under different climatic conditions. Proprietary brands of fertilizers are not included in these tests. Records of crop responses are kept and field days, which are attended by interested people, are held.

Chemical herbicides and insecticides are field tested by the College. Records are kept of the degrees of control effected on weeds and insects, immediate and delayed effects on crops and animals, and accumulation of the chemicals in soils, crops, and animals and their products.

Until recent years selection of breeding animals for the production of market hogs and cattle was done almost entirely on a subjective basis. Starting about 1950 objective measurements in the live animal, especially economy and rate of gain, proportion of lean and fat, and of the proportion of desirable cuts, were developed. The heritability of these characters was determined by research in animal breeding. This information was made available to breeders of purebred and market hogs and cattle. In discussions between livestock breeders and college animal husbandrymen tentative plans were developed to establish a program under College supervision in which these objective measures could be applied to the selection of superior boars and bulls.

Plans were first developed for a swine testing station. The General Assembly appropriated funds to pay for construction of the necessary buildings and equipment, and a competent supervisor was employed. A committee which included representatives of breeders of purebred swine and College staff members in animal husbandry and veterinary medicine established rules governing operations of the testing program. Operating costs are paid from fees paid by swine breeders who
enter pigs in the testing service. The service was initiated in the fall of 1958. The program is quite effective in identifying superior breeding animals.

A program to test purebred bulls of the breeds of beef cattle was established in 1960. Facilities for this program are adjacent to the swine testing station and both are supervised by the same personnel. This program has not been as well accepted by cattle breeders as has the swine testing program, probably due mainly to different management practices followed by beef cattle and swine breeders. A program for testing bulls on breeders' farms, supervised by College personnel, has been developed and is being well accepted by breeders.

**Greenhouse and Garden Soil Testing**

Florists and vegetable growers experience soil fertility problems, in greenhouse and garden soils, which are different from those which occur in open field conditions. Quite large amounts of mineral fertilizers are applied in greenhouse and commercial garden soils and the norms for plant food levels are considerably higher than those for field crop production. Residues of plant foods which carry over in greenhouse soils accumulate and cause "salting", a condition which results in reduced productivity.

Staff members of the horticulture department and commercial flower and vegetable growers established a soil testing laboratory on the College campus in 1950 in which the special procedures for testing these high fertility soils are applied. The growers paid the costs of establishing the laboratory. They also pay a fee for each sample tested, the proceeds being applied to the costs of operating the laboratory.

**Cooperative Sales of Feeder Cattle and Pigs**

Production and sale of beef cattle constitutes the largest segment of farm production and income of Missouri agriculture. The number of cows and heifers other than milk cows, about 1,750,000 in 1969, is considerably more than 2½ times larger than it was in 1950. Cow and calf herds constitute the major means of marketing the forage produced on the state's extensive permanent pasture and open timber lands.

Breeding herds of beef cattle are maintained in largest numbers in the areas north of the Missouri River and in the western third of the area south of the river. Income from the sale of beef cattle constitutes a higher percentage of total farm income in the Ozarks and the north central area than in other areas which produce large amounts of cultivated crops.

A number of methods have been practiced in marketing cattle and calves. At one time most cattle were sold to individual buyers who traveled through the country buying from farmers. Some of the buyers bought feeders for their own feedlots; others were dealers who bought for resale to cattle feeders or to move the cattle to a central market. They were shrewd dealers who were familiar with market demands and prices and often bought cattle at low prices. Other buyers operated at country shipping points and bought cattle which farmers brought in on designated days. Cattle growers with large herds often shipped feeders to central markets for sale by commission salesmen. In nearly all cases the seller seldom received as much for his cattle as the market warranted.
Prior to World War I, livestock growers in a number of communities organized cooperative shipping associations, assisted by agricultural extension workers. The associations offered livestock growers, and especially those who produced small numbers, the opportunity to ship and sell on central markets. The degree of success of a shipping association depended on the competence of management, loyalty of association members, the opposition of local livestock dealers, and the amount of discrimination against cooperative shipments which was sometimes practiced by central market buyers.

Congress passed the Capper-Volstead Act in 1922. This law established a broad legal base for cooperative marketing of farm products. At about the same time the Committee of Fifteen, composed of representatives of livestock producers and market agencies, developed a plan for a nationwide cooperative marketing organization known as the National Livestock Producers Association. Cooperative livestock marketing agencies were established at the major livestock markets and local marketing associations were established at numerous points in livestock producing areas. The program included producers’ stocker and feeder companies through which livestock growers could market stocker and feeder cattle to better advantage than had been possible previously. The Producers, as the organization was popularly known, placed livestock producers who marketed their livestock cooperatively in a much stronger competitive position than they had held previously.

The depression of the 1930’s, aggravated by the severe drought years of 1934 and 1936, caused extreme difficulty for Missouri farmers. Ozark farmers, whose principal income is from the sale of feeders, were particularly hardpressed. A number of cattle producers in Howell and Wright counties organized the Ozark Cattle Growers Association in 1935 and appealed for assistance by the Agricultural Extension Service. Extension animal husbandmen, E. S. Matteson and T. A. Ewing, responded to the appeal, and a new marketing program, called the cooperative feeder sale, was developed.

The cattle which were consigned to the sale were identified by ownership, graded, weighed, and sorted into lots by grade. The cattle were sold by graded lots at auction. Preference for the better grades of feeders, shown by the higher prices paid for them by buyers, emphasized for the growers the importance of improving their breeding, feeding, and management practices. The sales provided the extension specialists with a valuable teaching method with which to impress upon cattle producers the importance of adopting the practices which extension workers recommended.

Expansion of the feeder sale program to other areas of the state was further restricted during World War II. Following the end of the war, sales were established in many areas of the state. In the fall of 1968, a total of 64,261 feeders were sold.

In 1951 feeder pig sales, organized and conducted in a manner similar to that developed in feeder cattle sales, were started. The sales have brought about even greater and more rapid improvement in feeder pigs than has been experienced with any other class of livestock.

Extension workers have encountered opposition to their participation in these programs. Established livestock marketing interests, especially the livestock auctions and central markets, object to college staff members assisting cooperative
associations. One reason given for the objection is that the cooperative sales reduce the number of animals which are marketed through established channels, thereby crippling their business. Actually the number of animals sold through the cooperative sales is a small percentage of the total number of animals marketed. The use of improved production practices which has been emphasized by the extension participation in the cooperative sales has contributed substantially to the increase in cattle and hog production and to the total numbers which are sold through private marketing agencies. Another objection by marketing agencies to help given by college staff members to cooperative marketing associations is that taxes paid by the market agencies support the college, hence college staff members should not assist the competing cooperatives. The objection fails to recognize the fact that farmers also pay taxes.

In 1959 the feeder cattle and feeder pig growers incorporated as the Missouri Cooperative Feeder Livestock Association. Thirty-two county associations are members of the state association which is entirely farmer controlled. An executive secretary, employed by the state association, serves as the executive officer. Extension specialists render assistance and information to the county and state associations on technical and management problems.
Business Analysis of Farm Records

Many things go in cycles. Farm business records and their analysis to determine factors responsible for relative success in farming is no exception.

In the period 1910 to 1919, 85 percent of the time of the farm management staff of the Missouri College of Agriculture was devoted to collecting and analyzing farm business records. During the next two decades this percentage steadily diminished and reached a low of 17 percent by 1940.

In the first decade, W. J. Spillman of the USDA, D. Howard Doane, O. R. Johnson, and Ben Frame, of the Missouri College of Agriculture, were the leaders in this activity. At the beginning, farm records, including labor, were kept in great detail by cooperating farmers. Farm management staff and graduate students regularly visited these farmers to assist in setting up and keeping records which later were analyzed and reports published.

In the second and third decades, 1920-40, the detailed farm record method was replaced by farm surveys. Farms were visited only once and sources of data were a combination of the farmers’ records and estimates. This probably was not as accurate as the detailed records, but was adopted in the interest of time required and costs. By the end of the third decade, 1930-40, even the survey method was practically abandoned.

About 1940, under the leadership of J. W. Burch, director of the Agricultural Extension Service, farm management was adopted as a major project of an agricultural extension staff, both county and state. It was Director Burch’s contention that the sum total of the whole farm business was the most important consideration. That is, a farm operator could be efficient in one phase of his operation, but neglect of other phases could result in failure of the total farm business. Farm business success, he maintained, depended on the intelligent coordination of all phases of the farm business.

At the beginning, activities in this extension farm management project included mainly the promotion of improved techniques in crop production, animal production, and erosion control. Coordination of enterprises was limited mainly to crop and animal production. Many of these improved techniques required considerable amounts of investment capital, often recommended by extension
workers without due consideration to the farmers’ debt situation, cash flow, and the farmer’s management ability. As a consequence, some farm cooperators got into serious financial difficulties because of too rapid adoption of techniques that required investment capital, borrowed often on a short-term basis.

During this time (1940-53) the need for the value of farm records was constantly stressed. Improved farm record books, designed by B. H. Frame and Paul H. Bebermeyer, were distributed through the Extension Service. Each year demand for these books increased, but they were used mainly for income tax reporting. A whole farm business analysis was attempted on the very few farms of cooperators who were showing exceptional progress in improving net earnings. These analyses proved that farm reorganization coupled with competent management increased net farm income but did little to develop convincing data to show why this was so.

In 1954 Bebermeyer was transferred from his duties as district farm management specialist and assigned the job of developing a farm record analysis project. As he studied the record books and efficiency factors used in adjacent states, he found that the efficiency factors commonly used were those of physical production, such as yields per acre, pigs per litter, eggs per hen. As a farm management specialist, he observed that farmers could be efficient in the above factors and still not have successful farm businesses. Farmers' purchased inputs such as machinery, fertilizer, seeds, and others, were constantly increasing while prices of farm products were declining. Evidently the coupling of costs and returns was becoming increasingly important, and so dollar factors which coupled costs and returns were essential.

The measures of efficiency finally adopted were:

1. **Volume of Business**: Total value of production in dollars.
2. **Crops**: Net dollar returns for land and labor charged to crops.
3. **Animals**: Returns per $100 worth of feed fed, both purchased and raised.
4. **Labor**: (a) Value of hired and family labor per $100 of farm production and (b) value of farm production per man year.
5. **Machinery**: Costs, both fixed and variable, per $100 of production.
7. **Overall Efficiency**: Net earnings per $100 charged for land, labor, and working capital.

The functioning of the record program started with the business year 1955. Through the services of county extension agents, 245 records were obtained from farmers who were using the Missouri Farm Record Book. Student help and desk calculators were used to calculate the efficiency factors. The state summary for 1955, a serious drought year, showed that the average return for the operator's labor and management was only $657. Total capital managed per farm was $36,800. Farmers paid nothing for this record analysis service because of the newness of the project and the need for the data. Cost per record was about $15, not counting county agents' or the project leader’s time.

The farm record program was continued with no charge with 200-250 farmers per year until 1956, when it was decided by the administration that a fee should be
charged and, instead of using record books kept by farmers, monthly records would be mailed in by cooperating farmers and tabulated on electronic computers. After consulting with Michigan State University, an early innovator of this method, a charge of $25 per record was set. Computation of efficiency factors, however, was still done with desk calculators, since no adequate programmers were available. Little economy was realized by the change. Costs were about $60 per record.

The next year the per record charge was set at $50. As might be expected, enrollment declined to 90 farm cooperators for 1957. However, fortified with results from previous years' figures, an educational program was devised and enrollment continued to increase from year to year and leveled off at around 200-250 records per year.

In 1964, Bebermeyer retired and Dr. Carroll L. Kirtley was placed in charge of the program. In 1965, with the help of two programmers employed by the University, Kirtley began the task of computerizing all of the data processing including final summarization and analysis of each farm record. Some 2,000 hours of the two programmers' time was required, and this did not include the computerizing of inventory and depreciation records.

Prior to 1965 all coding for expense and receipt classification was done in the central office. In 1965, this became the responsibility of the cooperators. This has been satisfactory.

In the early years of the projects, farmers received quarterly reports and annual reports. In 1966 farmers began receiving a monthly report of expenses and receipts and thus could make any correction needed.

In 1967 depreciation schedules on machinery, equipment, and buildings were computerized. This practically eliminated the problems of omissions and farmers' errors in figuring depreciation. In 1968 depreciation schedules for purchased breeding livestock were introduced. Cooperators receive three copies of this complete depreciation schedule, one each for federal and state tax returns and one for their own files. In addition, a number of other supporting innovations to insure accuracy and service had been made.

However, the basic efficiency factors as developed by Bebermeyer have not been changed and have proven their worth in pointing out strong and weak points in individual farm business management.

From 1962 through 1967, record service fee charges were $50 per farm. In 1968 the fees were varied based on the sum of dollar transactions recorded. Fees range from $50 to $160 per year, and averaged about $100. That farmers are becoming more business minded and appreciative of the value of farm records is evidenced by the 1969 enrollment of 375 farms.

Credit is due Dr. Thomas Brown, extension farm management project leader, for initiating a strong educational program for farmers and county extension workers on the use of farm records as the basis of improving farm business management.

Farmers are not the only recipients of the value of the farm record project. Year-to-year information of the business management of farms has been of great value to farm management specialists and area farm management extension agents in carrying on continuing education for farmers whose larger farm units generate many new problems of business management. College teaching of farm management
is also enriched because professors are supplied with continuous information as to
changes occurring that affect farm net capitalization and income.

The following tables give some interesting data as reported by farm cooperators
from 1955 through 1967. These changes are not to be interpreted as representative
of all Missouri farms, since they are not necessarily a representative sample. It
shows only the financial status of reporting farms, expressed as straight averages for
the total farms reporting. Table II shows the wide range in farm income; indicates
the size is no guarantee of adequate income; and suggests the importance of skill in
management.
### TABLE I
**AVERAGES OF ALL FARMS**

<table>
<thead>
<tr>
<th>Item</th>
<th>1955</th>
<th>1960</th>
<th>1965</th>
<th>1967</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres cropland and open pasture</td>
<td>191</td>
<td>300</td>
<td>509</td>
<td>553</td>
</tr>
<tr>
<td>Acres cropland</td>
<td>137</td>
<td>218</td>
<td>378</td>
<td>445</td>
</tr>
<tr>
<td>Total capital managed</td>
<td>$36,844</td>
<td>$67,277</td>
<td>158,701</td>
<td>205,794</td>
</tr>
<tr>
<td>Value total farm production</td>
<td>$8,223</td>
<td>$16,461</td>
<td>38,788</td>
<td>39,822</td>
</tr>
<tr>
<td>Gross cash receipts(2^/)</td>
<td>$10,016</td>
<td>$21,322</td>
<td>46,456</td>
<td>63,362</td>
</tr>
<tr>
<td>Cash expenditures(3^/)</td>
<td>$8,287</td>
<td>$16,357</td>
<td>38,870</td>
<td>54,032</td>
</tr>
<tr>
<td>Return to operator’s labor and management</td>
<td>$657</td>
<td>$3,516</td>
<td>11,060</td>
<td>3,809</td>
</tr>
<tr>
<td>Return to $100 charged for land, labor, and capital(4^/)</td>
<td>$71</td>
<td>$121</td>
<td>$170</td>
<td>$98</td>
</tr>
</tbody>
</table>

\(1^/\) Not available.
\(2^/\) Includes sales of purchased commodities and items in beginning inventory.
\(3^/\) Includes purchased livestock and machinery.
\(4^/\) Cash expenditures and receipts adjusted by inventories.

### TABLE II
**AVERAGES OF TOP 20% AND BOTTOM 20% IN RETURNS TO OPERATOR’S LABOR AND MANAGEMENT**

<table>
<thead>
<tr>
<th>Item</th>
<th>1965</th>
<th>1967</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 20%</td>
<td>Top 20%</td>
<td>Bottom 20%</td>
</tr>
<tr>
<td>Acres of cropland and open pasture</td>
<td>774(1^/)</td>
<td>455(1^/)</td>
</tr>
<tr>
<td>Acres cropland</td>
<td>NA(1^/)</td>
<td>NA(1^/)</td>
</tr>
<tr>
<td>Total capital managed</td>
<td>$258,220</td>
<td>$114,220</td>
</tr>
<tr>
<td>Value total farm production</td>
<td>$74,354</td>
<td>$18,242</td>
</tr>
<tr>
<td>Gross cash receipts(2^/)</td>
<td>$85,862</td>
<td>$24,989</td>
</tr>
<tr>
<td>Cash expenditures(3^/)</td>
<td>$69,823</td>
<td>$22,211</td>
</tr>
<tr>
<td>Returns to operator’s labor and management</td>
<td>$33,539</td>
<td>$-141</td>
</tr>
<tr>
<td>Returns per $100 charged for land, labor, and capital(4^/)</td>
<td>$265</td>
<td>$76</td>
</tr>
<tr>
<td>Size in productive man work units</td>
<td>869</td>
<td>430</td>
</tr>
</tbody>
</table>

\(1^/\) Not available.
\(2^/\) Includes sales of purchased commodities and items in beginning inventory.
\(3^/\) Includes purchased livestock and machinery.
\(4^/\) Cash expenditures and receipts adjusted by inventories.
Service Laboratories and Equipment

Prior to the end of World War II substantially all of the analytical work conducted in Agricultural Experiment Station research made use of the conventional chemical, colorimetric, and microscopic methods. Between 1925 and 1935 Dr. L. J. Stadler used x-ray and ultraviolet equipment in his studies of the genetics of corn and barley.

Some interest developed about the end of World War II in possible uses of the electron microscope. Staff members in the physics department built an electron microscope and it was made available for use by research workers. It was not easily operated and experiment station staff members were not prepared to make use of it in research. At about the same time some departments became interested in possible uses of spectroscopic equipment in research with trace minerals.

Instead of establishing small laboratories in two or more departments, in which the expensive equipment would have limited use, a central spectroscopic laboratory was placed in the agricultural chemistry department and a specialist in spectroscopy was placed in charge. Each department which conducts research in which information is best obtained by spectroscopic analysis arranges with the laboratory personnel to have the work done. The use of the laboratory has increased and the equipment now includes a large grating spectrograph and accessory equipment, a small direct reading spectrograph, two research flame photometers, a projection comparator microphotometer, a fluorescence spectrophotometer, and an ultraviolet and infrared recording spectrophotometer.

The well-qualified staff of the laboratory, in addition to the service work, also conducts its own independent research program and offers course work for graduate students.

The Agricultural Experiment Station chemical laboratory staff, in addition to extensive research programs, carries a large amount of service work. Analyses of all the samples of fertilizer which are collected by the fertilizer control inspectors are made by the laboratory. Samples of feeds, fertilizers, animal products, and plants which are included in research projects conducted by other departments are analyzed by the laboratories. In addition to the standard equipment, the
laboratories use automated amino acid analyzers, gas-liquid chromatographs, electrophoretic instruments, analytical ultracentrifuge, and a mass spectrograph.

To meet the needs for research projects in several departments which use chemical isotopes, a laboratory has been equipped to make determinations of isotopes on the soils, plants, feeds, and animal products which are used or produced in the research. The isotopes are secured from the Argonne and Oak Ridge laboratories of the Atomic Energy Commission and the University reactor.

A research laboratory for low-level radiation was completed recently. It includes a room enclosed in steel and quartz sand which excludes most of the radiation of external origins. The room will accommodate animals ranging in size from small laboratory animals to mature cattle. The laboratory is equipped with sensitive measuring equipment, a liquid detector, and a crystal detector to enable research workers to measure natural or induced radiation in research subjects. This facility is used by the Agricultural Experiment Station, the School of Medicine, and the School of Veterinary Medicine.

Research workers with plant virus diseases secured the first electron microscope to use in their studies. The laboratory now has three instruments and related equipment and a staff of competent technicians. The laboratory facilities are available for use by other departments.

