A HISTORICAL STUDY OF THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION

By

FRANCIS RICHARD GILMORE

Bachelor of Arts
Wilmington College
Wilmington, Ohio
1951

Bachelor of Science in Education
Wilmington College
Wilmington, Ohio
1951

Master of Arts
Miami University
Oxford, Ohio
1952

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Thesis Approved:

Theodore L. Agnew
Thesis Adviser

Dan Selakovich

R J Nash

Sidney D. Brown

N N Durham
Dean of the Graduate College

PREFACE

This study is an examination of the historical development of the Oklahoma Agricultural Experiment Station from 1891 to the recent activities of 1965. Much information has been published concerning individual technical investigations, projects, and conclusions, but little has been done with the general historical development of the station.

The development of American agriculture and the application of scientific research to agricultural production have been of tremendous importance to the economy of the nation and to the individual states. However, professional historians have given little attention to agricultural history and science, and most specialists in the fields of the history of science and the history of agriculture have largely ignored the area of agricultural science. On the local level only a few studies by persons outside the field have touched upon the development of the station. Rarely have members of the station staff taken time to record the more general happenings or to place specific accomplishments in a larger perspective.

The purpose of this study is to present a story of the development of the Oklahoma Station as exemplified by major research accomplishments; impact of major national and state legislation; major changes and developments as to staff, land, and facilities; the major research emphases from one period of time to another; research as reported in station publications; and the value attached to the achievements by

various national and state authorities and other interested groups or individuals.

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TABLE OF CONTENTS

Chapter | Page

LIST OF FIGURES

CHAPTER I

INTRODUCTION

State agricultural experiment stations in the United States evolved out of a long history of agricultural experimentation in Europe and America. Although individual American farmers engaged in research and experimentation during the colonial period, no extensive organized institutional research developed until the latter part of the nineteenth century. Formal research came as a result of agitation by interested individuals, the activities of land grant colleges and experiment stations in a small number of states, the accomplishments of the European agricultural experiment stations, the need for more scientific information by the agricultural colleges, and the pressure of economic problems in agriculture.

After individual efforts and those of a few states had failed to produce the necessary results, federal support was procured to parallel the national development of state agricultural colleges. The Hatch Act and subsequent legislation was of such specific nature that the program of the stations closely followed the letter of the law. With changing conditions in the national economy and in agricultural production itself, the nature of research in agriculture changed accordingly. Work at stations that was designed to protect the consumer -- inspection of seeds, nursery plants, fertilizers, and diseased animals -- expanded into research activities designed to get a better and cheaper product to the consumer. Research would also leave the immediate farm to examine the whole of farm life, marketing economics, better utilization by industry of the raw materials of the farm, and special types of farming that many classed as businesses, such as horticultural efforts of florists. These changes in agriculture would be reflected in the research activities of the Oklahoma station and also in Oklahoma agriculture, which in turn would create new problems for the Oklahoma station to solve.

To get a better understanding of the part played by research in Oklahoma agriculture, an historical study of the Oklahoma Agricultural Experiment Station has been needed. First, certain generalizations could be reached not only from an examination of the Stillwater station, but from a brief survey of the general development of the agricultural experiment station movement. Second, a chronological examination of the Stillwater station could clarify the progressive development in size, nature, and importance of the operation of the Oklahoma station; in addition, it could illustrate directions which research activities have taken as a result of either federal incentives, interests of individuals, other outside influences, or general agricultural conditions.

The Agricultural Experiment Station Movement

The early experimentation and treatises of individual landowners and the successful efforts of agricultural societies in the nineteenth century stimulated the demand for practical answers to agricultural problems. The search for agricultural information encouraged scientific investigation. The concept of and the need for state agricultural experiment stations was present even before the Morrill Act, which provided for state agricultural colleges. Various states had taken individual action to gain new insights into current agricultural problems. Maryland had conducted various agricultural experiments as early as 1858.[1] Several persons had drawn plans for experimental farms. One such plan was proposed by Elkanah Watson, a prominent banker and businessman of Albany, New York. He wanted a "pattern farm" established that would contain from one hundred to two hundred acres and would be operated by a professor of agriculture who would conduct experiments on crops, trees, implements, architectural plans, animals, manures, "and all that related to chemistry, horticulture, botany, and mineralogy."[2]

John Pitkin Norton, professor of agricultural chemistry at Yale, introduced the idea of a nationwide system of agricultural experiment stations in 1845. One of Norton's students at Yale became interested in this idea and advocated the establishment of a station in Connecticut. Through the efforts of this student, Samuel W. Johnson, and those of Wilbur O. Atwater, agricultural chemist at Wesleyan University, the Connecticut Agricultural Experiment Station materialized in 1875.[3] Meanwhile research activities in Europe had influenced the movement in the United States through publications and visits of American scientists to European stations.

During the 1870's various individuals called attention to the

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[1] Edward D. Eddy, Colleges for Our Land and Time (New York, 1957), p. 76.

[2] Alfred C. True, A History of Agricultural Education 1785-1925, U. S. Department of Agriculture, Misc. Pub. No. 36 (Washington, 1929), p. 47.

[3] Wayne D. Rasmussen, Readings in the History of American Agriculture (Urbana, Illinois, 1960), p. 143.

thirty-odd experiment stations in Europe, which were directed in some cases by agricultural chemists.[4] The first such agricultural experiment station on a practical scale developed through the efforts of J. B. Boussingault of Alsace in 1834. Boussingault searched for the source of nitrogen in plants through systematic studies of weights and analyses of various manures and legumes.[5] J. B. Lawes established a second such operation -- Rothhamsted Experiment Station -- on his farm near Harpenden, England in 1841. He later discovered the application of sulfuric acid to phosphate rock to make phosphate fertilizers. Experimentation continued here with soils, fertilizers, and crop rotations.[6] These and other such experiment stations in Western Europe, and especially those in Germany, provided concrete examples for enthusiastic American agricultural scientists during 1870's and 1880's. Such contact through a European trip by Wilbur O. Atwater was a contributing factor in the founding of the first American station at Middletown, Connecticut.[7]

Another influence for the creation of experiment stations was the research conducted on national land problems at Morrill colleges.[8] Experimentation at those colleges began almost at the same time as

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[4]Ibid., p. 144. This could be a possible reason for the chemical emphasis in the Hatch Act.

[5]Erwin L. Le Clerg, et al., Field Plot Technique (Minneapolis, [c. 1962]), p. 1. One favorable element in the development of American agricultural stations was the availability of the Rothhamsted Station as a concrete example to follow. This English station had created an almost ideal pattern. Eddy, p. 95.

[6]Ibid., p. 2.

[7]Eddy, p. 71.

[8]Ibid., p. 94.

instruction. Numerous questions arose from instruction and from farmers that necessitated the formation of extensive research programs. The serious national problem of soil exhaustion and the number of abandoned farms gave evidence for the need of some federal program.[9] Another issue related to this latter problem was the need for some agency for inspection. An early writer concluded that the principal cause leading to the establishment of agricultural experiment stations was the increased use of commercial fertilizers and the need to prevent fraud in their sale.[10] Others who commented at the turn of the century on the formation of the experiment stations also stressed the increasing use of fertilizers and in addition the need to provide an agency that would educate the farmer in their practical use and yet free him from fraud and exorbitant charges by fertilizer producers. The new use of commercial fertilizers had also led to such abuses as multiplicity of brands, misleading names, and the tendency to utilize any sort of waste product regardless of fertilizer value.[11]

The national importance of agricultural investigations was quite evident by 1887, when twenty-eight states were conducting research in a formal manner.[12] It was also apparent to some that the state land-grant colleges would be convenient agencies to house experiment stations and assist in their administration and staffing. Further mutual

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[9] Ibid.

[10] H. P. Armsby, "Agricultural Experiment Stations," _The Popular Science Monthly_, XXIII (1883), p. 598.

[11] John P. Street, "Protecting the Farmer Against Fraud," _The American Monthly Review of Reviews_, XXXV (1907), pp. 213-14.

[12] Eddy, p. 95.

advantages would develop through transmission of research information and practical data to area farmers. It was also the general practice to have farms attached to the agricultural colleges and to conduct limited experiments with varieties of plants, fertilizers, and feeding tests with various kinds of livestock.[13] With all of these factors coming to the surface, attention centered on efforts to get federal assistance. A number of pressure groups, notably the Granges, participated in the drive to solicit support for legislation to provide a federal program of some sort.[14] Another group which supported proposals for national legislation was the state agricultural colleges themselves.

The Hatch Act

In January of 1882, the representatives of land-grant colleges met in Washington to discuss the need for federal aid to agricultural experiment stations. Legislation was instituted in 1883, but it failed to gain enough support in Congress.[15] Although the bill was introduced every year thereafter until passage, it was not until William H. Hatch of Missouri, Chairman of the House Committee on Agriculture, and James Z. George of Mississippi, Chairman of the Senate Committee on Agriculture, became interested in the problem and sponsored the bill in the

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[13]Alfred C. True, A History of Agricultural Experimentation and Research in the United States 1607-1925, U. S. Department of Agriculture Misc. Pub. No. 251 (Washington, 1937), p. 138.

[14]Murray R. Benedict, Farm Policies of the United States, 1790-1950 (New York, 1953), p. 105.

[15]True, Misc. Pub. No. 251, pp. 121-30.

respective houses of Congress, that passage was achieved.[16] The greater awareness of the nature of the problem, the position of Hatch as Chairman of the House Committee on Agriculture, and the efforts of the Grange contributed to the passage of the bill March 3, 1887.[17]

When Grover Cleveland signed the Hatch Bill an entirely new governmental policy was implemented. It was not only recognition of the responsibility of the federal government for the program and development of the agricultural industry through research, but it was also a recognition of the developing importance of science in the national economy.[18]

The Hatch Act provided:

> That in order 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 experiment respecting the principles and applications of agricultural science, there shall be established under the direction of the college or colleges or agricultural department of colleges in each state or territory established or which may hereafter be established . . . a department to be known and designated as an "agricultural experiment station."[19]

These general provisions allowed the stations rather wide latitude in their investigations. The more specific purposes of the experiment stations were outlined in section two. This provided:

> That it shall be the object and duty of said experiment station to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies

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[16]Eddy, p. 96.

[17]Ibid., p. 97.

[18]Frederick H. Mumford, The Land Grant College Movement, Missouri Agricultural Experiment Station Bulletin No. 419 (Columbia, 1940), p. 87.

[19]U. S. Statutes at Large, Vol. XXIV, p. 440 (1887).

> for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adoption and value of grasses and forage plants; the composition and digestibility of the different kinds of foods for domestic animals; the scientific and economic questions involved in production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States or Territories.[20]

These specific provisions, together with the need for the collection of basic information, had a great influence on the organization, personnel, specific projects, and general programs of the stations.

Control over activities of the experiment stations and the use of funds allotted came through the respective governors, state boards of agriculture, the Office of Experiment Stations, the Commissioner of Agriculture, and the Secretary of the Treasury.[21] However, problems arose between national officials and the respective states over administration and use of federal funds. The provision in the Hatch Act that read: "That nothing in this act shall be construed to impair or modify the legal relationship existing between any of the said colleges and government of the States or Territories in which they are respectively located,"[22] created a great amount of misunderstanding on the part of state officials and allowed the misappropriation of funds, making the stations merely political footballs. This situation was

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[20]Ibid., pp. 440-41.

[21]True, Misc. Pub. No. 251, p. 132.

[22]U. S. Statutes at Large, Vol. XXIV, p. 441 (1887).

counterbalanced in part by the further provision that each station send full and detailed reports of its operations to each of the above officials annually, on or before the first day of February.[23]

Section four of the Act provided for wide circulation of information through published reports and through the use of the franking privilege. It suggested:

> That bulletins on reports of programs shall be published at said stations at least once in three months, one copy of which shall be sent to each newspaper in the states or territories in which they are respectively located, and to such individuals actually engaged in farming as may request the same. . .[24]

This program was utilized to spread general as well as research information until the development of the Extension Service.

To finance these various activities the Hatch Act provided an annual appropriation of fifteen thousand dollars for each state.[25] With the anticipation of state support and use of the facilities of the land grant colleges, this sum appeared to be adequate during the first years. Thus the successful enactment of this legislation provided the facilities and funds which teachers of agriculture had requested. There had been a great need for a body of information in the field of agriculture, while the underdeveloped nature of agriculture had posed a serious handicap for teachers in the agricultural colleges. One writer, Edward Wiest, in commenting on the federal program for state stations, stated that: "Just as surely as the first experiment stations were the results of the desire of public spirited men and scientists to know

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[23]Ibid.

[24]Ibid.

[25]Ibid.

more about agriculture, so the Hatch Act was the result of the determination of teachers to secure more material."[26] Many forces had been responsible for the passage of the Hatch Act with its provision for research stations for each of the states and territories. This was the first of a series of national enactments designed to assist agricultural research activities throughout the United States.

General Nature of Agricultural Experiment Stations

The activities of the experiment stations were of far-reaching consequence in the respective states and territories. These efforts were exceedingly important in giving direction to the land grant colleges and even in providing for their continued existence.[27] The stations enriched the resident teaching and the forthcoming extension service by providing new data, principles, and methodology. The experiment station became a most important member of this institutional triad. The station was also instrumental in broadening the curriculum of the various agricultural colleges. In fact, the whole character of the colleges changed with the additional work of the experiment station. Research then became an organic part of the college activities. The faculty, by dividing their time between teaching and research, could transmit their newly discovered information directly to the people involved -- to farmers through institutes and short courses, and

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[26] Edward Wiest, Agricultural Organization in the United States (Lexington, Kentucky, 1923), p. 221.

[27] Earle D. Ross, Democracy's College; The Land-Grant Movement in the Formative Stage (Ames, Iowa, 1942), p. 141.

to the farmers' sons in the college classrooms.[28]

A second consequence of the establishment of the state station was that it allowed the gathering of experts who could carry on a program of research and experimentation which would not be limited by a need for individual profit or capital gain. Thus it could do what the farmer was never able to do.[29] By providing improved products through scientific practices, this group of experts encouraged farmers to respect the methods of book farming and to send their sons to pursue formal investigations of this information.[30] These agricultural experts had the difficult additional task of encouraging farmers to accept methods of science and to apply new techniques in farming operations.[31]

The function of the agricultural experiment station has varied from the period of first inception. Since 1935 the primary functions of the stations have been to maintain permanent values in farming (security of ownership and operation) and to make the business of farming a safer, a more remunerative, and a more satisfying occupation.[32] However, the general work of the stations had earlier fallen into five categories. These five areas were (1) investigations involving original features; (2) verification and demonstration experiments; (3) studies of natural agricultural conditions and resources; (4) inspection

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[28]Eddy, p. 100.