When the service laboratories first began operating, each project which needed the laboratory’s help included an item in the project budget to pay for the work done by the laboratory. In many cases the project leader found other uses for the money budgeted for the service; hence the part of the project which was originally considered sufficiently important to justify the expenditure of money was not carried out. The procedure was changed and funds are now allotted to each service laboratory with which to pay the costs of work done for other departments. Each research project leader discusses with the laboratory director the kind and amount of work to be done and the time when the samples will be delivered to the laboratory. The laboratory director then includes the work in his schedule and allocates the necessary amount of money from his budget. The project leader now gets the analytical work done without charge to his project fund and usually supplies the samples to the service laboratory at the time agreed upon.
The following pages provide historical accounts of the Schools of Home Economics and Forestry and the various College of Agriculture departments. Each College unit was responsible for preparing its own report.
School of Forestry

Readers who are interested in details concerning the School of Forestry are referred to a history of the School written by Dr. R. H. Westveld in 1968.

Forestry was one of the 16 subjects which were included in the University catalog which described the program offered in the new College of Agriculture in 1870. One course in forestry, included in the horticulture department, continued to be offered until 1907, when three courses are listed.

The Board of Curators appointed John A. Ferguson professor of forestry, effective September 1, 1911, and authorized establishment of a forestry department in April, 1912. A second staff member, E. C. Pegg, was appointed in September, 1912. Professor Ferguson resigned in December, 1912, and Frederick Dunlap was appointed professor of forestry in September, 1913. These two men continued to conduct the research and teaching work of the department until September 1, 1921, when the Board abolished the department.

No professional forestry courses were offered between 1921 and 1936, but a course in farm forestry was offered in the horticulture department. Some extension work in forestry was carried on during this time.

The work of the Civilian Conservation Corps and establishment of two National Forests in Missouri in the 1930's stimulated considerable interest in forestry throughout the state. R. H. Westveld was appointed assistant professor of forestry, effective January 1, 1936, and was authorized to establish a two-year pre-forestry curriculum. The name of the horticulture department was changed to the department of horticulture and forestry. The two-year program continued until September, 1946, when it was replaced with a four-year curriculum in forestry, in the horticulture department.

In June, 1947, Westveld, who had left the University in 1938, returned as professor of forestry and chairman of the department of forestry. Dr. Westveld's first objective was the development of a program in resident instruction at the undergraduate level, leading to a bachelor of science in forestry, which would qualify for early accreditation by the Society of American Foresters. He assembled a well-qualified staff of eight members and established a 12-week summer camp for students at the University Forest in Butler County. In the fall of 1949 the Society of American Foresters reviewed the work and facilities of the department and early in 1950 the society accredited the curriculum.
The faculty continued development of the under-graduate program and began offering graduate courses. The University graduate council approved the request to offer a masters degree in forestry in 1950. A program of research that would eventually meet the needs of the state was begun and the forestry extension program was strengthened.

The forestry department was first assigned space for classrooms, laboratories, and offices in temporary buildings. The new Agriculture Building, completed in 1960, included space for the offices, classrooms, and laboratories of the School of Forestry, which was established in 1957.

Extensive improvements have been made at the University Forest. Dormitory buildings for students and staff members, a building which includes a kitchen and dining room, and a classroom and office building have been constructed using lumber sawed on the site. A sawmill and other woodworking equipment have been added.

The original 9,000 acres which were in the University Forest included a number of widely separated small tracts. Through agreement with the U.S. Forest Service, legalized by acts of the Missouri General Assembly and Congress, exchanges of lands were made to consolidate University holdings. The Forest Service lands generally were more valuable than the University lands, hence the University Forest now includes 7,300 acres. All forestry students attend the 12-week summer camp at the University Forest following their sophomore year.

Development of the research program has made possible considerable expansion of graduate work. In addition to approval of the master of forestry degree program given by the University graduate council in 1950, the council approved the Ph.D. in forestry in 1962.

The number of undergraduates has increased from 113 in 1947-48 to 233 in 1967-68. During the same time a total of 534 bachelor of science in forestry degrees have been awarded. Thirty-six M.S. degrees have been awarded since 1950 and three Ph.D. degrees since 1962.

The objectives of the forestry research program are: 1) to contribute in every way possible to a strong under-graduate educational program, 2) to provide a basis for graduate work, 3) to assist in solving the state's problems in forestry and wood products, and 4) to provide subject matter for extension programs. The research budget was quite limited for the first 15 years.

Dr. Westveld, in 1954, called the attention of executives of forestry departments and schools to the small amount of forestry research being conducted and pointed out the need to increase substantially forestry research to help solve many problems in forestry and to build a basis for increased graduate work in forestry. As chairman of the Council of Forestry School Executives, in 1956-57, and chairman of several committees which represented forestry schools he continued the drive to secure more funds to support forestry research. After six years of work the efforts were successful when Congress passed the McIntire-Stennis Act, authorizing the appropriation of federal funds to support forestry research at land-grant universities and other state supported colleges and universities. The forestry research budget, now increased substantially by McIntire-Stennis funds, provides for a well planned research program. In 1948 the
forestry department and the U.S. Forest Service began cooperative research and this cooperation continues.

Forestry extension work began on a sustained basis in 1936. For a number of years one staff member did all the extension work. Forestry extension work includes educational programs in forest management, farm woodlots and utilization, and marketing. At present three forestry extension staff members are employed.

The forestry curricula are planned entirely by the forestry faculty. As the work in forestry became well established the forestry faculty considered the desirability of the establishment of a school of forestry. Two factors pointed to this as a desirable move. The forestry curricula were quite different from those in other departments in the College of Agriculture. As a separate school, forestry would carry prestige similar to that in most institutions where forestry curricula are offered. The proposal was submitted to President Ellis and the Board of Curators approved the establishment of a School of Forestry effective July 1, 1957, as a division of the Division of Agricultural Sciences. In 1960 the Board abolished the Division of Agricultural Sciences and made the School of Forestry a division of the College of Agriculture.

Bibliography

School of Home Economics

By 1938 the home economics department had been established for 38 years, research had been going on for 32 years and home economics extension had been operating for 23 years. Miss Florence Harrison was the new head of the department. Miss Amy Kelly was state leader for home economics extension and Miss Minnie Irons was in charge of home economics education.

The country was in the midst of a depression. Plans and ideas were big but funds were low and jobs were few and hard to find.

Research work dealt with beef quality, low-cost nutritive diets, stretching family budgets, textile research, and cost of clothing.

There was a steady enrollment growth in extension clubs partly because of the economic situation. Homemakers needed help to stretch their few dollars. The social contact of an organized club was very important since there were few or no funds for paid recreation. Subjects of importance were altering and making family clothing, handling family finances, grow-at-home food budgets, improved home sanitation, and the making of mattresses from Missouri cotton. Extension club members felt strong bonds with the University and a number managed to send their daughters to the University.

The 1940’s ushered in a stronger economy. Enrollment began to grow with the completed Gwynn Hall and Miss Harrison as department head. New courses were offered in large quantity foods; previously students majoring in this field had to take a semester at either Iowa State or Kansas State to complete requirements.

The war years 1941-45 brought problems to the campus. Many students entered some branch of service. Groups of both men and women were trained on campus. Once again some groups marched from class to class. This had not happened since women were first admitted to the University of Missouri, when women students marched by two’s to class and were preceded and followed by an older stern-appearing woman.

After the close of the war in 1945 the campus again teemed with students but things were different. Home economics enrollment and programs were influenced by the change. Many of the returning veterans were married. The town was woefully short of apartments. Baby carriages were common on campus. Both parents attended school or perhaps the wife worked to put the husband through school.
Food rationing and shortage of textiles sharply curtailed research during the war years. However, studies were done on a nutritious loaf for emergency feeding, dehydrated eggs, soybeans, culinary performance of new soft wheat varieties, and on basal metabolism of college women. After the war, research again returned to meat problems and textile studies.

Shortage of transportation and women joining the labor force curtailed extension club membership during the war. The home agents continued their efforts with information about utilization of food, clothing and household equipment, home drying of food, sewing machine clinics, and small home repairs.

Four key leaders resigned in 1948. Miss Florence Harrison (department head), Dr. Bertha Bisbey (food and nutrition), Miss Amy Kelly (extension), and Miss Minnie Irons (home economics education). These were replaced by Dr. Starley Hunter, Dr. Margaret Mangel, Mrs. Katharyn Zimmerman and Miss Margaret Alexander, respectively.

Growth and expansion began in earnest during the 1950's. Lack of space in Gwynn Hall necessitated moving the nursery schools and interior design classes to temporary buildings. Many new areas of emphasis were possible now with added courses and faculty. With the establishment of the four-year medical center in 1955, the nutrition and dietetics staff, with Miss Dorothy Vorhees as head, became professional members of the home economics faculty.

By the early 1950's Dr. Hunter had organized the subject matter area into sections. Courses were grouped and numbered by sections for the first time.

The home management house on Hitt street was torn down for a campus building. The girls lived in two additional old houses and one set of apartments before the new Home Management Center was built in 1963 between Gwynn and Stanley Halls.

Dr. Hunter resigned in 1954 to assume a position with the USDA in Washington, D.C. Mrs. Elizabeth Hensley became acting chairman until Dr. Margaret Mangel returned from a leave and assumed the chairmanship in 1955. Miss Alta Motter (1949-1959) resigned as head of home economics education and was replaced by Dr. Pauline Garrett.

Research during this era included human nutrition studies relating to specific age groups (older women, post adolescent, and college), children's clothing, cotton fabrics and fibers, Missouri soft wheat flour studies, food acceptability, food improvers, meat pigment studies, meat and poultry marketing, whole wheat recipes, cookies for children, and on all-purpose mix using non-fat dry milk.

Extension club enrollment increased again in the last half of the 1950's. Women again could travel more freely. They delighted in getting together in groups to learn of new products and processes. By 1955 special interest groups had become popular. Young homemakers' and young couples' schools were set up and subject matter tailored to fit the need to these young audiences. Often these subjects were studies in depth using new methods and approaches.

The 1960's could be called the era of expansion and change. The east wing was completed and named for Dr. Louise Stanley. The home economics department became the School of Home Economics with Dr. Margaret Mangel as its director. The five subject matter areas were headed: Food and Nutrition, Mrs. Elizabeth Hensley; Textiles and Clothing, Mrs. Adella Ginter; Home Management and Family
Economics, Miss Anna Cathryn Yost; Child Development and Family Life, Dr. Ruth Cooper Cook; and Interior Design, Dr. Kate Rogers.

The extension specialists became part of the home economics faculty in 1960 and were housed with their respective sections in Gwynn and Stanley Halls. Following the retirement of Mrs. Zimmerman in 1964, Dr. Mary Nell Greenwood directed home economics extension for one year. Then she advanced to director of continuing education for women in the four-campus system. Miss Charline Lindsay headed the group for almost two years. Dr. Virginia Norris has directed home economics extension since June 1967.

Dr. Pauline Garrett resigned in 1967 as head of home economics education and was replaced by Dr. Beverly Crabtree.

Undergraduate enrollment in home economics almost tripled in this decade from 245 (1960) to 620 (1968). Students enrolled in home economics education increased from 110 (1960) to 145 (1968), arts and science students with an area in home economics increased from 2 (1960) to 11 (1967). Home economics graduate students increased from 10 (1960) to 103 (1968). Total class enrollment in home economics class was 1,034 (1960) and 2,401 in 1968. The number of majors per faculty member increased from 15 (1960) to 22 (1968). Needless to say, programs and methods were examined carefully and modified whenever possible to permit attention to emerging program needs.

The 1960's brought a notable increase in men students and men faculty. Most of the men students pursued housing and interior design or restaurant management programs.

Organizations that continued to grow and develop during the period were the Home Economics Club, Phi Upsilon Omicron, and the Boone County Home Economists. The Citation Awards program began with the dedication of Stanley Hall in 1961. The student affiliate chapter of the American Institute of Interior Designers began on campus in 1961. The Student Council and the Home Economics Alumni group were organized in 1967. A graduate student organization began in 1968.

The Medical Center was expanding in size and services. Dr. Aimee Moore became administrative head of dietetics in 1961. Other changes in heads of subject matter areas with date changes were: Food and Nutrition, Dr. John Typpo, 1966; Textiles and Clothing, Dr. Mary Lou Rosencrans, 1964-1969; Home Management and Family Economics, Dr. Edward Metzen, 1966; Child and Family Development, Dr. Virginia Fisher, 1968.

Research was mostly a continuation of previous topics plus regional textile research on acceptability and serviceability of certain cotton garments, meat marketing, less tender meat cookery, use of meat tenderizers, electronic cookery, bread enrichment, corn oil pastry, freezing cream pies, red pigment color loss, historic costumes of Missouri, adolescent clothing norms, financial security measures of families, family financial goals, decisions and crises, communication, and development of test diets for protein research using guinea pigs. Appropriate research facilities are now available in Gwynn and Stanley Halls and the Home Management Center. Special facilities include both animal and human nutrition research areas, humidity and temperature controlled areas for textile research, and
three child development laboratories. Both costume and fabric collections are housed in Stanley Hall.

During the early 1960’s extension programs which emphasized home economics but also included other related areas were developed as the four campuses directed efforts toward the families of the state. Home economics extension expanded into the city to assist both urban and suburban homemakers. Organized non-home economics groups such as garden clubs and PTA’s and special interest groups asked for the help of the extension home economist. Low income groups, such as ADC mothers, handicapped, and older citizens, sought home economics information. Through a coordinated mass media approach utilizing television, radio, news releases, and pre-alerted listening groups, many new audiences were contacted with information on such varied subjects as life insurance and the use of credit.

A special thrust was given during this period to working with professionals and business people. Resident and extension staff cooperated in setting up seminars for professional and business people in each of the subject matter disciplines. Missouri’s workshop on working with the disadvantaged helped to focus statewide attention on the problems of this group which represents a fourth of the families of the state.

With the concern of the nation focusing on the individual, the consumer, and the family in a changing society and technology, the demand for graduates in the various facets of home economics is increasing dramatically as is the interest of prospective students. Business and industry, education at all levels, government agencies especially in urban areas, are seeking workers trained in child and family development, family economics and management, and housing and nutrition to work with the public, to communicate by means of mass media or to teach from nursery to post graduate school.

Master’s and doctoral students are taking positions in the schools and colleges of Missouri and in extension programs and business positions across the nation. The potential is limited only by resources.
Chemistry was first included in the program of the College of Agriculture in 1872, when Dr. Paul Schweitzer was appointed professor of chemistry. The term agricultural chemistry was first used in 1888 when chemical studies of soils and crops were started in the Agricultural Experiment Station. Agricultural chemistry was first established as a department of the College in 1894.

The research conducted during Dr. Schweitzer's term included work with soils, crop plants, and animal products. Analysis of the samples of fertilizer which are collected in the fertilizer control program have been made by the department from the start of the program in 1893 until the present time.

Dr. P. F. Trowbridge was appointed chairman of the department in 1907, following Dr. Schweitzer's retirement. The research work conducted under Dr. Trowbridge's direction emphasized research with animals and animal products. The two research projects with beef cattle, entitled "Use of Food" and "Retarded Growth," were widely recognized for the basic information which they produced. Dr. A. G. Hogan was appointed chairman of the department in 1923 and during his 32 years as chairman, the research was principally in animal nutrition and physiology of reproduction. Dr. Hogan was a pioneer in using synthetic rations composed of purified nutrients to isolate and identify essential nutrients. He attracted many graduate students who, after receiving advanced degrees, have become leaders in agricultural experiment station and industrial research, college teaching, and the animal feed industry. Dr. Hogan retired in 1952 and was succeeded as chairman by Dr. M. E. Muhrer. In 1967 Dr. Richard A. Bloomfield was appointed chairman.

Research in agricultural chemistry concerns many phases of agriculture. It is primarily bio-chemical in nature but also includes inorganic, physical, and analytical chemistry. Some basic research is included but, because the growth and reproduction of animals and plants are the subjects of agricultural chemical research, it is principally applied research.
The nutritional biochemistry and physiological chemistry group cooperates with all of the animal oriented departments of the College of Agriculture, several departments of the School of Veterinary Medicine, the School of Medicine, and various sections of the chemistry department. In certain areas such as nitrate toxicity and rescue foot the group works closely with the departments of plant pathology and agronomy.

All fertilizer samples which are collected in the state fertilizer control program are analyzed in the agricultural chemistry laboratories. Procedures which the laboratory personnel have developed have improved the accuracy and increased the rate of fertilizer analyses. Several of the procedures have been approved as official procedures by the Association of Official Agricultural Chemists.

The group which works with the hemophiliac swine cooperates with the pathology department of the University of North Carolina Medical School and with the Mayo Clinic in Rochester, Minn.

The nutritional biochemistry and physiological chemistry laboratories of the department are located in Schweitzer Hall and the analytical and spectrographic laboratories are in the Agriculture Building. The analytical and spectrographic laboratories are especially well equipped. In addition to the cooperative research projects and service work conducted in these laboratories, staff members have conducted research which has developed more accurate procedures for the determination of amino acids and trace minerals.

The courses offered by the department are mostly advanced courses for upperclass and graduate students. The numerous research projects provide part-time work for many students and enable many graduate students to do their thesis research in the department laboratories.

The research work of the department is financed from regular Agricultural Experiment Station funds and grants from industry and federal agencies. The department receives a greater total of grant money than any other department of the College.

Bibliography
Department of Agricultural Economics

The department of farm management was established in 1910 by D. Howard Doane. Professor Doane became state leader of county agents in 1913 and O. R. Johnson was appointed assistant professor of farm management. In 1919 the department of rural life was established with the two sections of farm management and rural sociology included. The department was divided in 1926 into the two departments of agricultural economics and rural sociology. Professor Johnson became chairman of agricultural economics and Professor E. L. Morgan chairman of rural sociology. Professor Johnson continued as chairman until he retired in 1957.

The initial work in farm management and farm accounts quickly expanded to include many other economic relationships which were involved in agriculture. These included: All of the costs of farm operations and of the production of the great variety of commodities; marketing farm products; farm cooperatives; legal aspects of poverty ownership, use, transfer, and taxation; farm organization and planning; economics of conservation; and numerous other areas. The development of agribusiness has extended the economic relationships of agriculture much farther into manufacturing industries, and the marketing, processing, and distribution of farm products.

Research

Because economics relates to all phases of agriculture departmental research is broad and much of it is cooperative with other departments of the College, with the Missouri State Department of Agriculture, other state experiment stations, and USDA.

Following World War I research was concerned mainly with costs of production, farm record analysis, farm credit, and farm cooperatives. The great depression and drought years of the 1930's directed the research toward land use, taxation, and farm finances. Development of the soil conservation program during these years also led to research into the economics of the use of soil and water management programs.

Depletion of the staff during World War II restricted research activity, but projects which had been started before the war were continued. In 1942 a report
was published on a study of land use experience in Callaway County, and in 1946 another report was made on prospective incomes from average size farms in grade two Ozark land. In anticipation of the return of servicemen after the war, considerable thought was given to programs for establishing them on farms.

Following the war the U.S. Corps of Army Engineers reactivated proposed flood control projects on several Missouri rivers. The first to be initiated was construction of a dam on the St. Francis River in Wayne County. The reservoir which would be formed above the dam would inundate a large area of good farm land. The procedures by which the land was secured included negotiations and condemnation of some land. Many landowners objected to the methods used in depriving them of their farms. The department of agricultural economics, cooperating with the Missouri Conservation Commission, local farm and business people, and the Army Engineers made an intensive study of the economic, social, and governmental problems encountered in the development of the Wappello dam. The study resulted in the development of procedures by which property owners are more equitably reimbursed for their property, towns are relocated without undue hardship on the people, schools are provided for, and readjustments to the new conditions are less difficult for local people. The procedures generally are followed in similar situations in other areas of the state.

Most of the staff members who had been in service returned after the war and several new men were added to the department staff. The rapid changes in agriculture which the applications of science and technology were effecting required considerable redirection of the department research program. A brief review of some of the research projects which were active in 1960 will indicate the nature of the department’s research work.

The relation of recreational resources to income in the Missouri Ozark region is a study of the development of the tourist and recreational industry. The establishment of a number of state parks in connection with several of the big springs and lakes is a part of the development. Dams on several streams have formed large lakes which attract a number of tourists during the summer season. The business which develops to provide for the needs of the many tourists affords employment for local people who formerly relied on the meager farm incomes obtainable from Ozark land.