[29]Wiest, p. 227.

[30]Ross, p. 142.

[31]Eddy, p. 124.

[32]Frederick B. Mumford, "State Encouragement of Agricultural Experiment Stations," The U. S. Egg and Poultry Magazine, XLIII (1937), p. 733.

and control work; and (5) dissemination of information.[33] Conditions in the various states did not always allow smooth operations in these five areas.

The opportunity created by the Hatch Act was not always used to the greatest advantage of agricultural science. In some cases misappropriation of funds limited the program. Some colleges used the available funds to establish the regular undergraduate program.[34] Other problems arose that persisted for a number of years. Some critics called attention to the emphasis on acquiring and diffusing information rather than on efforts along defined lines of pure and applied research.[35] The large attention to fertilizers and soils during the first years, considered necessary in view of the diversification of soil types in each state, hindered achievements with plot research.[36] The work of stations strayed far afield from the ideal concept of an agency in which scientific and practical investigations were to improve the methods of agriculture or to introduce new crops or industries.[37] Competent workers and especially directors were hard to find.[38] Various

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[33] True, Misc. Pub. No. 251, p. 142.

[34] Ross, p. 141.

[35] H. C. Knoblauch, et al., State Agricultural Experiment Stations, A History of Research Policy and Procedure, U. S. Department of Agriculture Misc. Pub. No. 904 (Washington, 1962), p. 81.

[36] C. G. Williams, "Some Thoughts on the Agricultural Experiment Station," Science, LXXVII (1933), p. 81.

[37] Alfred C. True, Agricultural Experiment Stations, Their Objects and Work, Office of Experiment Stations Bulletin No. 26 (Washington, 1895), p. 5.

[38] Ross, p. 141.

persons wanted quick answers to a large assortment of questions, and the general public lacked an understanding as to why answers to problems could not be given quickly.[39] This situation sometimes resulted in disruption of teaching duties and legitimate research for minor research projects. Lack of coordination and long-range research goals allowed funds to be used for the development of some special subject interests instead of the solution of fundamental problems.[40]

Unfortunately, emphasis was placed on immediate current solutions rather than on the more lasting contributions that would come from extended research. Fundamental problems had to be ignored for a time with the pressure for immediate answers and the lack of adequate staff.[41] Despite the specialization and the attention to the more immediate practical problems, the work of the stations during the early years emphasized the tremendous need for more scientific research devoted to basic problems of agriculture. There was a growing awareness of this need not just for the individual farmer, but in order to insure adequate food supply for the growing population.[42] Another outgrowth of the early activities of stations was the development of specialized sciences to meet the needs for solutions of practical problems. It was quite probable that this in turn gave encouragement to the further development of stations and colleges.[43] Entomology, for example, grew

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[39] Eddy, p. 95.

[40] Ross, p. 141.

[41] Eddy, p. 95.

[42] Ibid.

[43] Ibid.

rapidly as a result of the concern over diseases and insects. Horticulture and agronomy advanced at a similar rate with comparable progress in tests of varieties and development of facilities.

The experiment stations were unique examples where national influence rather than coercion was the policy.[44] In general, no attempt was made to dominate or control the work of the stations aside from the approval of specialized projects by the Office of Experiment Stations. This approval merely followed the interpretation of federal legislation and was used to insure the prescribed use of federal appropriations. Local initiative was greatly encouraged with only a minimum of administrative supervision.[45]

Station administration during the early years was in the hands of the president or dean of the college, one of whom was also designated as director of the station to alleviate the fear of weakening the authority of the college's chief officer. To augment his position his salary was increased in line with these additional duties. Later this procedure was abandoned as a hindrance, in that some individuals with little knowledge of agricultural science had increased duties with teaching and disciplining, or lacked a real interest in agricultural research and thus did not give adequate attention to station operations.[46] Despite a great amount of freedom on the local level, many of the states were slow to take a serious interest in station operations. Appropriations for the direct use of the stations were also slow in

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[44]Ibid.

[45]Mumford, Land Grant College Movement, p. 98.

[46]True, Misc. Pub. No. 36, p. 221.

coming from state legislatures. Lack of state support was compensated for in small part indirectly through the Second Morrill Act of 1890. This Act provided for the "more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts. . ."[47] It granted each state and territory $15,000 for 1890, and thereafter $1,000 would be added annually until the appropriation reached $25,000. Although this money was intended mainly for instruction, it did relieve the stations of some burdens where station funds had been diverted for that purpose.[48] Any new federal appropriation was a welcome assistance, since as late as 1903 over half the stations received no direct state aid.[49]

Despite all the problems and the lack of adequate financial assistance to the experiment stations themselves, a number of significant accomplishments were achieved. Some of these included the perfection of new scientific techniques such as the manufacture of vaccines and serums, inoculating materials for legumes, laboratory services in lime determinators for fertilizing purposes, and the diagnosis of plant and animal diseases.[50] From 1887 to 1903 the various stations published a total of 6,143 bulletins, circulars, and reports.[51] The experiment stations and the United States Department of Agriculture were able to make contact with larger numbers of the more intelligent farmers after 1900.

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[47] U. S. Statutes at Large, Vol. XXVI, pp. 417-18 (1890).

[48] Ibid.

[49] Eddy, p. 99.

[50] Ibid.

[51] Ibid., p. 98.

From both the state stations and the Department of Agriculture would come large amounts of tested information in the form of free official publications, journal articles, manuals, and textbooks.[52] Research at the stations would provide fundamental changes in production, as for example the twentieth century development of the dairy industry.[53] By 1900 the stations would become well established and would accumulate a vast amount of valuable and essential information. With the coming of the new century's prosperity, station workers would be more free to concentrate on original research.[54] Some stations would have more adequate support from their legislatures than others, and some would have more natural resources on which to draw. The Oklahoma station would have a number of adverse conditions with which to work during its historical development. It would have an almost continual history of inadequate state assistance, a diversity of agricultural conditions, certain adverse climatic factors, and a relatively new and rather poor population. The historical development of the Oklahoma Agricultural Experiment Station would reflect these persisting problems. In view of these circumstances the question would arise as to what has been accomplished at the Oklahoma station in its first seventy-four years of existence.

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[52]True, Misc. Pub. No. 36, p. 220.

[53]Ross, p. 141.

[54]Eddy, p. 124.