In cooperation with the atmospheric science department, agricultural economics has studied the effects of climate on resource use. In one of these studies correlations have been developed between weekly rainfall and corn yield. In a related project the economics of supplementary irrigation in Missouri have been studied. Records were obtained from farmers concerning investment in irrigation equipment and costs of applying water to corn, cotton, and soybeans in southeast Missouri. The effects of irrigation on yields and net income were determined.

Patterns of marketing livestock have been changing extensively in recent years. The large majority of livestock formerly went to a few large central markets. Local markets, most of them auction sales, have become the principal channel for marketing livestock in recent years. This development affects individual livestock producers, the community served by the local sale yards, livestock transporation facilities, and the relocation of meat packing plants.
Retailers and institutional eating places are important links between the farmer and the consumers of his products. It is estimated that 20 to 25 percent of the U.S. civilian food supply is consumed in commercial eating places. Agricultural economics is cooperating with animal husbandry and home economics in a study of the use of meats in the restaurant industry. The project has included studies of methods of cooking beef cuts, an extensive survey of restaurants and cafeterias in metropolitan areas, and surveys of the attitudes and habits of eating in restaurants.

The department cooperated with the horticulture department in a study of the changing structure of the fruit and vegetable market. The volume of fruits and vegetables marketed through terminal wholesale markets has declined and procurement by retailers directly from producers has increased.

The economics of the use of fertilizer on corn is being studied in a project which is being conducted by agricultural economics and agronomy in several locations throughout the state. The amounts of nitrogen and variations in plant population are the variables to be studied.

The economic effects of the application of new technology such as new kinds and sizes of machinery, new crop varieties, and new livestock and crop production techniques on yields, output, costs, and returns is the subject of a department research project. The information which is being secured is used in determining 1) the optimum farm organization solutions for model farm situations under the present level of crop technology and under an improved technology, 2) the resources needed (land, capital, and labor) to obtain given levels of income on dairy farms, beef farms, beef-hog farms, and others in an area.

During the last two decades farm families in Missouri have been forced to make many adjustments in order to maintain a financially successful farm business and a desirable standard of living. Many of these adjustments have been quite complex, involving technological, economic, and sociological changes of an interrelated nature. The departments of agricultural economics, agricultural engineering, agronomy, animal husbandry, and rural sociology cooperated in a project called "Family Farm Adjustments to Meet Technological and Sociological Changes."

**Resident Teaching**

The undergraduate courses in agricultural economics are planned to acquaint students with economic principles and their applications to farm operations, farm management, planning the farm business, and marketing farm products. A basic course introduces students to certain fundamental principles of economics and their applications to agriculture. Other courses are economics of agricultural production and distribution, farm management, agricultural prices, cooperative business organizations, resources and economic development, financing the farm business, and marketing farm commodities, a course which includes theory and practice of marketing, followed by sections which cover livestock and livestock products, poultry products, cotton and other cash crops, grain crops, and milk and dairy products.

The graduate programs offered by the department include advanced courses which permit the student to specialize in the area of his choice. The research projects which are conducted by the department provide ample opportunities for
the graduate student to select and conduct research work for a thesis and at the same time become familiar with research procedures and techniques by working with senior research workers.

Extension

The agricultural economics extension work includes educational programs in marketing and utilization of agricultural products. The state extension staff members are responsible for disseminating factual information to district and county extension workers, to groups of farm people, business and industrial people, consumer groups, and others who are interested. Their work is accomplished through conferences, short courses, published materials, exhibits, and by radio and television programs.

Twelve major divisions are included. They are: 1) marketing policy; 2) consumer information; 3) cash crops marketing; 4) dairy marketing; 5) food science and nutrition; 6) food service industry; 7) forestry utilization and marketing; 8) livestock marketing; 9) poultry marketing; 10) retailing-wholesaling; 11) produce marketing; and 12) transportation.
Department of Agricultural Education

The impetus for establishing a department of agricultural education at the University of Missouri came from passage of the Smith-Hughes (vocational education) Act by Congress in February, 1917. The University was designated shortly thereafter by the State Board of Education as the official center in Missouri to train teachers of vocational agriculture. The records indicate that teacher-training classes in agriculture had been started in 1908 with Professors M. F. Miller of the soils department and E. A. Trowbridge of the animal husbandry department as the instructors.

The annual report of the Missouri public schools for 1905 shows that 1,180 high school students were enrolled in agriculture. The number increased to 3,316 in 1910 and 9,029 in 1915. Reports from county superintendents to the state superintendent of public schools indicate that the increases in the county schools offering courses in agriculture and in the number of pupils studying the subject were even greater than increases in the high schools.

The demand for teachers qualified to serve as instructors of vocational agriculture in public schools increased markedly as federal moneys became available under terms of the Smith-Hughes Act. More than 100 schools in Missouri had established programs within 10 years.

The Department

The General Catalog for 1917-18 listed a four-year curriculum for the training of teachers of vocational agriculture, leading to the degree of Bachelor of Science in Agriculture. The curriculum for the training of teachers called for 105 semester hours of prescribed courses including military science and 13 hours to be elected from courses in technical agriculture. The following courses on methods in agriculture were offered by the School of Education:

149. Teaching of Vocational Agriculture, Animal Husbandry, F. B. Mumford, Professor of Animal Husbandry.

150. Teaching of Vocational Agriculture, Crops and Soils, M. F. Miller, Professor of Soils.
151, Teaching of Vocational Agriculture, Horticulture, J. C. Whitten, Professor of Horticulture.

The 1919-20 catalog makes reference to a special department of agricultural education in the College of Agriculture. Theo. E. Sexauer, a graduate of Iowa State College and with four years of experience as a teacher of agriculture at Abert Lea, Minn., was placed in charge of the teacher-training program. He was assisted by Ray E. Miller, a graduate from the Missouri College of Agriculture. Mr. Sexauer resigned in 1925 and was replaced by Sherman Dickinson, who was added to the staff in 1924.

By action of the Board of Trustees, control of the teacher-education program in agricultural education was assigned to the School of Education in 1940. Under the arrangement, majors in agricultural education continued to receive the B. S. degree from the College of Agriculture. Sherman Dickinson continued to serve as advisor for the division. Upon retirement from the University in 1945 he was succeeded by G. F. Ekstrom, from the University of Minnesota.

In 1947, arrangements were made by Dean L. G. Townsend, education, and Dean E. A. Trowbridge, agriculture, whereby a subject-matter position in technical agriculture was added to the program, with local funding for the position provided by the College of Agriculture. Mr. Joe Duck was assigned to the position. A position in farm mechanics was created on a similar basis in 1956, with Dr. Curtis Weston, instructor.

Undergraduate Program

The federally-aided program in vocational education was established at a time when college enrollments were affected by prevailing war conditions. The decrease in graduates paralleled the establishment of departments of vocational agriculture in high schools of the state. Three schools initiated programs in 1917-18. There were seven departments in 1918-19, 45 in 1919-20, and 74 in 1920-21.

The expanding program of vocational agriculture in the early twenties caused a shortage of teachers of agriculture. A report on teacher training for the fiscal year 1925-26 indicates that more than half of the 1926 graduates from the College of Agriculture were employed as teachers for the following year. The situation became more stabilized within a few years; although there were further increases in numbers of schools offering instruction in vocational agriculture. But few teachers left their profession during the depression years, thus reversing the supply and demand situation.

World War II again caused a shortage of teachers and many schools were forced to suspend such training for the duration. Less than 10 persons met certification requirements for the two years 1943-1945.

Data are incomplete for numbers of persons qualifying annually for teacher certification in vocational agriculture at the University of Missouri from 1918 to 1946. The estimated number based on unofficial information is approximately 400.

Enrollments in agricultural education at the University, following the second war, increased with the influx of veterans who took advantage of the G.I. Bill. The number of graduates with majors in agricultural education reached a maximum of 73 in 1949-50. Contrary to expectations this did not create a teacher surplus; since approximately half of the prospective teachers were employed as instructors of
veterans in the program of institutional on-farm training. A total of 726 persons met certification from 1945-46 to 1968-69.

The curriculum in agricultural education, organized in 1917-18, was developed further in 1919-20 with the appointment of T. E. Sexauer. At that time all of the work in methods, including vocational guidance, was handled by Sexauer and his assistant, Ray Miller.

A course in visual education was added to the curriculum with the appointment of J. J. Ankeny to the staff in 1920-21. The course dealt with various visual aids for classroom instruction. Special emphasis was placed on charts, slides, and motion pictures.

It is quite apparent that majors in agricultural education were assigned originally for practice teaching to the laboratory school at the University. The catalog for 1917-18 included the course 182F and 182W, practice teaching in vocational agriculture, with hours and credits arranged. The description stated that the course was approved for credit under the Smith-Hughes Act.

An annual report for 1920-21 carried information regarding the use of the departments of vocational agriculture at Centralia and Trenton for student teaching. J. R. Whitman and P. F. Barnes were instructors.

Records of student teaching from 1921-22 to 1923-24 are lacking. Sherman Dickinson came to the University in 1924 and was responsible for student teaching arrangements during his tenure, 1924-1945. Belton (J. L. Campbell, instructor) and Centralia were the student teaching centers, 1924-27. Boonville (W. L. Barrett, instructor) was added in 1929-30.

The responsibility for placements of graduates in agricultural education was handled for a number of years within the department. Appropriate credentials were compiled and made available to prospective employers.

A detailed record of placements of graduates in agriculture has been maintained since 1946. A 1948 release shows that the initial placement of 71 percent of the graduates was in vocational agriculture and four percent in other types of teaching.

Two professional organizations for majors in agricultural education are sponsored by the staff in teacher education. Alpha Tau Alpha is a national professional-honorary fraternity, and the Collegiate FFA is an organization open to former FFA members and to prospective teachers of vocational agriculture who were not members of the FFA while in high school. Both organizations are represented on the Agricultural Council in the College of Agriculture.

The Collegiate Chapter of FFA at the University of Missouri was first organized in 1935 and was disbanded in 1939, with a treasury balance of $120. The money was to be awarded during three consecutive years to outstanding Future Farmers entering the University. Alpha Tau Alpha was designated to administer the awards. Scholarships financed by Alpha Tau Alpha have been awarded annually since the chapter was reactivated following World War II.

The Collegiate Chapter of FFA was re-established at the University in the spring of 1947 and has since been active in the leadership training of prospective teachers and advisors of FFA chapters.

One of the cooperative projects of the two organizations has been that of assisting with the state judging contests and annual conventions of the Missouri
Agricultural Education

Association. Sleeping cots are set up in Rothwell Gymnasium which can be rented for nominal fees by members and advisors of visiting FFA chapters.

Graduate Program

Advanced degrees for graduate majors in agricultural education were first conferred in 1923, when three students were awarded the A.M. degree by the Graduate School. The first Ph.D. degree in agricultural education was awarded in 1931. During the years 1923-1968 inclusive, 247 majors in agricultural education received the masters degree and 36 the doctoral degree.

A special summer session for teachers of vocational agriculture was offered at the University from July 9 to August 3, 1928. The courses in advanced methods and in teaching of farm mechanics attracted a combined enrollment of 43 persons. Forty-six persons were enrolled in a similar program the following year. Plans for the special session in 1930 included courses in technical agriculture along with undergraduate and graduate courses in agricultural education. The incidental fee was $12.50, one-half that for the regular term, including an activity ticket covering lectures and entertainment provided by the director of the summer session.

The special sessions became quite popular with increased enrollments following the second war. Two one-month terms were organized in the summer sessions of 1947 and 1948. The schedule of courses included offerings in professional courses and in technical agriculture for teachers of vocational agriculture and extension personnel. Special sections of the course F320, adult education problems, were offered for teachers of farm veterans. The enrollment of teachers, exclusive of institutional on-farm training instructors reached a maximum of 90 in 1951.

An inservice course for beginning teachers of vocational agriculture, carrying resident credit, was organized during the fall of 1950. The students preregistered for the fall term. Preliminary meetings were held on campus with the enrollees during the late summer. Individual visitations and area meetings were held throughout the state during the fall, followed by a final session at the University at the close of the semester. Individual projects were related to program planning and the development of teaching materials.

A limited number of graduate courses in agricultural education were offered by extension from 1948 to 1955. The courses were taught by members of the resident staff at locations convenient to the enrollees. In 1967 the department of agricultural engineering requested approval of an inservice course in agricultural mechanization. The course includes five areas, each of which carries a maximum of three credit hours. Dr. Curtis Weston, associate professor of agricultural education and agricultural engineering, has enrolled teachers of vocational agriculture by extension in several sections of the course. Additional extension courses have also been taught by other staff members in recent years.

Veterans Education

The training of special teachers as instructors of farm veterans under terms of the G.I. Bill of 1947 became a major responsibility of teacher-education departments in agricultural education.

The first IOFT course in Missouri was organized at Kirksville on June 3, 1946, and taught by Clovis Jones. The enrollment in Missouri increased to 3,030 by
October, 1946. By January, 1947, there were 5,000 enrolled; and by January, 1948, there were 11,116 which more than doubled the enrollment of the previous year. Total enrollment of the program in Missouri reached 15,100 as of March 15, 1951.

To assist in the problem of preparing teachers for the IOFT program, 11 pre-service training courses were offered at the University under the direction of C. V. Roderick, assistant professor of agricultural education. The schedule included four groups in 1947-48, four in 1948-49, and three in 1949-50.

Inservice Training

An organized program of itinerant teacher training was established in 1926-27 with the appointment of G. J. Dippold, former teacher at Bethany, to the staff. For several years Mr. Dippold spent his entire time during the fall semester in the field. Mr. Dickinson, the other member of the resident staff, made several visits to vocational departments during the school year and spent two weeks in the schools during the early summer.

With the expansion of the teacher education staff in 1947, Mr. Joe Duck, former teacher of vocational agriculture at Neosho, was appointed to serve in a liaison capacity between the University and teachers of vocational agriculture in the state. One of his initial efforts was to organize the teachers by districts and sub-districts. Officers were encouraged to arrange annual programs of professional improvement. Meetings were held by districts two or more times each year. Officers of sub-districts were in turn encouraged to arrange for meetings on the monthly basis.

Services established by Mr. Duck have been continued on a restricted basis since his death. Earl T. Webb devoted a part of his time to inservice activities as a member of the staff from 1956-62. He was succeeded by Earl T. Carpenter, another graduate from the University, who had taught vocational agriculture at Kahoka and in one of the reorganized districts in Iowa.

Dr. Weston, instructor of vocational agriculture at Monett, was brought to the University as an instructor in agricultural education and agricultural engineering in 1956. This was an effort to strengthen the program of perservice training of teachers and to update teachers in the area of shop work.

For a number of years Dr. Weston devoted approximately half of his time to the teaching of skills and methods courses and the remainder of conducting workshops in several areas of agricultural mechanization.

Research

The lack of research has constituted a major weakness in agricultural education at the University of Missouri. This may be attributed to (a) lack of staff time and commitment for research and (b) lack of funds designated for research.

With certain exceptions, the department has not been successful in qualifying for research grants or fellowships although applications for such assistance were processed in recent years.

1959  An Application for an Evaluation Project under Public Law 531
1964  NDEA Fellowships
1965  NDEA Fellowships
Research in agricultural education has been confined largely to dissertation studies of advanced graduate students. A few studies have been made by staff members with the help of graduate students.

Funded Projects

The dissertation by Warren L. Griffin, completed January, 1964, dealt with "The Nature of Agricultural Occupations Other Than Farming in Saline County, Missouri." Mr. Griffin was employed jointly by the State Department of Education and the University for the remainder of the fiscal year to direct a statewide survey of agricultural occupations in communities served by departments of vocational agriculture. A preliminary report of the project entitled "Agricultural Occupations Other Than Farming In Missouri" was duplicated and distributed by the State Department of Education in 1964.

To expedite the further development of curriculum materials, E. T. Carpenter was assigned to a special project from June 1, 1966, through June 30, 1967. The project involved an agreement between the State Department of Education and the College of Agriculture to develop curriculum guides for vocational agriculture I and vocational agriculture II. Funding for the project was derived from the Elementary and Secondary Education Act of 1965, Public Law 89-10.

Following his retirement September 1, 1967, G. F. Ekstrom was encouraged by the vocational education section in the U. S. Office of Education to make a background study of agricultural education in the United States. Accordingly, an application for small project research was transmitted by the College of Education to the Director of Educational Research, Region VI, Kansas City. The project was approved as of April 1, 1968. A report of the Study, entitled "Historical Development of Agricultural Education in the United States Prior to 1917," was submitted to the Regional Office, April 19, 1969.

Present Status

The College of Education, which superseded the School of Education in 1948, became departmentalized in 1968. All vocational units were then placed in a department of practical arts and vocational-technical education. Wilbur Miller, associate professor of industrial education, is chairman of the department. Gene M. Love, associate professor, is the coordinator for agricultural education.
Department of Agricultural Engineering

Agricultural Engineering became a department when the original agronomy department was divided in 1914 to form the three departments of agricultural engineering, field crops, and soils. A. R. Kelly, who had taught the agricultural engineering courses in the agronomy department, continued in the new department until 1916, when he resigned and was replaced by E. W. Lehmann. Professor Lehmann resigned in 1920 and was replaced by J. C. Wooley, who continued as department chairman until 1948.

The research and teaching in agricultural engineering, from the earliest work to the present, is an excellent index to the development of the applications of power equipment and a number of other forms of technology to agriculture. The first course, called agricultural engineering, was offered in 1895 and taught by F. B. Mumford, professor of agriculture. The course included construction of barns, stables, other shelters, silos and fences; road building with special reference to country roads; and some attention was given to the mechanics of implements and machines. Ten years later the course was offered in the new agronomy department and covered farm drainage, road building, farm power, farm machinery, and the principles of draft as applied to farm wagons and implements. At the same time courses were offered by the College of Engineering in woodwork and forging, house framing, farm motors, farm surveying and drainage, cement and concrete construction, country roads, and rural sanitation.

When Mr. Kelly became instructor in agricultural engineering in 1912, the courses offered were farm buildings, farm machinery and motors, construction methods, and farm engineering, the latter course covering land measurement, tile drainage, road building, and farm water supply and running levels.

In 1916 an agreement was reached which provided for joint administration of agricultural engineering by the deans of agriculture and engineering. The dean and faculty of engineering are concerned only with courses offered in agricultural engineering and taken by students in engineering and the dean and faculty of
agriculture approve courses taken by students in agriculture. The department budget is administered by the dean of agriculture. The joint program remains in effect. The courses in agricultural engineering have been continually upgraded and made more technical and analytical and less descriptive.

The department offers two undergraduate programs, one in agricultural mechanization, the other in agricultural engineering. Students who major in agricultural mechanization enroll in the College of Agriculture, those who major in agricultural engineering enroll in the College of Engineering. Graduate work leading to the M.S. and Ph.D. degrees is offered by the department.

A report of the first research was published in Agricultural Experiment Station Bulletin 39 in 1897 and was entitled “Influence of Width of Tire on the Draft of Wagons.” In 1901 Bulletin 52 published the report of research on “The Influence of Height of Wheel on the Draft of Farm Wagons.”

In the 1920’s the research work in the department included farm lighting systems and the uses of mechanical power and combines. Farm lighting included acetylene gas and gasoline powered electric generators.

Research projects conducted by the department at this time include soil and water conservation, animal calorimetry and environmental requirements for animal housing, automatic control of farm field equipment, materials handling systems for north central farms, improved work methods, equipment, operating procedures and facilities for livestock markets, commercial feed lots, wool warehouses and dairy plants (cooperating with the department of food science and nutrition), and application of operations research techniques to management of agricultural machinery systems.

The agricultural engineering department has included one or more extension staff members since 1917. The extension program has included all phases of agricultural engineering, with varying degrees of emphasis at different times being placed on soil and water management, farm machinery and equipment, farm buildings, electrification, safety, farmstead improvement, crop drying and storage, and materials handling and feeding.
Department of Animal Husbandry

The animal husbandry department was established in 1904 and F. B. Mumford was the first professor of animal husbandry. E. A. Trowbridge was appointed instructor in 1906 and chairman of the department in 1911, a position which he held until 1945 when he became dean of the College and director of the Agricultural Experiment Station.

Two research projects which were conducted jointly by the departments of agricultural chemistry and animal husbandry developed information which has been recognized nationally and internationally. The first one, started in 1907 and continued until 1915, was called the “use of food experiment.” Beef cattle were fed different planes of nutrition and their tissues analyzed chemically to determine the effects of nutrient intake on the growth and composition of the animals. The second experiment, conducted from 1915 to 1921, was called the “retarded growth experiment.” The purpose was to study the effects of retarded growth of young cattle, caused by restricted nutrient intake, on their condition when mature at the end of a later period on full feed.

Dr. A. G. Hogan was appointed professor of animal husbandry in 1920 and also chairman of the agricultural chemistry department in 1923. In this dual position he conducted extensive research in animal nutrition. He particularly studied “unrecognized factors” in animal nutrition. Using synthetic rations composed of purified nutrients he isolated, identified, and determined the physiological roles of several vitamins and trace minerals.

The new areas of biological information which were being opened through research, in the early part of the 20th century, were of great interest to Mumford. As director of the Agricultural Experiment Station, he encouraged staff members to develop research programs in these subjects. His particular interests were in animal nutrition, endocrinology, genetics and breeding, and growth and development. He particularly encouraged the younger men to develop research in their fields of interest. Several of them developed highly productive research for which they and the Experiment Station received international recognition. In addition to Dr. Hogan, Dr. Sam Brody’s research in bioenergetics, growth, and development, and Dr. Charles W. Turner’s work in endocrinology are especially notable. Dr. Lewis I.
Stadler did pioneer work in genetics, using plants for his experimental material. Dr. Fred F. McKenzie's research in the physiology of reproduction added substantially to the knowledge in this area. Although these men were staff members of different departments, the basic information which their research developed is broadly applicable to man's knowledge of animals and plants.

The majority of the research work in animal husbandry has been applied in nature. It has included work in breeding, care, feeding, and management of domestic animals. Much work has been done with corn silage and pasture for beef cattle. Swine breeding and feeding research also has received extensive attention. Professor L. A. Weaver was in charge of swine research work from the time of his appointment as instructor in 1910 until he became chairman of the department in 1945.

Following World War II several young staff members were added to the department. These men were capable and well prepared to work in the areas of animal breeding, nutrition, and meats. Modern research procedures and equipment were applied to the research work.

Studies of physiology of reproduction in domestic animals were started by Dr. Fred F. McKenzie about 35 years ago. The work has been continued by Dr. John Lasley and Dr. D. T. Mayer, in agricultural chemistry, and present work includes studies in artificial insemination of swine, the synchronization of estrus, superovulation, and transplantation of fertilized ova.

The first animal genetics research at the Missouri Station was started just prior to World War II. This was a swine breeding project in cooperation with the North Central Regional Swine Breeding Laboratory. An unanticipated product of the project was the isolation of a line of hemophiliac swine. The inherited condition is quite similar to hemophilia in man. The department of agricultural chemistry has maintained the line and, cooperating with the medical research workers, has isolated a substance from normal blood, called the “S” factor, which produces the material which is essential in blood coagulation. Blood of hemophiliacs lack the “S” factor. It is now being produced in concentrated form and gives promise as a valuable substance to use in the treatment of hemophilia in man.

Breeding research with beef cattle includes a project to study possible effects of selection for various traits on weights of yearlings. A crossbreeding experiment is being conducted, using three breeds of beef cattle, to determine which traits show hybrid vigor and to determine whether crossbreeding in beef cattle is desirable and practical. Studies also have been made of possible methods of detecting genetically superior animals by blood and chromosome tests.

Dr. William H. Pfander was appointed a member of the animal husbandry staff in charge of nutrition work in 1952. Research has been developed on the nutrition of swine at different ages and stages of development, ruminant digestion and metabolism, mineral nutrition of ruminants, the biochemistry of nitrogen utilization, metabolic disorders and ration toxicity, and development of research methods and techniques. A number of projects are cooperative with the departments of agricultural chemistry and dairy husbandry.

The addition of the new abattoir and food processing laboratory in 1952 enabled the department to increase meats research substantially. Research projects
include studies of factors which affect color, flavor and odor of meat, effects of packaging materials, temperature, relative humidity and microorganisms on the case life of fresh meats, and the effects of various conditions in the live animal on carcass characteristics.

Meats research includes studies of the meat of animals which are produced in breeding research. Carcass studies constitute a part of the measure of the effects of breeding in the three breed cross-breeding experiment which is being conducted by the department. Estimates of the proportions of lean and fat tissues in the live animal, made with the sonoray and whole body counter, are checked by studies of the carcasses obtained when the animals are slaughtered. The meats research has been transferred to the department of food science and nutrition.

Undergraduate courses in animal husbandry have included an introductory course, which was required of all agricultural students for many years, followed by courses in animal breeding, breeds of livestock, feeds and feeding, livestock judging, meats, and production and management of beef cattle, hogs, horses and sheep. Minor revisions of the courses were made from time to time. In the mid-fifties the department began to restructure the courses, with the elimination of several of them; the addition of new courses and a thorough modernization of the work offered by the department has been made. Graduate work leading to the M.S. and Ph.D. degrees is offered by all sections of the department.

The animal husbandry extension work has dealt mainly with production, management, and marketing beef cattle, hogs, and sheep. The production and management programs have included encouraging producers to improve breeding herds by selection of superior females and, in recent years, to use males which have been tested; to improve pastures; and to feed complete rations and provide efficient, labor saving equipment. The value of using these production practices is demonstrated by encouraging producers to market feeder calves and pigs through cooperative sales.

The animal husbandry extension work is conducted by a well qualified staff of five men, four of whom have Ph.D. degrees.

Bibliography

A brief historical review of the development of the dairy department, by A. C. Ragsdale, is included in Mumford's history of the College. A course in dairying was established by Dean E. D. Porter in 1890. The dairy department was started in 1901 when Dr. C. H. Eckles was appointed as chairman of dairy husbandry. Dr. Eckles resigned in 1919 and Professor Arthur C. Ragsdale was appointed to the position. He continued as chairman until his retirement in 1961. Dr. Charles P. Merilan succeeded to the chairmanship for one year when he was appointed associate dean of the College. Dr. Joseph E. Edmondson became chairman in 1962 and remained until 1967 when he transferred to the food science and nutrition department. Dr. Harold D. Johnson was appointed chairman in 1967.

Research

The department has conducted a number of productive research programs. The research which was conducted under the leadership of Dr. Samuel Brody on growth and development and environmental physiology, with special reference to domestic animals, developed a great amount of basic information in these areas. Several departments of the College, a number of federal agencies, and the Herman Frasch Foundation cooperated in the operation and financial support of this work. In 1948 the psychroenergetic laboratory was constructed and a series of studies on the physiological responses of cattle to climatic and environmental conditions was made. The effects were studied of variations in temperature, humidity and air movement on thermal radiation, diurnal temperature rhythms, growth of beef and dairy breeds of cattle, lactation, feed intake, and thyroid activity.

Dr. Brody was unusual among productive research workers in writing complete reports of his research as the work progressed. Reports of his research are published in detail in Missouri Agricultural Experiment Station research bulletins. He also published many papers in professional and technical journals. His book, "Bioenergetics and Growth" is a classic in its field.

Another highly productive series of research projects were conducted by Dr. Charles W. Turner in the endocrinology of milk secretion. This work included studies of the development of the mammary gland during the embryonic state,
puberty, pregnancy, lactation, and involution. This included studies of the hormone lactogen, which directly stimulates milk secretion, and several other hormones which have synergistic effects upon lactogen. Radioactive isotopes, particularly iodine (I\textsuperscript{131}), were used to study the rate of thyroxine production by the thyroid gland and the consequent effects upon milk production. The departments of animal husbandry, dairy husbandry, and poultry husbandry cooperated in this work. Several federal agencies and private companies gave financial support to this research.

A series of research projects in nutrition and reproduction of dairy cattle has been conducted. This had included studies of dairy cattle breeding and management, artificial insemination, diet and growth, rumen bacteriology, biochemical and biophysical characteristics of cells, and soil fertility and forage quality.

A fourth major area of research includes studies of dairy products and microbiology. This has included projects with ice cream quality, composition and amount of milk secreted from individual quarters of the bovine udder as associated with udder inflammation, serological reactions of strains of staphylococcus aureus from the bovine gland, effects of wash-water quality and washing on the quality and storage ability of cottage cheese, dairy plant operation, dairy plant automation, and dairy products such as whey solids and cultured cream products.

Financial support has been received from a number of private industries in support of this research.

The dairy products staff members have worked closely with many dairy processing and marketing companies. A large number of graduates who have majored in dairy products are employed in the processing and marketing industries.

Resident Instruction

Undergraduate courses offered by the department include elementary work in animal science and dairy husbandry, dairy cattle judging, dairy production, dairy cattle breeding, and field training in dairy husbandry. Graduate courses include dairy chemistry, rumen physiology, endocrinology, physiology of milk secretion, environmental physiology, bioenergetics, and advanced dairy production.

The dairy products research and teaching work have been transferred to the food science and nutrition department.

Extension

The dairy extension program includes major emphasis on management, feeding, breeding, raising replacements, herd health, pesticide safety, and youth work.\textsuperscript{3}

The management program includes a dairy farm business research panel in which 128 dairymen were enrolled in 1968. The dairy fieldman's short course in January, 1968, gave special attention to effective lighting and mechanization through use of electricity. Production record keeping is emphasized and extension workers assist Dairy Herd Improvement Association supervisors in their work with dairymen.

Feeding and nutrition short courses are held with dairy producers and published information on feeding is distributed.

In meetings with dairy breed organizations the value of improving herds through selection superior breeding animals is emphasized. High mortality rates in
calves indicate the need for improving replacement raising practices by dairy producers.

Dairy extension staff members work closely with the Missouri Mastitis Council in disseminating information on the need for sanitation and disease control in dairy production. Agricultural engineering extension personnel cooperate in the selection and operation of milking equipment.

The safe use of pesticides continues to be a major concern of dairymen who must also face the problem of controlling many pests for which there is no approved long-lasting residual agent for control. The use of mass media for publicizing information concerning pesticide control and safety and assistance to individual dairymen having problems with pests or pesticide use represented most of the activity in this area.

Material has been prepared and published by the animal science departments and the School of Veterinary Medicine for use in the animal science 4-H project.

**Bibliography**

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Department of Entomology

Resident Teaching

The following information is taken largely from data by Dr. Leonard Haseman, emeritus professor and former chairman of the department of entomology.

A professor of natural history was one of the first faculty members in the University, that position being given to Dr. Edward H. Leffingwell in 1844. He was in charge of teaching natural history, chemistry, mineralogy, botany, and physiology. He was paid $500 per year plus one-sixth of all student fees which added perhaps $300 to his salary. The University catalog for 1844 mentions specifically the receipt, as a gift to the library, of a copy of Harris’ “Insects Injurious to Vegetation.” Thus, entomology was first taught as a part of the course in natural history. Dr. Leffingwell was replaced, for one year only, by a Dr. Litton who resigned after the first year. Dr. Leffingwell was thereupon reappointed and given additional equipment for teaching all branches of natural science.

In 1851 George C. Swallow succeeded Dr. Leffingwell but Prof. Swallow was appointed state geologist two years later and Professor J. Locke succeeded him in 1853. At this time Prof. Locke’s salary was up to $1,500 per year. On July 6, 1860, by an act of the State Legislature, Prof. Locke, along with the resident and all other faculty members, was dismissed and the Board of Curators re-established four departments, one of which was natural history and natural philosophy. Dr. Joseph G. Norwood took charge of this department and continued on the faculty for many years, later becoming dean of the medical faculty. Entomology continued to be a part of the course in natural history.

In 1869 Dr. C. V. Riley, the first state entomologist for Missouri, was appointed lecturer in entomology and continued in that capacity until 1875. At Missouri he would lecture once a week for a number of weeks each year and the entire student body was given the opportunity to attend these lectures. Because of his connection with the University he became known as Professor Riley, a title which remained with him the rest of his life. Riley also held a lectureship at Kansas State College from 1870-1872. This institution conferred on him an honorary A.M. degree in 1872 and the University of Missouri awarded him with an honorary Ph.D. degree in 1873.
In 1870, the Missouri College of Agriculture was established and George C. Swallow, state geologist, was appointed as the first professor of agriculture. In his report on the proposed course of study for the College of Agriculture, Prof. Swallow stated that entomology should have a prominent place in the catalog of study and that all would admit its importance. He also recommended the study of bee culture and the care of silkworms (sericulture). Dr. Riley continued as lecturer in entomology until 1875 after which it was offered along with zoology in the College of Agriculture. In 1876 Prof. Swallow’s report shows that entomology, dealing with insect classification and the study of pests of the farm and garden, was offered in the second semester of the sophomore year. In 1877-78 the same course was offered by Prof. Swallow.

In 1878, S. M. Tracy was appointed professor of entomology, economic botany, and superintendent of grounds. He gave a course in entomology dealing with anatomy, life history, transformation, classification, and geographical distribution of insect pests and their control. Prof. Tracy continued teaching entomology until 1887.

In 1886 L. R. Taft was appointed assistant professor of horticulture and zoology and superintendent of grounds. In 1887 Prof. Tracy resigned and Prof. Taft offered courses in entomology and beekeeping. At this time Dr. George D. Purinton was named professor of biology. The following year W. W. Clendening was named instructor of zoology and geology and Dr. Purinton was professor of biology and director and curator of the museum. In the College of Agriculture he served as professor of botany and entomology. In 1890 Dr. Purinton’s title in the College of Agriculture was changed to professor of botany, entomology, and zoology. He continued to teach entomology until 1894 at which time a professorship in entomology was created in the College of Agriculture.

J. M. Stedman came to the University as professor of entomology and entomologist of the Missouri Agricultural Experiment Station in 1895-96 and also had charge of nursery inspection work. He continued in that capacity until 1909. In 1903 George I. Reeves became instructor in entomology under Prof. Stedman and was succeeded in that position by C. R. Crosby who served until 1906. From 1906-08 Leonard Haseman filled that instructorship but left to work on his Ph.D. at Cornell and the entire department was vacant from September 1909 until Haseman’s return in August 1910. Members of the horticulture department carried on some of the entomology activities during the vacancy.

In 1910, Dr. Haseman was appointed chairman of the department, entomologist of the Experiment Station, and chief plant inspector. In 1925 the plant inspection work was transferred to the State Department of Agriculture. Dr. Haseman continued as professor and chairman of entomology until his retirement in 1954.

Between 1910 and 1929 a number of men served as assistants and instructors under Dr. Haseman. Among them, in chronological order were T. J. Talbert, C. G. Vinson, K. C. Sullivan, A. H. Hollinger, S. R. McLane, J. H. Snow, H. Bock, O. C. McBride, C. N. Davis, and Neely Turner. In 1929, T. E. Birkett became an instructor in entomology and continued his teaching activities as assistant professor until 1943. He was absent during the war years, 1943 - 1947, but returned in
extension education, teaching entomology by correspondence, and continued in that role until his retirement in 1964.

Until 1940 the teaching staff consisted of only two persons most of the time but in that year P. C. Stone and H. E. Brown were added to the teaching staff as instructor in entomology. Both were absent during the war years, 1943-46, but returned to the faculty, the former served as chairman of the department from 1954 until his death in 1968. During the war, Lee Jenkins as well as Dr. Ruth Stone (Mrs. P. C. Stone) assisted with the work of instruction in entomology. In 1946, the instructional staff was augmented by the addition of C. W. Wingo and W. R. Enns as instructors, these having previously been research assistants. Thus, after the war the teaching staff consisted of Drs. Haseman and Stone, H. E. Brown, Lee Jenkins, C. W. Wingo, and W. R. Enns with a complement of graduate assistants. In addition, T. E. Birkett was in extension education.

In 1960, the department moved from Whitten Hall, its original home, to the new Agriculture Building. The instructional staff was unchanged except for temporary assignments to newcomers, including A. K. Burkitt who taught a course in insect ecology one semester and P. J. Spangler who taught a course in aquatic entomology in two successive years. However, in 1965 the staff was increased by the addition of Dr. C. O. Knowles to teach insect toxicology; in 1967 by the addition of Dr. T. R. Yonke to teach insect morphology and taxonomy; and in 1968 by the addition of Dr. G. M. Chippendale to teach insect physiology. The most recent addition is a forest entomologist, the position presently filled by Dr. H. R. Hepburn.

**Historical Notes on Fruit and Vegetable Insect Research in Missouri**

Perhaps the first genuine research on insects in Missouri consisted of the identification, life history, and control investigations by C. V. Riley who reported on them at the end of his first eight months tenure as state entomologist of Missouri in 1868. It is of interest to note that in his introductory remarks to his first annual report, the first insects mentioned in general are the fruit insects and the first noxious insects reported on specifically include, respectively, two species of scale insects (bark-lice), a ladybird beetle predacious on these scales, the periodical cicadas, the cicada-killer wasp, the roundheaded apple tree borer, the flat-headed apple tree borer, the peach tree borer, and the plum curculio. Then follow three natural enemies of the plum curculio after which he discusses the codling moth and 12 species of cutworms. Potato insects are next which are succeeded by the woolly apple aphid on apple trees and then eight pests of grapes. Three species of bramble pests are followed by the strawberry leafroller, and then the tussock moth on apple.

Admittedly these were not taken up in any particular order, but it seems indicative of his preoccupation with fruit and vegetable insects which were of major concern to Missourians. Furthermore, these considerations almost certainly had repercussions on later research because among the first concerns of the College of Agriculture was the nursery inspection work designed to control the ravages of scale insects on fruit trees and ornamentals. In Riley’s first report he stresses “rigorous inspection” of apple nursery stock to avoid the spread of oyster-shell scale. Certainly the early work of Stedman and Haseman around the turn of the century
was concerned primarily with nursery inspection and the control of scale insects, particularly the San Jose scale after its introduction into the state about 1890. Between the time Riley left Missouri (1877) and the appointment of J. M. Stedman (1895) as professor of entomology and entomologist of the Missouri Agricultural Experiment Station, Miss Mary E. Murtfeldt seems to have been the only active research entomologist in the state, but little of her work was concerned with fruit insects. In spite of being crippled, she did a great deal of careful life history work at the USDA field station in Webster Groves.

Stedman went right to work on insect research and among his earliest publication (1898) were “The Woolly-Aphis of the Apple;” “A New Orchard Pest: The Fringed-Wing Apple-Bud Moth;” “The Fruit-Tree Bark Beetle;” and “The Common Apple-Tree and Peach-Tree Borers.” These were followed, almost annually, by additional bulletins on fruit insects. Stedman was succeeded by Leonard Haaseman in 1906. Much of Haaseman’s work was on fruit, vegetable, and ornamentals insects. One of his first publications was an article on “Some Orchard Insects of Missouri” which appeared in the fifth annual report of the Missouri State Board of Horticulture. From that time until his retirement in 1954, Haaseman published one or more papers on fruit, vegetable, and/or ornamentals insects every year with only about a dozen exceptions. During these “exception” years he was not without publications, but they dealt with other kinds of insects. His last publication of major status was in 1956 and reported on the biology and control of the maple gouty vein gall midge, a pest of ornamental maple trees.

In the meantime, plant inspection work was transferred to the State Plant Board in 1925. In 1929 the State Plant Board was abolished and this responsibility was assigned to the State Department of Agriculture and at that time a new state entomologist (K. C. Sullivan) was appointed thus removing that office from the Experiment Station.

To go back, briefly, it should also be pointed out that in 1899 the State Fruit Experiment Station was established at Mountain Grove. It is significant to note that a considerable amount of research on fruit insect control, especially scale insects again, was done at that station. Fruit insect research has been carried on irregularly at that station almost since its inception to the present.