CHAPTER II

ORGANIZATION AND OPERATION OF THE OKLAHOMA STATION 1891-1900

The Oklahoma Agricultural Experiment Station came into existence simultaneously with the Agricultural and Mechanical College. The station staff not only had the advantage of the almost five years experience of the older states and territories, but they also had the additional federal funds to create the college base of operation. Great opportunities were present to apply scientific methods to virgin land and new geographic and climatic factors. Unfortunately farmers of the territory had arrived fairly recently and unlike some of the gentlemen farmers of the eastern states, had amassed little wealth or experience with which to support research. Homesteading was an extreme gamble itself, and little resources were left for experimentation on individual farms or for tax support for a state agency. Many opportunists were at work trying to reap the greatest rewards through economic and political manipulations. In many cases the results were a collection of accidents and political maneuvers with little thought to a serious desire for the benefits to be derived from given institutions such as a college and a station. In addition, the general public was likely to develop no sincere appreciation of the advantages, efforts, and accomplishments of such an agency. It remains a question whether the attractiveness of a federal appropriation was the main reason for establishment and maintenance of the station by the legislature. Counties and communities seemed more concerned with the advantages of having the college and station rather than the benefits to be obtained from the research efforts. It appeared as if the major concern was to get something that would bring business to the county and town.

The Establishment of the Station

The formative years of the Oklahoma station paralleled the national pattern rather closely. Activities of the station followed the letter, intent and emphasis of the Hatch Act. Information disseminated was of a practical and somewhat elementary nature. The emphasis placed on the various chemical investigations in the law was reflected in the number and training of personnel assigned to that area of research. The Oklahoma station did not have the problem of misappropriated funds immediately, since both the college and the station were begun together in 1891, but this situation came soon afterwards. The station had the opportunity to get a good start into research since there was a lack of students who could qualify for admission to the college.[1] However, a great number of political conditions were present which would continue to undermine the development of the station.

Political activities in the territorial legislature and in local areas were of considerable significane in establishing the agricultural college and experiment station in Payne County and at Stillwater in particular. George W. Gardenhire, a member of the town council of Stillwater, first obtained the position as president of the Territorial Senate. In this capacity he made the statement to the Stillwater

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[1]Edward D. Eddy, Colleges for Our Land and Time (New York, 1957), p. 84.

Democratic leaders: "Boys, I've got things tied down there, we can have anything we want from an insane asylum to the State Capital!" Largely through the efforts of Hays Hamilton, prominent Stillwater resident, the group selected the agricultural college as the political plum for the town and county.[2] Hamilton moved at a mass meeting in Stillwater that the local representative in the territorial legislature be instructed to request the Agricultural and Mechanical College and Experiment Station for Stillwater. With the existence of only six counties in 1890 and with Logan and Payne cooperating, these two counties could expect to receive certain political concessions.[3]

However, several objections were made against the Stillwater site. It was twenty-five miles from the nearest railroad, and some suggested that the land was poor -- with a great amount of alkali and clay. Some rationalized the selection by concluding that successful experiments on that poor soil would help the majority of farmers in view of the generally inferior prairie soils of the state.[4] Others completely rejected the contention that the soil was poor.

After a period of negotiation during the First Legislative Assembly, Payne County received the college and station, with the proviso that the citizens of the town would furnish eighty acres and put up

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[2]Houston Overby, "The Story of Aggieland The Nineteenth Century," Oklahoma Agricultural and Mechanical College Yesterday & Today (Guthrie, [n.d.]), p. 3.

[3]James K. Hastings, "Oklahoma Agricultural and Mechanical College and Old Central," The Chronicles of Oklahoma, XXVIII (1950), p. 87.

[4]Berlin B. Chapman, "The Men Who Selected Stillwater as the College Site for A. and M.," The A. and M. College Magazine, II (1930), p. 109.

$10,000 with which to erect the first building.[5] The legislature had stipulated that the site should contain not less than eighty acres and that this land was to be suitable for an agricultural experiment station.[6] On October 27, 1890, the territorial legislature approved the Stillwater site, and the act went into effect December 25, 1890.[7] It read: "There is hereby established an Agricultural Experiment Station in connection with the Agricultural College. . .for the purpose of conducting experiments in agriculture according to the Acts of Congress..."[8]

The original eighty acres comprised land from the Duck and Jarrell homesteads. Frank E. Duck gave the first forty acres November 25, 1891. This was the land between Knoblock and Washington Streets and was a portion of the 160 acres he had filed on during the Run of 1889.[9] Alfred and Elizabeth Jarrell also deeded forty acres of their homestead for college use November 25, 1891. This acreage composed the area now occupied by Theta Pond, Willard Hall, and Whitehurst Hall. The Jarrells also donated the land for the test plot field "O," which was later used for continuous wheat experiments.[10]

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[5]The Statutes of Oklahoma, 1890, p. 82.

[6]Ibid.

[7]Oklahoma Agricultural Experiment Station, Bulletin No. 1 (1891), p. 4.

[8]The Statutes of Oklahoma (1890), p. 85.

[9]Alfred E. Jarrell, "The Founding of Oklahoma A. and M. College," The Chronicles of Oklahoma, XXXIV (1956), p. 321.

[10]Ibid., p. 4.

The Early Years of the Station

Dr. James C. Neal of the Florida station became director of the Oklahoma station on August 14, 1891.[11] On November 25, A. C. Magruder, B.S., formerly with the West Virginia Station, joined the staff as agriculturalist and horticulturalist.[12] The land was plowed for the experimental orchard on December 2, since growth of a few fruit trees during the previous year had indicated a possible value for this culture in the territory. Neal planned to plant three trees of every variety known in similar latitudes.[13] A plot of ground was also prepared for the testing of wheat. The director stated that no rigid plan was to be followed during the first years of the station in view of the meager records of temperature and rainfall, the lack of soil analysis, and the small number of prior experiments.[14] He believed that the work of the station should be of preliminary nature during the first year.[15] This opinion was understandable in view of the fact that the station consisted of 160 acres of land but had no buildings as late as

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[11] O.A.E.S., Bulletin No. 1, p. 8. Amie, daughter of Director Neal, stated that "Gov. George W. Steele, an old friend of my father sent for him to leave the college in Florida to take part in organizing the new college. Leaving the family in Indiana until a house could be had in the new town, father went on to Stillwater and soon had the wheels turning..." Stillwater News Press, December 7, 1952, p. 10.

[12] O.A.E.S., Bulletin No. 1, p. 8.

[13] Ibid. One important early experiment involved plowing of sod and determining the season to do so. An adage that sod should not be broken in winter was to be investigated.

[14] Ibid.

[15] Ibid., p. 10.

December, 1891.[16]

One of the first areas of activity involved the planned orchard and forest tree experiments. Neal had thought of forest trees for windbreaks, shade, and fuel, and possibly anticipated the reforestation of certain areas for checking evaporation and limiting the force of the winds on the plains.[17] Numerous varieties of fruit trees were planted -- 260 apples, 171 peaches, 72 pears, 105 cherries.[18] Other experiments during the first year included those with garden vegetables, dairy and beef cattle, and a complete line of grass experiments. Research with field crops was to be postponed for a time, but the successful first sorghum crop was of special significance for later research in feed grains.[19] Outdoor work during the winter of the first year was greatly hindered by unusually inclement weather.[20] However, by the fall of 1891 all of the 160 acres had been plowed.[21] This land needed proper cultivation, since it varied from alkali and thin surface soil with heavy clay subsoil to richer soils supporting good stands of grass.

The general basic structure for the program of the Oklahoma station took shape during the last years of the nineteenth century. Activities seemed to have followed closely the intent and letter of the

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[16]Ibid., p. 12.