At the University Haaseman soon attracted good assistants, and again it is of note that the thesis research in the department of entomology started with fruit insects. Thus the earliest master’s degree thesis, in 1917, was on the control of San Jose Scale by T. J. Talbert who later became extension entomologist and still later was chairman of the department of horticulture. Also in 1917 two additional masters’ theses were on fruit insects, one being by A. H. Hollinger on the “Scale Insects of Missouri” and the other by K. C. Sullivan on “Dipping and Fumigation of Nursery Stock.” The following year, 1918, a Ph.D. dissertation was accepted from George O. Shinji on the “Embryology of Coccids (Scale Insects).” This was the first Ph.D. degree granted in the department (aside from the honorary degree bestowed on C. V. Riley in 1873).

Through the 1920s and 1930s several additional masters’ theses were accepted most of which dealt with fruit insect or vegetable insect research. However, a formal project on fruit insects was not initiated until Lee Jenkins returned from getting his master’s degree at Colorado State University in 1932. This project was
entitled "Investigations of the Codling Moth and Its Control." It is still an active project but has long since been expanded to include all fruit insects as well as vegetable and ornamentals insects and other arthropods.

In addition to those named above, several investigators should be cited for their research on fruit and vegetable insects. These include C. G. Vinson, S. R. McLane, O. C. McBride, Neely Turner, W. M. Grube, E. T. Jones, L. J. Jones, J. A. Bailey, H. O. Ezell, P. B. McCall, C. L. Etter, R. L. Meffert, and H. L. Koch.

In 1937 the fruit insect project was expanded and intensified when H. E. Brown, W. W. Smith, and C. W. Wingo were hired as research assistants in entomology. At this time, these men were stationed in outlying sections of the state during the fruit growing season and came to Columbia for the winter months, usually going to regional meetings in the state to present the results of their research to the growers. Jenkins was stationed in northwest Missouri, Brown in northeast Missouri, Wingo in southeast Missouri, and Smith in southwest Missouri. In 1941 Brown was transferred to an instructorship in the department. Jenkins was moved to northeast Missouri to replace him. In 1941 Wingo joined the armed forces and was replaced in southeast Missouri by W. R. Enns who, in turn, entered the Army late in 1942.

After World War II, Jenkins, Wingo, and Enns formed the research team on the fruit insect project with the addition of G. W. Thomas as a graduate assistant and later instructor from 1948 to 1954. In 1949 Wingo left the project and in 1951-52 Enns was away on leave, being replaced for the interim by E. R. Oatman. In 1953, Enns returned and resumed work on the project with Jenkins and Thomas. In 1954 Thomas joined the Extension Service and Jenkins was pressed into service on a new project in cotton insect research, later, nematology on vegetables and field crops in southeast Missouri. Since that time, the project has been maintained by one man with from one to four graduate assistants. In 1963 H. E. Brown returned to the project, in part, to conduct some of the research on insects affecting shade tree and other ornamental plants. Annually, almost from the beginning of the project, at least three and sometimes five separate spray programs for control of pests in commercial apple, peach, and grape production areas have been published. Much of this annual revisionary work has been turned over to extension personnel but historically the fruit insect men have done their own extension work and written extension circulars.

Thus, it may truthfully be said that the real core of research in entomology has been, from the beginning, centered around fruit insects. This is by no means to belittle research on insects affecting field crops nor the outstanding research in apiculture both of which have been carried on intensively.

**Cotton Insect Research**

Prior to 1956 research on cotton insects in Missouri was confined primarily to surveys of the existing problems and farmer cooperator test plots. During 1956 Dr. D. L. Adkisson joined the department of entomology as a full-time researcher and project leader for cotton insect research. Under Dr. Adkisson’s leadership the project developed into a full-scale effort to provide cotton producers in the Delta area with current information relative to cotton insects and the use of insecticides for their control. Following Dr. Adkisson’s resignation, Mr. Keith Harrendorf joined
the staff as project leader for cotton insect research. The major effort at this time was to strengthen control recommendations by insecticide testing and studies on timing of insecticide applications. The employment, in 1960, of an extension area entomology agent, whose duties involves many cotton insect problems, was a valuable asset to the project.

As the Delta Center expanded and new facilities became available, the major emphasis in research gradually shifted to more long-range approaches. The acquisition of a well equipped laboratory and greenhouse allowed studies on insect rearing, laboratory evaluation of insecticides, studies on insect resistance to insecticides, and host plant resistance evaluations.

Insect toxicology is one of the newer disciplines in the department of entomology. Specifically, it is concerned with the metabolism and mode of action of toxicants in insects. In a broader sense, studies that contribute to a better understanding of the metabolism of insecticides and acaricides in other animals and plants and of the biological activity of these xenobiotics in general are usually considered within the realm of the insect toxicologist.

Prior to 1965 the only research related to toxicology in the department was concerned with the residual persistence of certain chlorinated hydrocarbon insecticides in plants and soil. In 1965 a laboratory designed specifically for toxicological research was established in the Agricultural Building. Since that time the following have been investigated: (a) the properties of insect enzymes implicated in the toxic action of certain insecticides, (b) the metabolic fate of radioactive organo-phosphorus insecticides in insects and rats, (c) the metabolism of radio-active acaricides in insects, mites, dogs, goats, and certain plants, and (d) the quantitative and qualitative aspects of photochemical alterations of insecticidal and acaricidal molecules. In addition, cooperative research has been conducted with personnel from the Fish Pesticide Research Laboratory of the Bureau of Sport Fisheries and Wildlife and the Cancer Research Center of the Ellis Fischel State Cancer Hospital.

The overall aim of research in the toxicology laboratory is to learn as much as possible about the interactions of insecticides with insects and other organisms. This knowledge could be an aid in assessing any hazards associated with the use of insecticides and perhaps form a basis for the design of more selective and efficient chemicals for insect control.

**Corn Insect Research**

Prior to 1955 the research on corn insects was under the direction of Professor Harry E. Brown and other members of the department. The first entomologists to join the staff as corn insect specialists were Dr. Arthur Burditt and Mr. Paul Spangler. Burditt devoted the majority of his time to the European corn borer while Spangler worked on the other corn insects.

In 1967, when both Burditt and Spangler left to accept positions elsewhere, Dr. Don D. Peters joined the staff and accepted the responsibility for both projects. While he was on the staff, a third project on the spotted alfalfa aphid was added to his responsibilities. In 1959 he left to accept a position at Iowa State University.

Dr. Mahlon L. Fairchild replaced Peters in July, 1959. In 1964 a project on corn rootworm was initiated, and Mr. Gerald J. Musick joined the staff as instructor.
of entomology and remained until 1969. Also in 1964, Dr. Armon J. Keaster accepted a position and was working on corn insects at the Delta Center.

Dr. C. C. Burkhardt was an instructor of entomology for one year during 1966-67. He had held a half-time appointment two years 1964-66 and during the combined time worked on the project “Insecticides-Soil Inhabiting Insects” which was initiated in 1964.

A new project, “Corn Viruses”, was initiated in 1965. The newest project, “Southwestern Corn Borer,” was initiated in 1968 and is under the direction of Keaster.

Weed Insects

On February 8, 1968, a research project was initiated to study insects associated with weed and cultivated communities. This project was designed to determine which known pests species utilize weed communities and study their seasonal occurrences, relative numbers, host plants, and biologies in weed communities. Special emphasis was placed on the plant bugs in the orders Hemiptera and Homoptera.

Investigations currently underway involve: 1) the plant bugs, Miridae, including three economically important species, the rapid plant bug, the alfalfa plant bug, and the meadow plant bug; 2) the leafhoppers of the subfamily tettigoniellinae, which includes the important *Draeculacephala* species; 3) the stink bugs, Pentatomidae, including the pests *Acrosternum hilare* (Say) and *Euschistus* species.

The only previously related work conducted in this area was that done by Mr. R. L. Shotwell from 1955-1957 on department of entomology research project 286, “Investigations of the Biology, Ecology and Control of Grasshoppers Injurious to Corn and Related Crops,” and Project 369, “The Biology and Control of Legume and Grass Insects Including Grasshoppers, Stink Bugs, Soil Insects, and Occasional Pests.” The latter project was continued by Mr. C. C. Blickenstaff from 1958-1960, and by Dr. D. M. Daugherty from 1960 to date.

Livestock Insect Research

The record of research involving insect pests of livestock dates from July 1941 when Leonard Haseman and W. E. Roland published Bulletin 430, “Controlling Bot and Warble Flies of Livestock in Missouri.” This bulletin dealt with the life history and control of six species of bots and warbles attacking horses, cattle, and sheep. Prior to this T. E. Birkett (1931) had studied the morphology and physiology of the alimentary canal of the larva of the common ox warble.

In 1953 the first normal Experiment Station project dealing with livestock insect pests was written with C. W. Wingo as project leader. Since that time a livestock insect project has been continued with major emphasis on studies of the house fly, lone star tick, and face fly biology, and the role of natural control in distribution of the species.

Entomology Extension

The main functions of the extension entomology project has been and still is gathering and disseminating experimental data and abundance information on insects, as well as recommending controls for the pest species.
Numerous changes, both in personnel and demands for information, have taken place since T. J. Talbert served as the first extension entomologist in 1917. Some of those who held the position are as follows:

- George D. Jones (1930 to 1942)
- Henry Baker (1942 to 1944)
- Stirling Kyd (1944 to 1946)
- George D. Jones (1946 to 1949)
- Virgil Burk (1949 to 1952)
- Stirling Kyd (1952 to 1960)
- George W. Thomas (1960 to 1967)
- Wilfred S. Craig (1967 to date)

With an increase in demands on the service of the project, additional efforts were made to increase the available knowledge on insect populations. In 1953 George Thomas was hired as the first cooperative economic survey entomologist to gather insect population information. He held the position until 1958. Others who have held this position are as follows:

- Ralph E. Munson (1958 to 1964)
- Edwin C. Houser (1964 to 1966)
- Ralph E. Munson (1966 to date)

Francis E. Wood joined the staff in 1960 to work in 4-H entomology and to aid in the survey work. When Wood resigned in 1964, Leroy L. Peters was hired to replace him and continues on the staff.

In 1965, following considerable controversy in the nation with regard to the use and misuse of pesticides, Dr. Wilfred S. Craig was appointed to the entomology extension project to coordinate education in the safe use of these chemicals.

Over the last few years the demand for information on the control of a number of insect pests has increased greatly. To secure answers to many of the more limited insect control problems, Dr. James Huggans was appointed to the staff in 1968 as field testing specialist in entomology.
Department of
Extension Education

Extension education became an official department of the College of Agriculture in 1960. Specifically, the Board paper creating the department says that: "this Department shall offer work in various phases of Extension work and that the staff of the Department shall include the staff of the Agriculture Editor's Office, State 4-H Club staff, and State Extension Agents, as well as others to be added on recommendation of the Dean and approval of the President." As time has passed, the state 4-H club staff has become known as the youth and 4-H staff; and the state agents are now known as district extension directors. The number in the department has increased considerably over the years and people in many related areas now hold academic appointments in the department of extension education. These include areas such as:

1. Administrative staff of the Extension Division
2. State youth and 4-H staff members
3. Extension information and agricultural editor's staff
4. District directors
5. Civil Defense staff
6. Extension education department teaching staff and the Extension Division training staff
7. Short course and conference staff

Prior to the formal creation of the department, there had been a long history of offering undergraduate and graduate work. Originally the work was begun by Cannon C. Hearne and upon his leaving the University of Missouri in the early 1940's, Professor F. E. Rogers assumed responsibilities for extension training and advising undergraduate students.

Professor Rogers served as the first department chairman and served until his retirement in 1962. Dr. Stirling Kyd was department chairman from July 1, 1962, until September, 1966. Dr. Randel K. Price has been department chairman since September, 1966.
Undergraduate students were advised in this department until 1963 when it was determined that it was more appropriate for undergraduates not to consider themselves as having a major in extension and that they should elect specific subject matter degrees.

The master of science program in extension education officially began in 1938 as a M.A. program and it remained a M.A. program until 1953 when it became a M.S. program. E. T. Itschner, who for many years was the extension dairy specialist, was the first graduate in 1938. Only a few students participated in the masters program prior to the early 1950's. Enrollment began to increase then and the heaviest enrollment has been since 1960. As of August, 1968, 281 individuals have received a M.S. degree in extension education.

Prior to 1951 only 10 degrees were awarded. During the 10 years, 1951-1960, the number of degrees earned was 113 and in the eight years, 1961-1968, the number of M.S. degrees in extension education was 168.

Graduates have come from 21 states in the United States and from 11 countries. The largest number of non-American students has been from India with 49 persons having received masters degrees. Other countries represented include: Pakistan, Greece, Egypt, the Phillipines, Nepal, Sudan, Equador, Thailand, Ethiopia, and Scotland. Graduates of the department can be found in leadership roles, not only in the state of Missouri, but in other states in the United States and also in other countries around the world.

Over the years the department's approach to graduate study has changed considerably. In the beginning the program was primarily oriented toward agricultural extension since the extension workers who participated were primarily in cooperative extension work. As time has evolved, the extension organization has taken on broader programs and has broadened its own concept to include extension for all people. Thus, the program of study has changed correspondingly. In more recent years the graduate program has become an adult education degree. Heavy emphasis is given to the social and behavioral sciences and to the courses taught within the department rather than the previous trend toward heavily oriented agricultural and home economics subject matter courses. Since adult education is perhaps the largest, fastest growing segment of education today, the extension program is equipping many people to assist with this effort.
Department of Field Crops

The department of field crops, originally farm crops, was established in 1914. Beginning in 1904 the agronomy department included crops, soils, and farm mechanics. During the 10 years, 1904-1914, the research and teaching work of the department expanded rapidly, particularly in crops and soils. Professor C. B. Hutchinson strongly supported the thesis that separation of the crops section would provide the opportunity of developing that area more effectively than was possible in the combined department. The administrative decision to establish a department of field crops was accompanied by the establishment of the department of farm mechanics, later renamed agricultural engineering, and the soils department.

In 1916 Professor Hutchinson resigned and was replaced as chairman by Dr. W. C. Etheridge, who continued in the position until his retirement in 1955. Under Dr. Etheridge’s direction very effective programs in crops research, resident teaching, and extension were developed. He was particularly successful in securing the cooperation of the crops division of the Bureau of Plant Industry, USDA in crops research. The cooperation by BPI included financial support and assignment of BPI personnel to work in Missouri. Research in genetics and plant breeding especially has benefitted by BPI support. The research in genetics which was initiated and carried out by Dr. L. J. Stadler received substantial support from the BPI. Dr. Stadler received national and international recognition for this work and was elected to the National Academy of Science. The cooperation has continued with the federal agency which is now the Crop Science Division of the USDA’s Agricultural Research Service.

The continuing objectives of plant breeding research are to develop crop plants which have more desirable agronomic characteristics, increased resistance to diseases, improved quality, and higher yield. Grains, forages, and fiber crops are included in the breeding programs.

The department was quite active in introducing new crops, especially soybeans and annual lespedeza. Soybeans were first recommended to farmers in the 1920’s principally as a hay crop. The establishment of oil mills developed a demand for the beans for production of oil and high protein soybean meal, used mainly for livestock feed. Plant breeders have developed varieties which are well adapted to
Missouri conditions and production has increased until soybeans are the number one cash crop in Missouri.

Because of the wide variations in soil types and climatic conditions, the development of crop varieties which are adapted to these conditions has been a major activity of the department. The field crops department has probably made more extensive use of outlying fields and plots located on farms of cooperating farmers than has any other department. Outlying fields have been discontinued since the research centers have been established and the work with cooperating farmers has been reduced.

Since World War II the field crops department has expanded research and extension work particularly in weed control and plant pathology. Selective herbicides which have been developed by the agricultural chemical industry have changed weed control practices drastically. Their practical and safe use under farm conditions requires much detailed study by Agricultural Experiment Station personnel and a great deal of instruction by extension workers.

The field crops department did not include plant pathology research in its program of work until 1955 when Dr. M. D. Whitehead was appointed to the staff. Farmers were becoming increasingly concerned about crop injury caused by diseases. The research program includes both basic and applied studies of the bacterial, fungal, and viral diseases which affect the principal field crops of Missouri.

The decision to unite the field crops department with soils to form the agronomy department was approved by the Board of Curators in May, 1967.
Department of Horticulture

Instruction in horticulture began early in the history of the College of Agriculture. The report of the curators to the governor for 1873 shows 113 students enrolled in agriculture and 25 in horticulture. The course of study in horticulture included horticultural botany, essays on pruning, transplanting and propagating, kitchen gardens, economical botany, fruit culture, and landscape gardening. The land now known as the white campus was designated for use for horticulture and an orchard and vineyard were established on the area in 1871. George Husmann, an accomplished horticulturist from Hermann, was appointed the first professor of horticulture in 1878.

The Missouri State Horticultural Society, first organized in 1859, was quite active in the establishment and development of the horticultural work in the College. The first greenhouse was constructed in 1878 and a second one was added in 1882. Both greenhouses were destroyed by a severe windstorm in 1890.

Several men served for short terms as chairmen of the department before 1894 when Dr. J. C. Whitten was appointed. He remained until 1918 and was replaced by Dr. Victor R. Gardner, who resigned in 1922. Professor Thomas J. Talbert succeeded Gardner and remained until 1950, when he retired and was replaced by Dr. Raymond A. Schroeder.

Research

The intensive cultural practices under which most horticultural crops are grown are conducive to the development of diseases and insects which cause heavy damage to the crops. This is the case whether the crops are grown in the open or under glass and is common to fruits, vegetables, flowers, and ornamentals. Because of the situation, a substantial part of the research work of the horticulture department is directed toward studies of host-parasite relationships and the development of methods and materials to use in reducing injury caused by pests.

The research work of the department has dealt with the breeding, propagation, production, disease, and parasite problems with fruits, vegetables, flowers, and ornamentals which are produced in Missouri. W. L. Howard and W. H. Chandler, during the early years of this century, and Andrew E. Murmeek, between 1925 and 1953, conducted valuable basic and applied research in plant physiology.
Major areas of research in which the department has been especially active are: rest period of plants, photoperiodism, mineral oil emulsions, pollination of fruit plants, fruit bud formation, spray injuries, spray formulations, plant breeding, disease resistance, variety testing, spray residue toxicity and removal, use of antibiotics, hormones for thinning, and preharvest sprays and chemical weed control.

Production of apples developed rapidly during the second half of the 19th century and reached a peak about 1900, when the census reported more than 20 million apple trees in Missouri. Disease and insect damage to trees and fruit then became widespread and many apple growers went out of business. A large part of the research and teaching programs of the horticulture department dealt with control of orchard pests. The recommended spraying practices did not appeal to many apple growers and they abandoned their orchards.

Since World War II the research program of the department has been more basic and technical work than previously. A number of young men with excellent preparation have been added to the staff. The additional laboratory space in the new Agriculture Building has been equipped with apparatus, including growth chambers in which light, temperature, humidity, and air movement can be controlled, and three electron microscopes. New greenhouses afforded facilities with modern equipment for research and teaching. The research work with bacteria and viruses which cause diseases of plants has been quite productive.

In 1967 the plant pathology work was transferred to the plant pathology department and the food processing work to the department of food science and nutrition.

Resident Teaching

Courses offered by the department have been extensively revised and upgraded since 1950. Many of the courses such as general horticulture, general pomology, and spraying have been dropped and courses such as plant nutrition, plant origin and development, and post harvest physiology added. Floriculture and landscape architecture have been expanded considerably. Graduate courses have been increased in number and the level of work raised.

Extension

The horticulture extension program has been continuous since it was started in 1917. The work has included all segments of horticulture and has been adjusted to meet the changing patterns of the industry. Vegetable gardening, which was important and which received special attention during both world wars, has declined in importance. Calls for assistance in landscape design have increased greatly from urban and rural people.

Extension workers have always worked closely with the Missouri State Horticultural Society and with the State Florists Association. Each year the extension and resident staff in horticulture and entomology prepare and publish information concerning methods and materials to use in plant disease and insect control. The development and use of many chemical insecticides and herbicides require horticulture and entomology extension workers to disseminate information on the procedures for their use, effectiveness, and hazards incident to their use.
Department of Poultry Husbandry

The poultry husbandry department was established September 1, 1911, when Harry L. Kempster assumed the position of assistant professor of poultry husbandry. Professor Kempster remained chairman of the department until his retirement in 1954. From 1911 to 1921 Professor Kempster maintained a one-man department with the help of student assistants. During these years Professor Kempster established the poultry farm, organized and taught six courses, conducted a number of extension programs, and began several research projects. In 1921 E. W. Henderson was appointed instructor in the department. T. S. Townsley was appointed poultry extension specialist April 1, 1917. Two additional extension specialists were appointed during World War I.

Research

Prior to 1938 the poultry research programs dealt mainly with nutrition and management of growing chickens and laying hens, housing, improving egg quality, and egg marketing. Some research with turkeys and game birds was included.

Since 1938, and especially since World War II, the research work of the department has been more technical and basic in nature. Dr. E. M. Funk developed a process, called thermostabilization, by which the quality of fresh eggs can be maintained for long periods of time.

The rapid development of large-scale commercial production of broilers, eggs, and turkeys has been made possible through the application of information obtained from research and, in turn, has changed the character of research which the department conducts. In 1948 the department began a poultry breeding experiment in cooperation with the other agricultural experiment stations and USDA in the North Central Regional Poultry Breeding Project. This project continued for a number of years and produced a substantial amount of information on the inheritance of characters in poultry which are of economic value.

Nutrition research, which previously had dealt principally with studies of proteins and ration formulations, was directed to studies of the requirements of amino acids, vitamins, antibiotics, and trace elements, especially zinc and copper.
Studies of thyroid activity of turkeys and laying hens have determined thyroxine secretion rates. The related effects of thyroid activity and varying lengths of periods of light exposure upon time required for pullets to reach sexual maturity, upon egg production, and several egg characteristics have been studied.

Considerable attention has been given to studies of the effects of some production and management procedures upon the quality of poultry meat and eggs. Studies are underway on the composition of eggs in relation to quality and utilization of eggs in market channels.

The results of the research work have been published by staff members in Experiment Station bulletins and in professional journals.

Graduate and Undergraduate Teaching

The research program of the poultry department provides the opportunity for graduate students to do their graduate research in a number of areas. The department offers graduate work which leads to the M.S. and Ph.D. Degrees.

Undergraduate work in poultry husbandry offers curricula which permit students to prepare for professional poultry work, careers in business related to poultry industry, and in science for students who intend to continue with graduate work. Field trips are conducted by the department to enable students to become familiar with poultry production, marketing, and processing operations. Field Training also may be secured by students who work during the summer for a commercial producer or processor. Students may receive college credit for field training by making a study of the operations where they work and preparing a report under the supervision of a department staff member.

Extension

Poultry extension work has been conducted by the department since it was established. In 1911 about 250,000 farms had flocks of chickens. The development of large-scale commercial poultry production has reduced the number of farm flocks to about 40,000 in 1969. For many years the poultry extension program was conducted on a statewide basis, through county extension agents and published materials. After 1927 information also was disseminated on radio programs. During World War II use was made of moving pictures to show producers improved methods of production and to inform consumers about the food value and use of poultry products.

The annual report of the poultry extension specialists for 1968 states:

"Efforts were continued toward developing concentrated egg production areas in the state. A major portion of specialist time was devoted to serving areas where egg production makes a sizeable contribution to farm income. Jasper, Newton, and McDonald counties continue to make up the most concentrated egg production area."

Missouri broiler production was over 20 million birds in 1968, most of them in two counties in southwest Missouri. The state ranks third in number of turkeys produced. Both of these industries require a substantial part of the attention of extension specialists.

The extension program includes a number of 4-H projects.
Bibliography

Department of
Rural Sociology

Teaching

A course called rural communities was offered in 1906-07 by the sociology department. The teacher was T. J. Riley. In 1909 the course was called rural sociology and continued to be offered by the sociology department until 1919, when it was transferred to the newly established department of rural life which combined work in agricultural economics and rural sociology. O. R. Johnson, who was chairman of the department of agricultural economics became chairman of the department of rural life.¹

The department was separated into the two departments of agricultural economics and rural sociology in 1926. Professor Johnson remained as chairman of agricultural economics and Dr. E. L. Morgan was appointed chairman of rural sociology. Professor Morgan died in 1937 and Dr. Charles E. Lively became department chairman.

Course offerings in the department include the general areas of rural social organization, community organization and leadership, sociology of health, the sociology of youth, communication and diffusion of information, social change, population and demography, research methods, and rural social problems.

Rural sociology has not had many undergraduate majors until recent years. The increasing development of programs which include work in the social and sociological aspects of rural life by agricultural industries, farm organizations, and government agricultural agencies has encouraged more undergraduates to major in rural sociology.

Much greater interest is evident in recent years in advanced work in rural sociology. Advanced courses are taken by many students from agricultural economics, extension education, home economics, education, and journalism. Graduate students come from the same academic areas and a number of them are from other countries. Since 1938 the department has awarded 37 masters and 13 doctors degrees.

Department staff members participate actively in professional societies and a number have served as officers in state, regional, and national organizations. They
also serve as advisors and consultants in areas of local, state, and national concern. The areas include conservation of natural resources, public health, population movements and distribution, social organization and leadership, diffusion of research information, and research methods. Three staff members have served as consultants with the Agency for International Development and with the Ford and Kellogg Foundations in several foreign countries.

Research

The department of rural sociology gained early recognition for rural health research and has continued productive work in this area. The establishment of homogeneous social areas in which to conduct demographic work, in 1940, has enabled staff members to conduct valuable survey type studies. Pioneer research in the diffusion of research information has contributed substantially to knowledge in the subject. A comprehensive study of rural churches in Missouri was made during the 1950's. A resurvey of churches is now being conducted.

The department staff members have published the findings of their research in numerous Experiment Station research bulletins and professional journals. Numerous papers have been presented at state, national, and international conferences by staff members.

Extension

Department members have participated in various extension activities through the years but a regular extension program in rural sociology was not developed until 1964. An attempt at extension work was made in the late 1930's but was soon abandoned. The extension work deals mainly with leadership training and extension sponsored rural development activities.

Bibliography

The soils department was one of the three departments formed in 1914 when the original agronomy department was divided. Professor M. F. Miller, who had started and developed the agronomy department, became chairman of the soils department. He retained the position until 1938 when he was appointed dean of the College, succeeding F. B. Mumford.

Professor Miller soon organized courses in soil chemistry and fertility, physics, biology, survey, management, and conservation. Courses have been revised as new information obtained from research has become available. New areas have been added and courses now include forest soils, development and morphology of soils, and isotopes in soils. Advanced courses for graduate credit have been offered since the department was established and many students have earned M.S. and Ph.D. degrees.

Because of the concern expressed by many farmers that serious damage was being done to soils by erosion, Professor Miller established the research project to measure soil and water losses from land under different systems of cropping and cultural treatment in 1917. The highly significant information which was obtained from this project was available in the 1920's when nationwide concern developed over soil losses by erosion and the movement to establish a soil conservation program started. This work by Professor Miller was largely responsible for the establishment, in 1930, of USDA soil conservation experiment stations.

Other productive research which was conducted during the 1920's and 1930's included work with soil colloids, decomposition of minerals in soil formation, nitrogen and organic matter turnover in soils, the influence of long continued systems of cropping and soil treatments on crops and on soils, and the influence of available plant foods in the soil on the nutritive values of the crops grown on the soil.

For many years the belief existed that fertilizers must be applied to soils in quite limited amounts because it was assumed that the concentration of chemicals in liberal applications of fertilizer would be sufficiently high to damage plants. Information obtained from research showed that the proportions in which the plant food elements were applied to soil were far more important than the total amount. The cost of large applications of fertilizer was generally believed to be in excess of any possible increased crop value produced by its application.
In 1948 staff members of the soils department applied fertilizer to plots on which corn was grown at the McCredie farm, the amounts being calculated to provide sufficient plant food to produce 125 bushels per acre. The total fertilizer cost was $41.00 per acre. The high fertility plots yielded 130 bushels per acre. This compares with an average annual yield of 35 bushels on the same land during the previous seven years.

Since then the department has conducted research which has produced much more complete information concerning relationships among a number of factors which affect crop yields including soil type, amount and proportion of plant foods, and soil moisture. After obtaining information from soil tests, farmers can apply the approximate amounts of plant foods which are required to produce desired yields of crops. Yields of corn in excess of 100 bushels per acre on large areas are common in Missouri.

The value to farmers of the county soil testing laboratories, which were established in nearly all counties of the state after 1946, is largely dependent on research in soil fertility and soil physics. The complex nature of soil chemistry and plant nutrition requires continuing research upon which to base sound recommendations for the application of plant foods for crop production.

Studies in the soils department in recent years have included movements of soil water, causes of water toxicology, and causes of nitrate accumulations in some areas of soil or water. These studies are being directed to the attention now being given to water by the recently established Water Resources Research Center, a program in which the University and federal government are cooperating.

Information accumulated in soil fertility and chemistry studies focus attention on overcoming the problems associated with water being a limiting factor in obtaining maximum soil responses. Since maximum fertility responses also are closely related to plant populations and varieties, this phase of the department's studies has become more closely concerned with use of proper crop varieties and herbicides.

A very effective extension program, called the Clover and Prosperity Campaign, was started by the soils department in 1922. The slogan “Clover and Prosperity” was used to emphasize the idea that if clover was grown in abundance farm prosperity would follow. A small truck was equipped with demonstration materials and extension specialists moved the truck from one county seat to another, holding one-day programs which had been well advertised in advance. The response by farmers was excellent. Field crops and soils extension specialists worked together on this program. In later years the extension program called the county soils and crops conference was established in many counties throughout the state. At these conferences state crops and soils extension specialists present information by illustrated talks, demonstrations, and discussions with people who attend.

Research in meteorology was started in the department, in cooperation with the U. S. Weather Bureau, in 1946. Dr. Wayne L. Decker was appointed climatologist in 1949 and, in addition to carrying on the research work, he developed courses in climatology and meteorology. As the research and teaching work expanded, staff members were added. In 1967 the program was separated from the soils department and the department of atmospheric science was established.
The department of veterinary science was established in 1886 by Dr. Paul Paquin, who left the University in 1890. Dr. J. W. Connaway, who had been assistant veterinarian, was appointed head of the department in 1891 and continued in that position until his retirement in 1931. Dr. A. J. Durant, who had been a staff member in the department since 1912, succeeded Dr. Connaway as department head, a position he retained until the establishment of the School of Veterinary Medicine in 1946.

During World War II the increased value of beef and dairy cattle, hogs, and sheep caused farmers to be much more aware of the need to control diseases among their animals. The number of well-qualified veterinarians was small and farmers in many areas of the state had no veterinary service. As a result, farmers, through the Missouri Livestock Association and other organizations, called for the University to establish a School of Veterinary Medicine which would train veterinarians to practice, especially in rural areas.

The University administration recognized the need for more graduate veterinarians and in 1946 approved the proposal to establish a school of veterinary medicine, based on the department of veterinary science. The original Connaway Hall, built in 1911, the buildings which had been used in the production of anti-hog cholera serum and virus, and a few small wood structures were all that were available for the school. Two army warehouses were moved from Camp Crowder and rebuilt to provide a building for clinic and hospital uses. A special appropriation of $50,000 was made by the General Assembly to pay the estimated costs of buying equipment and adding staff members.

Because the proposal to establish the School of Veterinary Medicine was made principally by farm livestock producers who wanted the services of competent veterinarians, and because the new school represented the expansion of the department of veterinary science in the College of Agriculture, the belief existed that the new school should be closely associated with the College of Agriculture. The assumption was that this close association of the school with agriculture would influence most of the graduates of the School of Veterinary Medicine to engage in large animal practice. This was the assumption on which the General Assembly
made the first appropriation to establish the school. As will be seen, the subject of veterinary medicine, like a number of other professions, was soon to undergo an evolutionary development which now includes several areas in addition to large animal practice.

The American Veterinary Medical Association establishes standards for educational programs in veterinary medicine. Accreditation of a school of veterinary medicine is made only when a committee of AVMA finds the faculty, curricula, and facilities of the school complies with established standards.

Early in 1949 AVMA was requested to inform the College of Agriculture concerning the requirements for faculty, curricula, and classroom and laboratory facilities that must be met. The association committee furnished the information requested. The dean of the College informed the committee of the proposal to keep the School of Veterinary Medicine associated with the College. The College also proposed to require the two years pre-veterinary work to be taken in the College of Agriculture, with the four-year curricula in veterinary medicine to be determined by the veterinary faculty.

The AVMA Committee wanted the administrative officers of the School of Veterinary Medicine to have direct communication with the University president. President Middlebush recommended and the Board of Curators approved the establishment of a Division of Agricultural Sciences in which the College of Agriculture and the School of Veterinary Medicine were on an equal basis, the administrative officer of the division to have the title of director. The dean of the College of Agriculture retained the same title; the administrative officer of the School of Veterinary Medicine had the title of director. The proposal was agreed to, reluctantly, by the AVMA.

A search was made for a director of the School of Veterinary Medicine and Dr. A. H. Groth, a graduate of the Iowa School of Veterinary Medicine, was appointed, effective July 1, 1949. Dr. Groth was an able administrator and, despite many perplexing problems, developed the school into a first-class institution.

The first class of students was admitted to the school in September, 1946, and graduated in June, 1950. Thirty freshmen students were admitted each year. When the school was well established, under Dr. Groth’s direction, the requirements for admission were high and nearly all students who entered completed the four years of work and received DVM degrees.

In addition to large animal practice, three other areas had been developing in the veterinary profession and after World War II development in the three areas was quite rapid. One of the three areas is small animal practice. The number of small animals kept as pets has increased rapidly, especially in cities. Small animal practice attracts many graduate veterinarians who have prepared themselves particularly for this practice in the School of Veterinary Medicine. A second area is public health. Many infectious diseases are transmissible from animals to humans. Sanitation and food inspection are included in public health work. Federal, state, and city public health services employ many graduate veterinarians. The third area is research. The large number of problems in diseases of animals and their relationships to human health require extensive and continuing research. The establishment of the National Institutes of Health and the support which they give to research in causes and
methods of control of diseases of man and animals has greatly stimulated research in these areas. The Missouri School of Veterinary Medicine has developed a substantial program of research which serves the dual purpose of discovering information on causes and control of diseases and provides training in research methods and techniques for graduate students who are preparing for careers in research.

When these developments were well advanced in the School of Veterinary Medicine, the administration and faculty of the School believed that the teaching and research programs could be more effectively conducted if the School were separated from the College of Agriculture and placed on the same level in the University organization as the other academic divisions. The request was presented to President Ellis and approved by the Board of Curators. The change became effective July 1, 1958, and the title of the administrative officer was changed from director to dean.

The pre-veterinary curriculum continues to be offered in the College of Agriculture and the majority of students who enter the School of Veterinary Medicine have completed the pre-veterinary curriculum. A few students who have secured suitable pre-veterinary work in other colleges are admitted to the School.
NEW DEPARTMENTS

Five new departments were established in 1967. The departments are agronomy, atmospheric science, genetics, food science and nutrition, and plant pathology. The extensive changes which developed in agriculture and related industries following World War II strongly influenced the decision to make the changes.

Establishment of the new departments involved considerable modification of existing departments. The organization of the agronomy department not only meant loss of identity of the field crops and soils departments, but it included removal of genetics and plant pathology from field crops and of atmospheric science from soils. The School of Forestry and department of horticulture had included plant pathology staff members who were transferred to the new department of plant pathology. Establishment of the department of food science and nutrition required transferring staff members and their programs from the departments of animal husbandry, dairy husbandry, horticulture, poultry, and the School of Home Economics.

The proposals for realignments of subject matter groups were discussed informally for a number of years by staff members, farm people, representatives of industry, and College administrators. Progress toward the eventual establishment of the new departments moved at different rates among the groups which were concerned.
Department of Agronomy

The agronomy department includes the main sections of the former departments of field crops and soils. The work in crops and soils was first organized as the agronomy department by M. F. Miller in 1904. Work in the two areas had developed to the point that it was deemed administratively advisable to establish two departments, field crops and soils, in 1914. Professor Miller became chairman of soils and C. B. Hutchinson of field crops. Hutchinson resigned as chairman in 1915 and was replaced by W. C. Etheridge, who remained until his retirement in 1955.

The two departments developed strong programs in research, resident teaching, and extension in their respective areas. These are described in more detail in the sections on crops and soils.

The principal interests of the two departments were the sciences and practices which are involved in soil management and in the production of grain, forage, and fiber crops. Numerous specialties are included in the sciences and in the applied phases and each individual resident staff member is a specialist in one of the areas. Each extension staff member must understand the applications of a number of the specialties.

The programs of work which each department conducted usually supplemented those of the other department. At times sharp disagreements developed between the two departments which reduced the effectiveness of the work and caused some adverse criticism among people in the state.

The committee which Dean Kiehl appointed in 1966 to study the proposal to combine field crops and soils in one department stated the benefits which could be expected by the formation of an agronomy department.

"Many of the problems involved in crop production are closely related to both the plants being produced and the soil in which they grow. The research involved should be very closely related and coordinated. A team of extension specialists speaking for the total area instead of two teams of specialists speaking for parts of it separately would be much more effective. In addition, the information presented would not be discordant or, as is sometimes now the case, in disagreement."
“Obviously, the relations of our programs with the public would be more effective and be received with more respect if the lack of coordination now involved could be eliminated.

“Stimulus would be provided to expand the research base in crop physiology, ecology, and management areas. These are areas in which we are weak compared with other experiment stations in the north central region, yet they are quite basic to all agronomy work.

“Restructuring an agronomy program would encourage more efficient development and use of resources at Columbia and at the area centers. It would prevent or remove duplications of equipment, buildings, and workers. The cumulative effect would be to reduce the unit of inputs required for output in all phases of the program.

“The strength of such a restructured program would depend on the talents and ability of the men attracted to it as well as its administrative leadership. If well qualified men are added and new areas of research are developed, the offering of meaningful new courses will be possible. Graduate students will be attracted by the stronger research programs and to the scholars that might be added. Conceivably, development of greater dimensions to the total teaching and research programs in the College of Agriculture not possible with existing staff and structure, would be a distinct possibility with a restructuring of soils and crops in a program of agronomy.”

Staff members of both departments agreed that the chairman of the agronomy department should come from another university which had an agronomy department.

The Board of Curators approved Dean Kiehl’s recommendation that the agronomy department be established, effective September 1, 1967. Dr. C. M. Woodruff was appointed chairman with the understanding that he would continue until a chairman from another university was appointed. In February 1969, Dr. R. L. Mitchell, of Iowa State University, was appointed and assumed his position June 1, 1969.
Department of Atmospheric Science

The program of atmospheric science, originally called climatology, was initiated in 1946 when Dean Emeritus M. F. Miller negotiated a cooperative program with the U. S. Weather Bureau. The Bureau agreed to make available weather records in Missouri and to assist in the processing of the data into a form usable by modern computing facilities. The University agreed to employ a qualified climatologist to conduct research dealing with the relation of weather to agricultural production.

The primary objective was to conduct research in agricultural climatology. The research was to develop information which would be made available to agricultural producers to assist them to minimize the hazards of Missouri’s climate and to maximize the assets of the weather resource. The second objective was to develop courses in climatology and meteorology for undergraduates.

During the years 1947 through 1949 the climatological program was directed by Dean Miller, with the cooperation of Harold McComb, who was the meteorologist in charge of the Columbia Weather Bureau Office. In 1949 Dr. Wayne L. Decker was appointed climatologist in the soils department and assistant professor of climatology in the geography department. He initiated research on the effects of weather on agricultural production and taught courses in introductory climatology and meteorology.