[17]Ibid., p. 9.

[18]Ibid., p. 12.

[19]Ibid., p. 13.

[20]O.A.E.S., Bulletin No. 2, (1892), p. 3.

[21]O.A.E.S., Bulletin No. 1, p. 12.

Hatch Act, the interests and points of view of the staff, and the wishes of farmers for quick answers to their problems. The agriculturalist followed the thinking of the national office in his statement that the station should not be a model farm.[22] In 1892, the staff grew to four in number with the addition of George Holter, B.S., chemist, and a farm superintendent.[23] The farm now consisted of 80 acres in section 14, Township 19, range 2, and 120 acres in section 15, Township 19, range 2. The virginity of the land found in section 15 was shown by the heavy growth of bluestem grass, the presence of several buffalo "wallows", and several demolished prairie-dog towns.[24]

Extensive experiments in horticulture and agronomy centered around grasses and varieties of corn as well as garden fruits and orchard trees. Thus research seemed to tend toward diversified farming rather than specialized agricultural production. Great attention was given to orchard preparation and the selection of orchard trees -- apples, apricots, cherries, crabapples, nectarines, peaches, pears, plums, and persimmons. Trials of various berry plants -- blackberries, currants, gooseberries, raspberries, and strawberries -- were conducted to find varieties best adaptable to local conditions. The staff also prepared

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[22]Ibid.

[23]O.A.E.S., Bulletin No. 2, p. 1. "George L. Holter was a precise little chap that we all loved. He came to teach Chemistry and be Station Chemist. He could see farther into the future than the rest of us and bluntly told us, what we later realized that we were breaking out too much grass land." - Hastings, p. 83.

[24]Ibid., pp. 3-4. "I hunted prairie chicken on the land that has been used as a building site for nearly all the major University buildings, including Old Central." - A. C. Jarell, "I Remember When..." Oklahoma State University Magazine, II (July, 1958), p. 7. Jarrell was a member of the class of 1896.

an extensive vineyard with plantings of three vines each of several varieties. Work with field crops included trials of varieties of corn, wheat, oats, flax, sorghum, and cotton. Work in the area of cover crops involved planting of various clovers and grasses in narrow strips on the prairie section of the farm to determine their vitality in relation to prairie grasses and weeds. The staff also planted some fifty grasses -- native of Australia, Africa, and Asia -- in plats four feet by eight feet along the border of the prairie. These were designed to test their adaptability to the soil and climate of the Stillwater area. Little thought appeared in regard to the diversified soils and climatic conditions in the territory as a whole. Magruder also planted a number of Danish pasture grasses as well as a number of more common varieties. Two large plats -- one eighty acres and one forty acres -- provided space for some twenty common varieties of grass and a number of varieties of clover.[25]

Work with grass, corn, and horticultural products called attention to the serious problem of insect control. Research in entomology seemed to have come out of the practical necessity to protect vegetation at the station rather than from a concerted program. The problem did result in the publishing of various formulas for control of diverse types of insects.[26] The entomologist made studies of chinch bugs, squash bugs, rose chafers, and various borers. The former at least were a common problem to farmers in the nation as well as in Oklahoma. Investigations suggested that arsenate of lead was the best insecticide for

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[25]Ibid., pp. 5-19.

[26]O.A.E.S., <u>Bulletin</u> No. 3 (1892), pp. 1-20.

leaf-eating insects.[27] Very likely insect control was a factor in the addition to the staff of A. N. Caudell as an assistant in entomology and meteorology.[28] Extreme weather patterns had destroyed many experiments and in so doing had slowed the general research accomplishments. This experience may also have influenced the employing of a person to make meterological observations.

The year 1892 saw the first experiments with field crops, centered around oats, corn, and winter wheat. The staff experimented with ten varieties of oats, forty-four kinds of corn, and three kinds of wheat.[29] In the fall of 1892, the agriculturalist planted 254 varieties of wheat. The staff did the seeding in plats 3½ feet by 300 feet in a forty-acre field with a two foot space between plats to prevent mixing.[30] The agriculturalist also set aside an acre of land to be sown in wheat year after year without the addition of fertilizer.[31] The first livestock obtained by the station was a pair of runaway mules that were acquired in 1892 from an "angry puffing owner."[32]

The First Facilities for the Station

The state was slow to provide facilities for the college and station. Inadequate facilities would be a continued problem plaguing the

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[27]O.A.E.S., Annual Report, 1894, pp. 1-4.

[28]O.A.E.S., Bulletin No. 4 (1892), back cover.

[29]Ibid., pp. 1-7.

[30]O.A.E.S., Bulletin No. 8 (1893), pp. 3-5.

[31]Ibid., p. 15.

[32]"Research System in Its 56th Year of Science Serving Agriculture, A. & M. College Magazine, XXVII (1956), p. 29.

station for years. On June 30, 1892 the station had $3,000 for the construction of buildings, a sum which allowed for the erection of an office and residence for the director, a chemistry laboratory, stables and store houses, and a cottage for a farm superintendent.[33] Supposedly the first permanent building on the grounds was the college horse barn just northwest of the site of the forthcoming "Old Central." Close after this came the three-bedroom house for the director of the station. "A little frame shack" was erected on a spot southeast of the site of "Old Central" and used by Professor Holter as a chemistry laboratory. The second college barn, a cattle barn, was constructed near the present Whitehurst Hall location and perhaps on the site of present-day Willard Hall. This latter building was used for various experiments with cattle, hogs, and a few sheep and poultry.[34] The first or horse barn was fifty feet long and thirty feet wide, containing four stalls, a harness room, a tool room, two bins, a mcw and a wagon room.[35] The first academic building for mutual use by the college and station was "Old Central!"[36] The station had some facilities in this building, but they soon would prove inadequate. In June, 1893, a threshing and

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[33]Oklahoma Agricultural and Mechanical College, Report of the President, December 31, 1894, p. 7.

[34]Jarrell, p. 321.

[35]O.A.E.S., Bulletin No. 2, p. 19. The laboratory constructed in 1892 was thirty-two feet long and twenty-four feet wide and contained a twelve by twenty-four foot weighing room, two offices, and a dark room. A water system with a 300 barrel tank to supply water added to the conveniences, and water was piped to various locations on the farm.

[36]Hastings, p. 82.

seed house was erected, with an Atlas engine and boiler, a twenty-eight inch agitator, a blower, and a thresher completing this facility.[37] The sum of $750.00 from the Hatch fund provided for a portion of these facilities. According to the annual report, some of the larger expenses coming out of the $15,000.00 for 1892-1893 were $392.00 for bulletins, $252.33 for seeds, $477.81 for feed, $315.50 for fencing and lumber, $510.70 for implements, $420.82 for livestock, $641.04 for trees, $173.68 for water supply, $1,713.68 for the laboratory, $4,914.80 for salaries, and $2,878.37 for labor.[38]

The agricultural season of 1893 seemed to have brought good conditions to the station, according to a newspaper report of the success with hay, cowpeas, watermelons, bermuda grass, and muskmelons. Wheat planting was scheduled to start September 1, 1893.[39] A number of similar press releases were excerpted to provide the basis of Bulletin Number Eleven which gave practical suggestions in the areas of insect control for plants, field crops, drainage, horticulture (trees and vegetables) and, in the area of chemical research, fertilizers, drinking water, and corn usage.[40] This type of publication emphasized a continual problem that would plague station staff — as to whether their work should be research or popular education.

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[37]O.A.E.S., Bulletin No. 8 (1893), p. 5.

[38]O.A.E.S., Annual Report, 1893, p. 38. Some of the first students at the college worked for researchers such as Magruder for 10 cents an hour - "I Remember When," Oklahoma State University Magazine, Vol. II (1958), p. 7.

[39]The Norman Transcript, September 15, 1893, p. 1.

[40]O.A.E.S., Bulletin No. 11 (1894), pp. 47-68.

In January, 1893, the station had embarked on a program to correct the absence of soil analyses around the state. First came an examination of the soil at the station and a recommendation of materials to be added to increase fertility.[41] However, this was only a small beginning at understanding growing conditions in the territory. Vegetation in the Great Plains has been determined by fluctuations in climate and soil factors. A change of any one factor while others remained constant would bring about a change in vegetation — rainfall, soil texture, soil depth, available soil moisture, the saturation deficit of the air. A gradual decrease in rainfall from east to west has caused a gradual change in natural vegetation as well as in commercial crop production. H. L. Shantz in his 1923 article on the natural vegetation of the Great Plains recognized these facts by placing about one-half of western Oklahoma in the Great Plains region. This situation would encourage special research plots and stations in the western portion of the territory at a later time. Pasture, dry land farming, and irregation would subsequently be examined in light of their geographic factors. Variations would occur in regard to such factors as length of drought period (of importance to natural vegetation for the range cattle industry), while the presence of clay soil would carry vegetation westward.

Research activities at the Oklahoma station in 1893 included the study of grasses of the region. The natural vegetation of the Great Plains stretches in wide belts north to south through the various states. Oklahoma has had four distinct grass areas — the largest

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[41]O.A.E.S., Bulletin No. 5 (1893), pp. 3-16.

portion has been the bluestem bunch-grass, while smaller portions have contained sand grass and sand sage or shinnery, a third type has been a wire grass area, and grama and buffalo grass occupied the fourth region.[42] Bulletin Number Six of the station showed a growing awareness of some of the geographic needs of the state by giving notice to the necessity for good lawn grasses, grasses for pastures, and forage range grasses.[43] Both the director and the agriculturalist worked with the various grasses. The first test of seventy-three varieties was somewhat inconclusive as a result of a drought. Some varieties survived this test of stamina, but additional tests were necessary to provide information concerning other characteristics. In another investigation the staff planted thirty-three cover crops -- grasses, clovers, soybeans, earth nut, vetch, alfalfa, cow peas -- in plots and examined them for possible adaptability to the Oklahoma climate.[44] Tests of grasses, wheat, and certain types of corn would remain as a continuing area of investigation.

In addition to the determination of climatic adaptability of various grasses and forage crops, the staff in 1893 made several chemical analyses to discover the nutrient values of such plants as cow peas and prairie hay. Chemist Holter examined these two plants to discover the amount of ash, protein, fiber, carbohydrates, and fat in each.[45] He

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[42]H. L. Shantz, "The Natural Vegetation of the Great Plains Region," Annals of the Association of American Geographers, Vol. XIII (1923), pp. 82-84.

[43]O.A.E.S., Bulletin No. 6 (1893), p. 1.

[44]Ibid., pp. 22-26.

[45]Ibid., pp. 33-39.

also called the attention of farmers to the value of cottonseed meal for milk cows, but warned of the dangers of this feed for pigs, hogs, and calves. Benefits from its use for cows were twofold. Not only was cottonseed meal more economical, but it also raised the melting point of butter and thus allowed for greater preservation in the relatively warm climate of Oklahoma.[46] Station Bulletin Number Seven called attention to the nature of pure water and conditions causing contamination, suggesting certain procedures in locating and maintaining wells.[47] Water analysis would be of interest in 1894 as well, since one of the bulletins was devoted to it. Other bulletins for 1893 concerned tests of grasses, clovers, and forage plants were ineffective because of the drought, the delivery of foreign seed from Australia, Java, Japan, Austria, and Hindustan gave encouragement for the next year. Certain varieties of wheat appeared to be superior as to amount of grain, yield of straw, ratio of grain to straw, and amount of grain per acre.[48]

The Station expanded its publications and their distribution from year to year. In 1894 the Station was issuing two types of bulletins — one quarterly and one designated as a Press Bulletin issued monthly and mailed to newspapers of the territory and other agricultural papers in the United States. These latter press releases had begun in March of 1893.[49] The Press Bulletin was well received and widely copied during the fiscal year 1893-1894. The director expressed a belief that

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[46]Ibid., pp. 38-39.

[47]O.A.E.S., Bulletin No. 7 (1893), pp. 39-48.

[48]O.A.E.S., Bulletin No. 8, pp. 16-18.

[49]O.A.E.S., Bulletin No. 11 (1894), p. 47.

the Press Bulletin was a valuable assistance in getting the work of the station before the people.[50] By the end of 1894 the mailing list of the station Bulletin had reached 6,000; the monthly Press Bulletins for the year contained 116 short paragraphs totaling 2,400 pages.[51] Expenses for producing these publications, the cost of labor involved, and labor cost in general rose considerably from 1892 to 1894, as will be shown below.[52] A third source of agricultural information for local patrons and other interested persons was the annual report of the station. Apparently 1894 was the first year in which an annual report was prepared by the director, and it was implied that this was required by the United States Department of Agriculture.

In the 1894 report Director Neal expressed a desire for skilled technicians to assist the college's department heads, who were carrying on the research projects of the station. Each member of the station staff held a corresponding position in the college. This situation ideally was to combine research and instruction to the mutual advantage of both. The director implied that progress was hampered in both areas from the lack of capable trained assistance, which seemed to be a common problem of most stations. An abundant supply of unskilled labor helped in the non-technical projects, but many projects of technical nature had to wait for more funds, the expansion of colleges, and the graduation from college of students of agriculture.

The report further stated that this financial problem was not a

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[50]O.A.E.S., Annual Report, 1894, p. 3.

[51]Ibid., pp. 3-4.

[52]Ibid., p. 7.

result of the misappropriation of funds, as had been true with some stations. All of the $45,000 allotted during the first three years contributed to the development of the station.[53] Capital expenditures and developmental expenses were reflected in the following representative figures:

	1891-92	1892-93	1893-94
Salaries	$2,414.10	$4,914.80	$3,529.46
Labor	2,493.64	2,878.37	5,516.06
Publications	203.90	460.50	512.50
Chemical Supplies	1,360.30	1,713.68	1,143.38
Seeds and Plants	695.51	316.37	128.80
Implements	1,637.48	883.95	70.54
Building Repairs	3,000.00	750.00	699.25[54]

Expenditures for labor might be somewhat suspect as unusually high, but the newness of the facility may have warranted this much. In addition the staff had moved into one wing of "Old Central," which had been dedicated June 15, 1894. Offices, library, and laboratories were all centrally located in this building. Justification for the expenditures of the funds for experimentation and research was a part of the information given in the Annual Catalogue and Prospectus of the Oklahoma Agricultural and Mechanical College for 1893-1894. One comment was that:

> Very few farmers possess facilities for carrying on experiments accurately and to definite results. From a lack of acquaintance with the laws of nature, experiments, generally, unless guided by scientific men, are comparatively valueless for the determination of vexed questions of practice and the establishment of general principles. Our chemical laboratory will enable us to enter upon a series of experiments to be prosecuted to a successful determination.[55]

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[53]Ibid.