Decker continued to conduct the research and teaching programs in meteorology until 1961 when Dr. Grant Darkow was added to the staff. The number of courses offered by Decker was increased to five and he continued to conduct the cooperative work with the Weather Bureau during the 1950’s. He began a study of the modification, by irrigation, shade and wind barriers, of the energy balance at the earth’s surface and associated reduction in stress upon plants. This research project is being continued. In 1960 a project on evaluation of cloud seeding, in cooperation with the department of geophysical sciences, University of Chicago, was conducted in south Missouri through 1964. The results showed no increase in summer rainfall by the seeding agent.
Since 1960 the research program has been expanded to include projects in three major areas. The areas are: 1) the energy balance of the earth and atmosphere, 2) climatology, and 3) dynamics of the atmosphere.

The department conducts cooperative research with the School of Forestry and the agronomy department. Joint research work is conducted with the Environmental Science Services Administration, Weather Bureau. The department participates in the north central regional program “Weather Information to Agriculture.”

The research work of the department is financed principally by Agricultural Experiment Station funds. In addition, substantial research grants have been received from the National Science Foundation and the Environmental Science Services Administration.

Areas of Research and Principal Projects

1. The energy balance of the earth and atmosphere
   a. The balance at the earth’s surface: All biological materials, both plant and animal, are subject to stress due to the environment. Since this stress limits productivity, in the late 1950's a project was instigated to study the relationship of the energy balance at the earth’s surface and stress. Modification of the energy balance and an associated reduction in stress by irrigation, shade, and wind barriers have been or are being studied.
   b. Instrumentation and radiation transfer in the atmosphere: The radiation transfer and instrumental research begun in 1961 and terminated in 1967, concerned itself with the development of economical devices to measure and integrate flux densities of solar and infrared radiation at the earth’s surface and within the atmosphere by balloon borne methods.

2. Climatological investigations
   a. Simulation of the effects of climate on man’s activity: The installation of the first electronic computer in the College of Agriculture in the late 1950's allowed the design of experiments which simulated the most effective use of weather information. These simulation models have been used to study the relationships between climate and grain drying, irrigation, animal housing, and the social and economic impact of weather modification.
   b. Definition of the climate of Missouri: In 1947 the College of Agriculture began an extended study of the climate of Missouri as it affected Missouri agriculture. Through this effort a half million weather records have been placed on punched cards and magnetic tape. Probabilities of favorable and unfavorable climatic events have been calculated.
   c. Cloud seeding evaluation: In cooperation with the University of Chicago, a cloud seeding experiment was conducted from 1960 through 1964. The College of Agriculture reduced the rainfall statistics and conducted statistical tests. The analyses, which are essentially completed, indicated that summer rainfall was not increased by the seeding agent.
3. Dynamics of the atmosphere

a. General circulation studies: Research in the atmospheric general circulation started in the summer of 1967. This is a basic science in relation to the weather forecasting and climatic modification. The major research topics include energetics of the atmosphere, momentum exchange process, scale interactions, and predictability of the atmosphere. By the end of 1968, the line of work gained a wide recognition in the national and international joint efforts in the large-scale atmospheric dynamics.

b. Dynamics of the atmosphere: The severe convective storm dynamics research, which started in 1961, has centered in three related areas, beginning with a continuing study of the climatology of severe storm occurrences in Missouri. The analyses of the distribution in time and space of the total energy of a severe storm-producing atmosphere constituted a second area. In addition to increasing our understanding of the unique nature of the severe storm-producing situation, this research has yielded results with severe storm forecast possibilities. The third area consisted of research into the effects of the interaction of cumulus and cumulonimbus clouds with their environment on the intensity of convection.

c. The mesoscale dynamics of the free atmosphere: Mathematical modeling of portions of the atmosphere begun in 1963 have yielded theoretical explanations for several previously observed, but unexplained oscillating motions of the atmosphere. These motions are associated with observed pronounced diurnal variations in cloudiness and precipitation in the midwest and with delicately banded high level clouds and clear air turbulence.

Cooperation with Groups or Agencies

1. Departmental cooperation

a. Cooperation with the School of Forestry in studies of the energy balance of a hardwood forest. This investigation concerns the water use and dry matter production of forests.

b. Working with the soil survey group in the agronomy department, the potential water requirement for various soils and climatic regimes in Missouri were evaluated. This research primarily concerns an evaluation of the aluvial areas along the Missouri river.

c. All departments are supplied basic weather data from the experimental farms or the nearest weather stations upon request.

2. Joint programs with Environmental Science Services Administration, Weather Bureau

a. In 1947 a joint memorandum of understanding was drawn between the College of Agriculture and the Weather Bureau for the processing of climatological data for Missouri. The Weather Bureau supplied and edited the original weather records while the University prepared data punch cards and processed the data onto magnetic tapes. Under this agreement both agencies were to utilize these data in joint and independent research.
b. When the Weather Bureau established their State Climatology program for Missouri in 1956, the College of Agriculture agreed to participate in the technical aspects of the program. The state climatologist was given a staff appointment in order that he might participate in the climatological research of the College. Through the cooperation improved techniques have been developed for gathering and processing severe storm information.

c. As a part of a national effort, a cooperative program in agricultural meteorology was established in 1962 at the Delta Research Center. Under the terms of this agreement a program of service to the farmers of southeast Missouri was instigated and cooperative research was undertaken.

3. Participation in research with other Agricultural Experiment Stations

Missouri has participated in the Technical Committee of the North Central Region on "Weather Information to Agriculture." This regional effort has continued since 1955 and has provided national leadership among the experiment stations. Basic climatological analyses have been made showing the probabilities of rain, extended dry periods, periods with critically cold and warm temperatures, and solar energy studies. The regional temperature study was conducted at the Missouri station between 1960 and 1965.

Outside Financial Support

1. National Science Foundation

a. Since 1960 four separate research awards have been made to Dr. W. L. Decker for the evaluation of cloud seeding experiments.

b. In 1964 an award was made to study the energy balance at the earth’s surface with Dr. W. L. Decker and Dr. G. L. Darkow as coinvestigators. This award was extended in 1966 for an additional two years.

c. A three-year study of the social and economic effects of weather modification was funded in 1966 in support of the research of Dr. J. D. McQuigg.

d. An award was made to Dr. E. C. Kung to study the general circulation in 1967.

e. Dr. G. L. Darkow was awarded funds to study the diurnal oscillations in the atmosphere in 1968.

2. The Environmental Science Service Administration

a. The research of Dr. W. L. Decker has been supported by the Weather Bureau and Environmental Data Service in annual or biannual awards since 1956. This research has concerned the environmental influences on evapotranspiration.

b. The Institute of Atmospheric Science awarded G. L. Darkow funds for studying the dynamics of cumulus development.
3. **Office of Water Resources Research**

During 1966 and 1967 a cooperative research program with the soil survey group studied the water resources of aluvial lands along the Missouri river.

**Special Equipment**

1. In 1964 a research facility was built for studying the surface energy budget of a fescue meadow. This facility includes a building, electronic data acquisition equipment, and instruments.

2. Beginning in 1959 the need for a facility to study the environmental factors affecting evapotranspiration was recognized. During the intervening decade instrumentation, irrigation equipment, and a research area has been developed. In 1969, two semiprecision lysimeters were installed in the research area.

**Principal Results**

1. The development of procedures for collecting severe storm data now being adopted on a national scale and the use of these methods in establishing the most complete and consistent summary of five years of tornado occurrences for a state-sized area.

2. The establishment of the largest collection in existence of upper air soundings made within close proximity to known tornado occurrences.

3. The development of a simple index based on total energy distributions used to better delineate those areas in which severe convective storms are possible.

4. The development of simple and economical instruments to measure net solar radiation flux and time-integrated values of incoming solar radiation.

5. Experimental determination that a reduction in evapotranspiration is realized as the level of soil moisture declines.

6. Establishment of a method for determining evapotranspiration from weather data and the use of these methods in rational management decisions.

7. Establishment of the fact that a five-year experiment in cloud seeding in Missouri did not increase the precipitation.

8. The development of methods for determining the probability of periods with adverse and favorable temperatures and precipitation in Missouri.

The atmospheric science department does not have an extension program. Development of the research program has enabled the department to expand the graduate program, and the M. S. and Ph.D. degree programs are offered in the Graduate School.

The senior faculty includes five members, all with Ph.D. degrees. In addition, a number of visiting professors and research fellows have contributed to the work of the department.

Justification for the establishment of the department of atmospheric science was presented under two headings.

1. Benefits to the atmospheric science group. Departmental status would make the operation of a research and graduate program less difficult. Although research grants and contracts are viewed on the merit of the proposed research, when a
granting agency is choosing between two good proposals they are likely to select the one from the established department. The recruitment of graduate students would be more effective with a department organization. It requires real salesmanship to obtain a graduate student in atmospheric science without the department designation. A departmental status would provide the opportunity for developing a small but effective undergraduate program.

2. Benefits to the College of Agriculture. The establishment of a department of atmospheric science will increase the support to the program from agencies outside the University. This support will provide additional research facilities of all of the research staff in the College of Agriculture.

Much of the research conducted by the staff will be directed toward basic atmospheric processes. Because of the support by the College of Agriculture there will be an opportunity for application of these research findings to agriculture. Research in the energy balance of the earth’s surface, evapotranspiration, weather modification, forecasting technique, water supply and climatological methods will contribute to the increase in quantity, quality and efficiency of agricultural production in Missouri.

Establishment of the department of atmospheric science was authorized by the Board of Curators in May, 1967, and it began operating September 1, 1967.

**Resident Instruction**

The department offers undergraduate and graduate curricula in atmospheric science. The undergraduate curriculum includes the courses in physical, mathematical, and geophysical sciences which qualify students for a major in the subject. The curriculum prepares students for graduate study and technical positions in meteorology.

The graduate program was well established when the department began operations. Students with majors in the physical, mathematical, and geophysical sciences are qualified for graduate work in atmospheric sciences. Students who complete the doctoral requirements are qualified for independent research and university teaching.
Department of Food Science and Nutrition

The original food technology group which eventually became the department of food science and nutrition was the committee charged with developing a food science program which was appointed by Dean E. A. Trowbridge in 1947. The committee members represented the departments of animal husbandry, dairy husbandry, home economics, horticulture, and poultry husbandry. Development of an undergraduate curriculum which would permit students to major in food technology was the first activity to which the committee gave its attention.\(^1\)

In 1953 the committee, working with representatives of the St. Louis section of the Institute of Food Technologists, planned and conducted a conference which dealt with various aspects of food technology. The conference has been held annually and from it has come many ideas which have helped develop undergraduate and graduate courses, extension programs, and research work. Courses which are now emphasized are basic chemical, microbiological, and physical principles rather than specific processes or procedures. The upgrading of courses and the establishment of new areas based on food science research has resulted in adoption of the term food science as a more appropriate definition of the profession than the term food technology.

The Food Science and Technology Committee of the College of Agriculture Council recommended, in 1962, that food science should receive major emphasis in view of its importance to the economy of the state, and that greater emphasis should be given in the College program to research, undergraduate and graduate teaching, and extension work in the subject.

Dean Elmer Kiehl appointed a Food Science and Nutrition Committee, in June, 1964, with instructions to consider and recommend plans for strengthening the food science and nutrition program in the College of Agriculture. The committee considered the subject in depth and reported to Dean Kiehl in December, 1966.\(^2\) The Board of Curators approved the establishment of the department of food science and nutrition in May, 1967. The department became operational September 1, 1967.

Dr. Damon Catron was appointed chairman of the new department. He was well qualified as leader for the department. In November, 1967, he died suddenly.
Dr. Joe Edmondson agreed to serve as acting chairman until another chairman could be appointed. Dr. Dee Graham was appointed chairman and assumed his duties June 1, 1969.

The food science section of the department is developing well, but problems related to the nutrition work have not all been solved and that section has not made much progress.

The north central regional experiment station directors have approved the Missouri Station as the regional center for energy and metabolism research with emphasis on human nutrition. The directors allotted $200,000 to fund the center. In 1963 Congress passed legislation which authorized the establishment of four USDA food science and nutrition regional research centers. The north central regional directors have approved the location of the north central research center at Missouri provided a strong food science and nutrition program is developed here.

During the 20 years of its existence the food processing committee developed undergraduate and graduate curricula. The undergraduate curriculum permitted students to develop major programs in food processing, usually in a specific area such as dairy products or meats. The graduate curricula provided for M.S. and Ph.D. degree programs. As the graduate curricula evolved, it included greater emphasis on the basic sciences and less emphasis on specific food products.

The faculty of the food science department states that although the activities of the department will be oriented primarily to the needs of Missouri, they must also be related to national and international food problems. The programs of the department are organized under the three broad areas of food science, nutrition, and food distribution. The undergraduate and graduate curricula in food distribution include a number of courses in agricultural economics and in the School of Business and Public Administration.

Research

The food technology committee which was appointed in 1947 reviewed the food processing and technology research which was underway in the several departments and began coordinating the work. Projects in which the personnel of two or more departments were particularly concerned were planned and conducted as interdepartmental projects. Agricultural economics, animal husbandry, and home economics cooperated in several meats projects.

Staff members who were well qualified to conduct research with foods using modern techniques and equipment were added to department faculties. Examples of research with meats are: a study of meat constituents that influence flavor, odor and color; color stability, microbiology, packaging and process development of meat; effects of various ante-mortem stress conditions on post-mortem carcass characteristics of beef, pork, and lamb.

Research with dairy products includes sanitation in milking parlors and in processing procedures, use of automation in fluid milk processing, and public health microbiology.

Poultry products research includes development of methods to improve acceptability, stability, and utilization of poultry products. Studies were made on fractionation of egg components, changes caused by processing techniques, and destruction of Salmonella in egg products by heat pasteurization. Effects of
electronic cooking on physical and chemical properties of egg white and ovalbumin have been studied.

The effects of home preparation procedures on levels of pesticides in market samples of fruits and vegetables have been studied.

The case life of fresh meats as affected by packaging materials, temperature, relative humidity, and microorganisms is the subject of research by department staff.

The foregoing are examples of the scope and nature of research which is being conducted by the department but only a part of the complete research program is included.

**Extension**

Prior to World War II substantially all extension work in foods and nutrition was conducted with rural people. Home economics extension workers included both rural and urban families. Following the war the restaurant business in urban and resort areas expanded considerably. The Agricultural Extension Service received many requests from restaurant operators for assistance in management, quantity food purchase and preparation, meal planning, sanitation, and training food handlers. A restaurant specialist was added to the extension staff in agricultural economics. He conducted numerous conferences and short courses for restaurant operators and employees in the various areas of restaurant work. Staff members in agricultural economics, animal husbandry, dairy husbandry, home economics, horticulture, and poultry husbandry assisted with the program. The food science and nutrition department staff includes three extension specialists who conduct educational programs for groups of food retailers and food service establishments. Staff members from the other departments which are concerned assist with the programs.

**Bibliography**


2. Reports of Preliminary Activation Committees on Programs for Agronomy, Atmospheric Science, Food Science and Nutrition, Genetics and Plant Pathology. In office of dean of agriculture.
Department of Genetics

A course called genetics and evolution was first taught at the University of Missouri in 1912-13 by Dr. George Lefevre, professor of zoology. In 1923-24 the course was replaced by a course in genetics, also in the zoology department.

Genetics has been an important discipline at the University of Missouri since it first received emphasis in the early career of Lewis J. Stadler, 1921-54, who built an effective program largely through his own genius and reputation. Dr. Stadler began his highly productive investigations in a study of some fundamental genetics problems dealing with the variability of crossing over in maize.

Dr. Stadler built an internationally recognized establishment through his own work and by bringing to the University a succession of brilliant and promising young scientists most of whom later went elsewhere to establish landmarks in their fields. Most of these people could not be held because the strength of the group was based on one scientist's reputation rather than a strong department with adequate funds and facilities.

Following the death of Dr. Stadler in 1954, an individual with stature comparable to his was sought as his replacement. This was not accomplished. The establishment was inherited by mostly young men who had only promise and new ideas to substitute for the reputation and strength of their predecessor. The growth of this group back to national prominence is the result of hard work, of a spirit of enlightened cooperation seldom found in academic circles, and of encouragement from several levels of University administration.

Dr. Ernest R. Sears came to the University in 1937 and his investigations in cytogenetics have made major contributions to understanding the evolutionary development of domestic wheat. Through the application of some genetic principles which he has discovered, genes have been transferred to domestic wheat from other plants related to wheat, resulting in the production of improved varieties of wheat.

Genetics research and graduate teaching developed in the department of botany, field crops, and zoology, and for many years with little effort to coordinate the work among the departments. Financial support was obtained principally from Agricultural Experiment Station and USDA funds and some University money.
In 1957 the genetics staff members in the three departments expressed the desire to cooperate in unifying the program through a University genetics coordinating committee. The committee was appointed by President Ellis in 1958 and established the following goals: 1) initiate an undergraduate program, 2) initiate a graduate program leading to a degree in genetics, 3) seek outside funds to support expanded research programs, 4) plan and seek funds for added research facilities, and 5) build a reputation for competence.

Research

The research program which was developed by the committee included projects in: mechanism of heredity of corn and algae; cytogenetics of corn and wheat and with cultured animal tissues; genetic studies with aradopsis; cytological studies of wheat and aradopsis; virus and heritable host pathogen interactions.

The members of the committee were strong in the areas of cytogenics, physiological genetics, gene control systems in higher plants, and in microbial genetics.

Resident Teaching

The undergraduate program which the committee developed has been successful. In 1967 more than 100 undergraduate students were enrolled in the basic genetics course each semester. The graduate program has been developed quite satisfactorily. Between 1957 and 1967 nine Ph.D. degrees were granted and in 1966-67, 14 graduate students were enrolled in the program.

The genetics department was authorized by the Board of Curators in May, 1967, and became active September 1, 1967. Dr. Myron G. Neuffer was appointed chairman of the department. The department faculty includes 15 regular staff members, two visiting professors, and one postdoctoral fellow.

Dr. Allan B. Burdick was appointed chairman of the department July 1, 1969.
Department of Plant Pathology

Plant pathology was recognized by the University at the turn of the century when Dr. Howard Ayres, professor of biology, taught a course in agricultural botany. His successor, Dr. Charles Thom added two courses in cryptogamic botany, the first dealing with algae and fungi. He was also responsible for a practical course in plant diseases for agriculture winter students.

In 1902 Dr. B. M. Duggar joined the Missouri staff as professor of botany and initiated the first course in mycology. He continued the plant disease course until 1907 when the first bona fide course in plant pathology, parasitic fungi, was introduced into the curriculum. This same year, Dr. George M. Reed came to Missouri, offered a course in bacteriology, and in 1908 assumed Dr. Duggar's teaching duties. Botany, previously listed in the College of Agriculture, became part of the Arts and Science College. However, botany's ties with agriculture continued through joint appointments and dual listing of courses. Under the guidance of Dr. Reed, 13 students obtained their A.M. degrees and one his Ph.D. Their theses problems varied from ones strictly microbiological in nature to pathological, including diseases caused by *Fusaria*, *Puccinia*, and the powdery mildews.

Dr. W. E. Maneval, a young Ph.D. from Johns Hopkins University, remembered primarily for his excellence in teaching, arrived in 1915. During his long tenure of service, he assumed the entire teaching responsibilities in plant pathology and bacteriology. Four students benefited from Dr. Maneval's leadership as thesis advisor. Dr. W. J. Robbins, who replaced Dr. Reed in 1919, changed the research emphasis into investigations primarily of a physiological nature. In addition to his professorship in botany, Dr. Robbins held an appointment as the Experiment Station physiologist. Simultaneous with Dr. Robbins' appointment, Dr. Edwin F. Hopkins was employed as assistant professor of botany and became the first Experiment Station plant pathologist. Dr. I. T. Scott, a student of Dr. Robbins, succeeded Dr. Hopkins and remained as the Station plant pathologist until 1931 when H. W. Richetts was appointed for a one year term.