[54]Ibid.

[55]Oklahoma Agricultural and Mechanical College, Annual Catalogue and Prospectus, Session 1893-94, p. 32.

This statement was another example in which the chemist was given an increasingly important part in the program of the station, perhaps reflecting the leadership of chemists in the European agricultural experiment stations.

The year 1894 saw many events at the Oklahoma station. A feeding stable was built, and in general facilities were superior to those of the college itself.[56] Nevertheless the director, J. C. Neal, called for the addition of a greenhouse for the horticulture department, a new location for the costly meterological instruments, and a more adequate water supply.[57] Definite results had come from investigations in the area of agronomy, horticulture, and entomology. Only fifty varieties of wheat were available for testing because of economies in the use of station funds; however, this year's experience suggested that stable manure be used on farm land, that farmers sow wheat as early as possible after September first, and that bearded varieties were the most successful.[58] Neal considered the territory as ideally suited for wheat since conditions were good for growth and ripening, little danger existed from freezing, winter rains were frequent, weather was mild during growth in April, and the harvest season was dry. He considered wheat superior to corn as the latter was assumed to have too many enemies.[59] The director also passed on to local farmers information concerning use of surplus wheat that had been produced from investigations

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[56] Report of the President, December 31, 1894, p. 7.

[57] O.A.E.S., Annual Report, 1894, pp. 5-6.

[58] O.A.E.S., Bulletin No. 12 (1894), pp. 70-72.

[59] O.A.E.S., Bulletin No. 13 (1894), p. 73.

by other states. In this case, the station was only acting as a disseminator of information.[60] In the area of feed grains the agriculturalist tested forty-two varieties, conducted investigations of the distance between hills, the number of kernels per hill, the number of stalks to the hill, frequency of cultivation, listing versus drilling, and subsoiling versus non-subsoiling on local soil.[61]

By 1894 the staff had concluded that plums, cherries, grapes, and peaches were especially adapted to Oklahoma, and they planned to aid in their culture through encouraging various societies for the promotion of horticulture. Work in horticulture continued with tested new varieties. The staff conducted trials with seeds obtained from Australia, Java, Japan, Austraia, and India in an attempt to discover plants best suited for the local soil and climate.[62] The tests of vegetables had included seven varieties of peas, twenty-seven of beans, thirty muskmelons (planted in an apple orchard between young trees), thirty-six of watermelons, twenty-nine of cucumbers, twelve of beets, five of radishes, thirteen of lettuce (sown by drills), eleven of potatoes, and eleven of turnips. The results of these trials in 1893 provided a basis for the recommendations for plantings in 1894.[63] Along with these trials in horticulture, entomological studies centered around chinch

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[60] Ibid., pp. 73-76.

[61] O.A.E.S., Bulletin No. 10 (1894), pp. 39-46. Subsoiling involves bringing soil located below eight inches from the surface of the land to be exposed with the finer texture on top and mixing the two soils together to reduce wind and water erosion.

[62] O.A.E.S., Annual Report, 1894, p. 4.

[63] O.A.E.S., Bulletin No. 9 (1894), pp. 5-35.

bugs, squash bugs, rose chafers, and various borers.[64] The main lines of research were listed in The Yearbook of Agriculture as chemistry, horticulture, field experiments, soils and waters, feeding experiments, and entomology.[65] The relatively smooth operations of the Oklahoma Experiment Station thus far would change into confusion as a result of happenings in 1895.

Internal Troubles of 1895 and Legislative Investigation

The picture of the station given by the director — one of good progress with no corruption and no misappropriation of funds — was shattered at the end of 1894 by the statements of the college president, Henry E. Alvord, and by other comments on political manipulations. One indication of trouble was a newspaper article to the effect that a new board of regents had been appointed, and that these men had proceeded to award political favors. The Board created a new position with a salary of $1200 and placed a "good" Democrat in it. At the same time the partner of one member of the Board was placed in charge of the experiment farm with a salary of $1500 plus a residence. Academic affairs were also endangered as the faculty men were invited to resign, since most of them were members of the Republican party.[66] Another indication of dissatisfaction with conditions at Stillwater came with the resignation of President Alvord on December 21, 1894.

Alvord's term, July 1 to December 31, 1894, was quite short.

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[64] O.A.E.S., Annual Report, 1894, p. 5.

[65] Yearbook of Agriculture, 1894, p. 528.

[66] The Kingfisher Free Press, May 3, 1894, p. 4.

Nevertheless, his background as a former professor of agriculture and president of Maryland College and director of its station had placed him in a position of competence to judge the conditions of the Oklahoma college and station.[67] In his report Alvord stated that many, even members of the board of regents, had a mistaken notion as to the purpose of the experiment station. Some held it to be a free seed distributing agency, and others expected it to raise maximum crops and be a "model farm" and conduct all operations at a profit.[68] Alvord pointed out that the purpose of the station was to expend its income judiciously for the greatest good of the greatest number of Oklahoma farmers, and that the only true crop should be information. The success of its producing and distributing information should be the gauge to measure station efforts.[69] He suggested further that the board of regents should encourage and assist the station staff in their attempts to attend farmers' institutes and similar meetings and to make greater personal contacts with farmers in all parts of the Territory.[70]

Alvord went on to state that basic questions needed to be answered, since a new system of farming had to be worked out for the climate of Oklahoma, including crops to survive drought and extreme heat, and grass or other forage crops to cover the land for pasturage. President

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[67] Report of the President, December 31, 1894,p. 8. According to an article in The Stillwater Eagle Gazette, President Alvord resigned as president because he had been dissatisfied with conditions and had requested changes by the Board of Regents, but these requests were ignored. The Eagle Gazette (Stillwater) January 17, 1895, p. 1.

[68] Ibid., Report of the President, p. 10.

[69] Ibid., p. 11.

[70] Ibid.

Alvord critized past accomplishments of the station, particularly the fact that: "Variety tests of grains, grasses and forage crops and of vegetable and fruits, have occupied large areas and consumed much time and money with results of comparatively little value and that mainly local in application."[71] He was also aware of the political pressures placed in some areas of research, despite which definite solutions to agricultural problems had been achieved by members of the staff. He suggested that:

> Some of these questions essential to successful farming in Oklahoma, the members of the station have already taken in hand. Their prosecution has been interfered with by the pressure, incidental to a new country settled by people from distant and widely differing soils and climates, for more temporary and superficial work.[72]

President Alvord then proceeded to summarize the activities of the station during 1894 and to criticize the general situation at the college and station. The agriculturalist had eighty acres under cultivation during the growing season, but because of a long drought and hot July winds these field experiments were a total loss. The horticulturist supervised fifty acres occupied by orchards, vineyards, small fruit plantations, a garden, and a nursery.[73] Though losses were great because of adverse weather conditions, some accomplishments came through exhibits of methods and results at several agricultural fairs and in public meetings for agricultural and horticultural groups around the territory.[74]

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[71]Ibid.