It was during this time that Dr. C. M. Tucker initiated his classic studies on *Phytophthora*, being awarded his Ph.D. in 1931. One year later, Tucker was appointed associate professor of botany and Experiment Station plant pathologist. In 1938 Dr. Tucker became chairman of botany, a position that he held until his untimely death in 1954. During his active professional career, nine doctoral and
four masters candidates received their degrees under his direction. It was also in these depression years that Dr. Carl Vinson joined the department of horticulture. He was recognized as one of the leaders in plant virus research until ill health intervened and terminated his professional career.

In the war years plant pathological research was limited to the Phytophthora and Fusarium studies of Dr. Tucker and the plant disease survey work of Dr. T. W. Bretz who arrived in 1943. Following the war, Dr. C. H. Kingsolver was added to the Experiment Station and botany department as plant pathologist and assistant professor. In 1947 Dr. E. S. Luttrell arrived to teach plant pathology, bacteriology, and mycology but left after two years. His position was filled by Dr. John Hollis, plant pathologist and assistant professor, and Dr. R. F. Brooks, bacteriologist and associate professor in botany and animal husbandry. In 1950 Dr. Kingsolver accepted a position with the U. S. Biological Warfare Division, leaving a vacancy which was filled in 1953 by Dr. M. C. Michaelson. That same year, Hollis left the botany department and was replaced by Dr. J. E. Peterson.

In 1954 the plant pathology section in the Experiment Station was transferred from botany into their respective plant science departments. Drs. D. F. Millikan and Michaelson were involved in this move and Bretz, due to the reorganization of the USDA, was faced with the decision of moving to Ohio. Since the teaching of plant pathology in botany to forestry students had not been completely satisfactory, Bretz was offered and accepted a professorship in forestry with this responsibility.

Expansion of plant pathological research was evidenced by Dr. R. N. Goodman's efforts in phytobacteriology and a continuation of Michaelson's work by Dr. Marvin Whitehead who arrived in 1955. Three years later Dr. O. H. Calvert was added to the field crops department. In 1960 Whitehead left Missouri and was replaced by Dr. T. D. Wyllie. Further additions included Dr. Einar Palm, for extension, in 1964 and Drs. John Miller and William Bugbee in 1965. This same year Dr. B. G. Tweedy replaced Professor Swartwout in horticulture and Dr. Fred Morgan was added as the USDA soybean pathologist, a position presently held by Dr. R. H. Scherff. Other additions were found in the Forest Service with Dr. A. D. Partridge arriving in 1956 and being replaced by Dr. Fred Berry two years later. With Dr. Berry's departure in 1964, the U.S. Forest Service closed their subsection in Columbia.

The separation of plant pathology staff members into the areas of field crops, forestry, and horticulture prevented the development of coordinated programs of research and teaching. Despite the fact that several plant pathologists at the University of Missouri have individually gained national and international reputations in their respective fields of research, the University has not attained any appreciable recognition as a center for research and graduate study in this area.

The establishment of an administratively organized plant pathology department will enable the University to gain more recognition in the field. This will enhance the competitive position with other land-grant institutions for financial support, for the best qualified personnel, and in the recruitment of well qualified graduate students.

The Board of Curators authorized establishment of the department of plant pathology in May, 1967, and it began operations September 1, 1967. Dr. T. W. Bretz was appointed chairman. He died in December 1967, and was succeeded as chairman by Dr. R. N. Goodman.
APPENDIX I

1938-1969
Dean and Director’s Office

First
Appointed

Aldrich, Richard J., Assoc. Dean and Dir. 7/1/64
Bodenhamer, Schell H., Assoc. Dean for Extension 7/1/67

1Cloninger, C. Kenneth, Admin. Asst. to Dean and Dir. 1952
Fisher, Artie M., Supr. Dir. Off., Col. of Agr. 1952
Folks, Homer C., Assoc. Dean 6/15/63
Kiehl, Elmer R., Dean and Director 9/1/60

2Longwell, John H., Dean and Dir. Emeritus 9/1/48
McClure, Ray C., Counselling Coordinator 1967

2 9Miller, M. F., Dean and Director 1938

1Moritz, Francis L., Admin. Asst. to Dean and Dir. 1955

Purdy, Allan W., Adm. Asst. to Dean (Dir. Student
Aids and Awards, U. of Mo.) 1950
Rogers, Ralph R., Asst. to Dean and Dir. 1958
Scobee, Samuel E., Fiscal Officer, Col. of Agr. 1965

2Shirky, Samuel B., Assoc. Dean and Dir. Emeritus 1920

9Trowbridge, E. A., Dean and Director 1945
Van Eaton, Earl N., Adm. Asst. to Assoc. Dean 1965
Wilkening, Walter T., Coordinator Foreign Trainees 1965

1938-1969
College of Agriculture, Resident Faculty

First
Appointed

Agricultural Chemistry

Aue, Walter A., Asst. Prof. 8/15/65
Bloomfield, Richard A., Prof. 9/1/56
Burnett, Joe D., Instr. 9/1/68

1Carroll, Edward J., Instr. 1/1/56
Cooper, Richard G., Asst. Prof. 2/1/64
Cornell, Creighton, N., Asst. Prof. 6/1/62

2Cowan, E. W., Prof. 9/31/27
Feather, Milton S., Asst. Prof. 7/1/67

2 9Flynn, Laura M., Assoc. Prof. 9/15/42
Garner, George B., Assoc. Prof. 6/1/53
Gehrke, Charles W., Prof. 2/1/49

1Godbey, William G., Asst. Prof. 9/1/56

2Haigh, Leonard D., Assoc. Prof. 9/1/07

2-9Hogan, Albert G., Prof. 7/1/23
### Agricultural Economics

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<tr>
<th>Name</th>
<th>Position or Rank</th>
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<tbody>
<tr>
<td>Johnson, Frank</td>
<td>Instr.</td>
<td>9/13/54</td>
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<tr>
<td>Koirtyohann, S. R.</td>
<td>Asst. Prof.</td>
<td>9/1/63</td>
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<td>Lamkin, William M.</td>
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<td>Mayer, Dennis T.</td>
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<td>Muhrer, Merle E.</td>
<td>Prof.</td>
<td>4/1/40</td>
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<td>O'Dell, Boyd L.</td>
<td>Prof.</td>
<td>9/1/39</td>
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<td>Pickett, Edward E.</td>
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#### First Appointed

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Kirtley, Carroll L., Asst. Prof.
Klingner, Clarence, Prof.
1 Lasley, Floyd, Instr.
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4 L'Hote, Homer J., Instr.
McNabb, C. G., Prof.
1 Mann, Fred L., Asst. Prof.
5 Metcalf, Virgil A., Assoc. Prof.
6 McKinsey, James W., Prof.
1 Maxon, Richard C., Instr.
2 Miller, Frank, Prof.
1 Miller, John D., Asst. Prof.
Miller, Kenneth, Assoc. Prof.
Moser, David E., Assoc. Prof.
Ragsdale, J. M., Prof.
Rhodes, V. James, Prof.
Rottman, Leroy, Asst. Prof.
Schneeberger, Kenneth, Asst. Prof.
1 Smith, J. N., Instr.
Torgerson, Randall E., Asst. Prof.
Voss, Leonard A., Assoc. Prof.
Warnken, Philip F., Assoc. Prof.
West, Jerry G., Asst. Prof.
Whitted, Stephen F., Prof.
Wiggins, E. R., Asst. Prof.
Wilson, Lorene, Asst. Prof.
Workman, Herman, Assoc. Prof.

Agricultural Editor
1 Adams, Veta, Asst. Editor 1945
1 Bailey, R. M., Asst. Editor, Instr. 1965
1 Ballew, Carmel, Prof. 1964
1 Bank, Gail, Asst. Editor, Assoc. Prof. 1955
1 Bay, Ovid, Editor 1951
1 Brand, Jean, Asst. Editor 1958
1 Burch, Charles, Asst. Editor 1949
1 Colley, W. H., Asst. Editor 1956
1 Collins, Donald N., Asst. Editor 1957
1 Dailey, F. Duane, Asst. Editor, Asst. Prof. 1959
1 Duncan, Clyde H., Assoc. Editor, Assoc. Prof. 1956
1 Edwards, Arthur V., Assoc. Editor 1947
Esslinger, D. M., Asst. Editor, Instr. 1969
Appendix 1

1 Etheridge, E. B., Assoc. Editor, Assoc. Prof. 1960
1 Florea, Rose, Asst. Editor 1945
Gregory, Orrine, Assoc. Editor, Assoc. Prof. 1960
1 Guenzel, Teresa M., Asst. Editor 1962
Gwin, Paul H., Assoc. Editor, Assoc. Prof. 1953
Hatesohl, Delmar E., Assoc. Editor, Prof. 1954
Hodgson, R. James, Asst. Prof., Instr. 1962
Hoffman, T. E., Asst. Editor, Instr. 1964
1 Howard, Margaret A., Asst. Editor 1957
2-9 Jeffrey, Arthur A., Editor 1921
Jones, R. R., Asst. Editor, Asst. Prof. 1967
1 Keller, C. C., Info. Specialist 1951
Lee, Richard L., Editor, Prof. 1954
Leslie, E. K., Assoc. Prof. 1968
1 Lindsay, Betty T., Asst. Editor 1948
1 McDermott, J. K., Asst. Editor 1950
1 Mackie, William E., Asst. Editor, Instr. 1962
Miller, D. J., Asst. Editor, Asst. Prof. 1962
Miller, G. E., Asst. Editor, Instr. 1968
1 Miller, Lloyd D., Asst. Editor 1946
1 Moritz, F. L., Asst. Editor 1955
1 Nutter, L.D., Asst. Editor 1946
1 Phifer, Bryan, Asst. Editor 1950
Preston, Eliza, Asst. Editor, Instr. 1965
1 Springer, Donald M., Asst. Editor, Asst. Prof. 1962
Van Brackle, R. D., Asst. Editor, Instr. 1967
1 Van Trump, J. W., Asst. Editor 1958
1 Winner, Elmer B., Editor, Prof. 1953

Agricultural Education

1 Ankeny, J. J., Assoc. Prof. 1921
Carpenter, Earl T., Asst. Prof. 1962
9 Dickinson, Sherman, Prof. 1924
1 Dippold, G. J., Asst. Prof. 1926
9 Duck, Joe, Assoc. Prof. 1947
2 Ekstrom, G. F., Prof. 1946
Love, Gene M., Assoc. Prof. 1967
1 Miller, R. E., Asst. Prof. 1919
1 Sexauer, T. E., Prof. 1919
Stewart, Bob R., Asst. Prof. 1969
1 Webb, E. T., Assoc. Prof. 1956
Weston, C. R., Assoc. Prof. 1956
### Appendix 1

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Appendix 1

Agronomy

2 Albrecht, William A., Prof. 7/1/16
Anderson, Laurel, Prof.
Asay, Kay Harris, Asst. Prof. 6/1/65
Aslin, Wynard E., Res. Assoc. 8/1/52
Baldrige, Joe D., Assoc. Prof. 9/1/41
Blanchard, Robert H., Assoc. Prof. 7/1/68
2 Brown, E. M., Prof. 1922
Brown, James R., Asst. Prof. 1/1/63
Brown, Norman, Instr.
Cavanah, Lloyd E., Assoc. Prof. 6/1/48
Christy, C. M., Assoc. Prof.
Duclos, Leo A., Asst. Prof. 4/1/66
2-9 Ethridge, W. C., Prof. 1915
Falloon, J. N., Prof.
Fisher, Theodore R., Asst. Prof. 9/10/51
2 Fleetwood, J. R., Prof.
Fletcher, O. Hale, Prof. 6/1/48
Forsyth, F. E., Res. Assoc.
Graham, Ellis R., Prof. 9/1/37
Hayward, Carl C., Asst. Prof.
1 Hayward, Charles, Instr. 9/1/55
1 Hicks, Raymond, Instr. 1/1/58
Horrocks, R. Dwain, Asst. Prof. 1/1/67
9 Jamison, Vernon C., Res. Assoc. 6/30/55
Kerr, Harold D., Asst. Prof. 9/1/67
2 Klemme, A. W., Prof.
Kroth, Earl M., Asst. Prof. 5/1/58
2 Krusekopf, H. H., Prof.
Lawance, Samuel, Res. Assoc.
Lopez, Perla L., Asst. Prof. 7/15/67
Luenners, V. D., Res. Assoc.
Lumsden, D. K., Res. Assoc.
Marshall, C. Edmund, Prof. 9/1/36
Matches, Arthur G., Assoc. Prof.
Mattas, Richard E., Instr. 5/29/61
1 McBride, Alexander C., Instr. 7/1/64
Miller, B. J., Instr.
2-9 Miller, Merritt F., Prof., Dean and Dir. 1938-45 1904
Mitchell, Roger L., Prof. 5/15/69
Murphy, W. J., Prof.
Nelson, Curtis J., Asst. Prof. 7/1/67
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9 Pinnell, Emmett, Prof. 1/15/57
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**Animal Husbandry**

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**Atmospheric Science**

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**Dairy Husbandry**

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| 9/28/40          |
| 9/1/68           |
| 2/27/61          |
| 9/1/41           |

2-9 Itschuer, E. J., Prof.
Jensen, Robert G., Asst. Prof.
Johnson, Harold D., Prof.
Kibler, Hudson H., Asst. Prof.
1Kirkham, W. R., Res. Assoc.
Lane, A. G., Asst. Prof.
1Leighton, Rudolph E., Supt. Hatch Farm
1McIntyre, Charles W., Asst. Prof.
Martz, Frederic A., Assoc. Prof.
Merilan, Charles P., Prof.
Meinershagen, F. H., Prof.
1Miller, William R., Res. Assoc.
Moon, Richard D., Res. Assoc.
Peet, Horace S., Asst. Prof., Supt. Hatch Farm
1Pipes, Gayle W., Asst. Prof.
1Premachandra, B. N., Asst. Prof.
2-9 Ragsdale, Arthur C., Prof.
Rainey, Lawrence R., Supt. Foremost Farm
Regan, M. J., Prof.
1Reineke, Ezra P., Asst. Prof.
2Reid, William H. E., Prof.
Sikes, John D., Assoc. Prof.
Smith, Kenneth L., Asst. Prof.
1Srivastava, Laxoni, Instr.
1Stallecup, Odie T., Instr.
1Swanson, Eric W., Instr.
1Tallman, Kenneth L., Instr.
2Turner, Charles W., Prof.
1Von Berswordt-Wallrobe, Rolf, Res. Assoc.
1Wada, Hiroshi, Res. Assoc.
1Wayman, Oliver, Res. Assoc.
1Williams, Ralph, Res. Assoc.
1Williams, Walter F., Res. Assoc.
Appendix 1

Fairchild, Mahlon L., Prof.  7/15/59
Harrendorf, Keith, Asst. Prof.  2/20/58
2-9 Haseman, Leonard  1906
Hepburn, Howard R., Asst. Prof.  1/1/69
Hoffman, J. D., Res. Assoc.  
Huggans, J. L., Res. Assoc.  
Jackson, R. D., Res. Assoc.  
2-7 Jenkins, Arthur L., Prof.  6/1/30
Keaster, Armon J., Asst. Prof.  6/1/58
Knowles, Charles O., Prof.  1/12/65
Lawson, Francis R., Prof.  10/1/64
Marston, N. L., Res. Assoc.  
Munson, R. E., Asst. Prof.  
Parker, F. D., Res. Assoc.  
1 Peters, Don C., Asst. Prof.  6/10/57
Putter, Benjamin, Res. Assoc.  
1 Shotwell, Robert L., Res. Assoc.  
9 Stone, Philip C., Prof.  2/1/56
Thomas, G. W., Assoc. Prof.  5/1/40
1 Williams, G. J., Asst. Prof.  
Wingo, Curtis W., Prof.  1956
Yonke, Thomas R., Asst. Prof.  7/15/37

Food Science and Nutrition
Bailey, Milton E., Assoc. Prof.  9/15/58
Baldwin, Ruth E., Prof.  9/1/61
Bassett, H. J., Assoc. Prof.  
9 Catron, Damon, Prof.  9/1/66
Cotterill, Owen J., Prof.  9/1/61
Edmondson, Joseph E., Prof.  9/1/41
Fields, Marion L., Assoc. Prof.  6/1/60
Graham, Dee M., Prof.  6/1/69
Hedrick, Harold B., Assoc. Prof.  9/1/53
Korschgen, Bernice M., Instr.  
Marshall, Robert T., Assoc. Prof.  9/16/57
Naumann, Hugh D., Prof.  2/1/49
Shelley, Dean S., Instr.  10/1/56
Stringer, William C., Assoc. Prof.  9/15/59
Welch, J. M., Prof.  

Forestry
Adair, Kent, Asst. Prof.  1/1/67

1 Allen, E. P., Instr.  7/10/59
1 Begeman, Gilbert, Instr.  7/10/59
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Appendix 1

Home Economics

Johnson, Sarah J., Instr. 2/1/68
Kaufmann, Clinton M., Assoc. Prof. 9/1/62
Kilbride, Janet E., Instr. 9/1/68
Kintner, Treva C., Instr. 9/1/68
McKelvey, Frances A., Assoc. Prof. 9/1/53
1 Maharg, Leta G., Assoc. Prof. 9/1/42
Mangel, Margaret, Prof. and Director 9/1/40
1 Martinson, Marian L., Asst. Prof. 9/9/55
1 Mathieson, Edna F., Asst. Prof. 9/1/57
Metzen, Edward J., Assoc. Prof. 9/1/63
Miller, Sue E., Instr. 9/1/67
1 Pudelkiewicz, Cecelia, Assoc. Prof. 10/6/57
1 Rice, Dona A., Instr. 1/1/69
1 Rice, Robert R., Assoc. Prof. 9/1/65
Rogers, Kate E., Prof. 9/1/54
Saxon, Doris G., Prof. 2/1/51
Sunoo, Sonia H., Asst. Prof. 9/1/65
1 Swall, Donna S., Instr. 9/1/57
Sweet, June R., Instr. 9/1/67
1 Teetsel, Maxine, Asst. Prof. 9/1/60
Thornburg, Kathleen R., Instr. 9/1/67
Tuthill, Byrdine H., Asst. Prof. 8/1/56
Typpo, John T., Prof. 9/1/66
Weaver, Christine P., Assoc. Prof. 9/1/66
Wingo, Caroline E., Assoc. Prof. 9/1/58
Yost, Anna C., Assoc. Prof. 9/1/54

Horticulture

Dunn, John H., Asst. Prof. 9/1/68
Gaus, A. E., Prof.
Hartley, D. E., Asst. Prof.
Hemphill, Delbert D., Prof. 6/1/40
Hibbard, Audrey D., Prof. 3/1/33
1 Johnston, Melvin R., Assoc. Prof. 4/1/52
Lambeth, Victor N., Prof. 9/1/46
Lobenstein, Charles W., Assoc. Prof. 1/15/66
2 Martin, W. D. Jr., Prof.
2 Muneeek, A. E., Prof.
Rogers, Marlin N., Assoc. Prof. 9/1/49
Rothenberger, R. R., Asst. Prof.
Sacamano, C. M., Instr.
Schroeder, Raymond A., Prof. 3/11/34
Smith, James E., Prof. 10/1/39
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## Appendix 1

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Appendix 1

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McNamara, Robert L., Prof. 9/23/48
Pinkerton, J. R., Asst. Prof.

Plyler, Henry E., Instr. 1/1/60

1 Resigned
2 Retired
3 Transferred to B&PA
4 Transferred to Deans Office
5 Assistant to Chancellor
6 Chief of Party, India Program 1964-69
7 Staff member, India Program
8 Appointed Dean and Director in 1945
9 Deceased
10 University Landscape Architect
11 Chief of Party, India program 1969-
### APPENDIX 2.

**Funds Expended by Missouri Agricultural Experiment Station**

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### Note

- Hatch Fund
- Regional Research Fund
- Agri. Marketing Act
- Total Federal Funds
- State Approp.
- Other
- Total

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+ Included in Hatch Fund after 1964
### APPENDIX 3.

#### Resident Instruction Funds

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