[72]Ibid.

[73]Ibid., pp. 11-12.

[74]Ibid., p. 12.

Alvord implied that Oklahoma was lax in providing the buildings and equipment for the station, and stated that the college was one of those institutions guilty of using funds for instructional purposes rather than for research. He pointed out that college duties of the station staff in the areas of chemistry, agriculture, and horticulture were so great as to prevent their effective efforts in research.[75] He stated further that: "The current income of the institution to date, has been wholly derived from the treasury of the United States...."[76] Not only did the territorial administration rely entirely on federal funds to operate the college and station, but it also began to use federal funds for rewards to the political party then in office. Members of the Board of Regents obtained $1,800 in eighteen months for expenses in their various junkets.[77] A second case of payment was that of $1,200 plus housing to the farm superintendent, which was considered as not only useless, but a hindrance to the station staff, since his inefficient handling of workmen and teams interfered with more direct administration by the station staff. A third example of political manipulation was that of the secretary of the college and station. He was a political appointee and an incompetent person, yet he received $1,500 a year, which was equal to the salary of the upper half of the faculty and more than that of the other half. Both the secretary and the farm superintendent were paid from Hatch funds.[78]

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[75]Ibid., p. 14.

[76]Ibid., p. 16.

[77]Ibid., p. 18.

[78]Ibid., pp. 20-21.

Two other problems directly related were salaries and financial records. President Alvord did not include in his report a statement of what was considered a fair proportion to be taken from station funds to pay the salaries of teacher-researchers. Much political maneuvering and misappropriation of federal funds was indicated. Unequal pay for equal work was another abuse cited. The extent of these abuses was hidden to some extent by the fact that no adequate financial records were maintained during the first three years of the station and college operation. The report implied that part of the reason for poor records came from the director's lack of interest, and hinted that in any case some mishandling of funds was suspected.[79]

With President Alvord's resignation and the release of his report, the great amount of public discussion led to a legislative investigation of the college. Alvord was given credit for courage in expressing his convictions concerning the college, but newspaper comment also reported that the "old gentleman was charged with being somewhat old maidish in his ideas."[80] Yet it was considered that he was a man of principle and that the machine politics needed to be exposed. The newspaper writer went on to state that the forthcoming investigation would have "some effect in purging the putrid rottenness from the institution... and perform the functions... upon a strictly [non] partisan and non-political basis."[81] The resolution for a legislative investigation had been passed by both houses, signed by the Governor, and

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[79]Ibid., pp. 18-19.

[80]The Eagle Gazette, January 17, 1895, p. 4.

[81]Ibid.

returned to the Council.[82]

Events at the territorial capital at Guthrie regarding the investigation provided newspapers with a number of stories. A reporter from the Daily Oklahoman, on the scene at Guthrie, wrote that the investigation committee had "secured sensational testimony, showing how thousands of dollars were corruptly squandered, positions openly bought and sold and members of the Board of Regents went on long junketing tours at the expense of the institutions."[83] The Eagle Gazette reported that an audit of the college books was conducted in a basement room of the legislative building in Guthrie by S. H. Kelsey of Cross, who stated that it was "an awful job."[84] Meanwhile the Secretary of the College, T. M. Upshaw, returned the criticism by making an attack on Alvord for excessive expenditures for books and photographs where "whiskers had to be just so."[85]

With the alleged expose of so much corruption at Stillwater, the President of the Territorial Council, John H. Pilzer, introduced a resolution to take advantage of the situation and have the Agricultural and Mechanical College removed to El Reno, but this effort was rejected.[86] Apparently a whispering campaign was waged against the Stillwater location by means of a rumor that the college land was an alkali bed and worthless for agricultural purposes. The Eagle Gazette refuted

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[82] The Eagle Gazette, February 7, 1895, p. 3.

[83] The Daily Oklahoman (Oklahoma City), February 13, 1895, p. 4.

[84] The Eagle Gazette, February 14, 1895, p. 1.

[85] Ibid.

[86] The South and West (Beaver, Oklahoma), February 14, 1895, p. 1.

this rumor and stated that the land was better than the average of the territory. "The college farm," it continued, "is all that could be desired for the purpose for which it was intended."[87] It was rolling enough for good drainage, and had a good view.

Although efforts to move the college failed, the legislative report of the investigation of the college censured J. C. Neal, the station director, for poor methods of keeping station records and for his inability to produce a large number of vouchers.[88] The investigating committee exposed two additional abuses at the college. One regent had been superintendent of buildings at a salary of five dollars a day, seven days a week, even while no building was being erected. Other regents purchased livestock at double or treble their value; and as a result of such procedures members of the investigating committee stated that: "In our examination into the financial management of the institution we have found little to commend and a great deal to condemn."[89] After the investigation of the college other problems continued to develop that hindered the work of the station. Director Neal, writing in the college paper complained of the lack of support for its college and station -- buildings were too small, a new chemistry building was badly needed, and efforts continued to remove the college to some other location.[90]

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[87]The Eagle Gazette, February 14, 1895, p. 4. However, the legislative investigation committee reported adversely on the site. Territory of Oklahoma, Council Journal, 1895, p.665.

[88]The Daily Oklahoman, March 2, 1895, p. 1.

[89]The Edmond Sun Democrat, March 8, 1895, p. 1; Territory of Oklahoma, Council Journal, 1895, p. 665.

[90]The Oklahoma A. & M. College Mirror (Stillwater), May 15, 1895, p. 2.

The station staff changed considerably between March and December, 1895. President George E. Morrow, taking office July 1, 1895, replaced Neal as director and Magruder as agriculturalist. Henry Glazier replaced Frank Waugh in horticulture.[91] Neal died December 22, 1895, soon after completing work on a bulletin, Oklahoma Weeds.[92] Between December, 1895, and April, 1896, four men were added to the staff: John Fields, B.S., assistant chemist; I. H. Bone, B.S., assistant agriculturalist; A. N. Caudell, meteorological observer; and J. T. DeBois, clerk.[93] With this shake-up in the staff it was no wonder that the Yearbook of Agriculture reported research at the Oklahoma station only in the three areas of soils and waters, feeding experiments, and entomology.[94] Earlier in the year the station had assisted in efforts to form a Payne County Agricultural Society and had served as a meeting place January 22, 1895, for the election of delegates to the Territorial Agricultural Association.[95]

At this time the station was performing a number of non-research-oriented services, including those with agricultural societies. The Office of Experiment Stations in 1895, listed five such general services to be performed by the experiment station as (1) providing information to farmers, (2) practical tests of methodology, best varieties, and best adaptable breeds of livestock, (3) assistance in control of

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[91]O.A.E.S., Bulletin No. 17 (1895), p. 2.

[92]Ibid., p. 3.

[93]O.A.E.S., Bulletin No. 18 (1896), p. 2.

[94]Yearbook of Agriculture (1895), p. 559.

[95]The Eagle Gazette, January 11, 1895, p. 1.

insects and diseases, (4) protection of farmers against adulteration and mislabeling in the commercial sale of feeds, fertilizers, and seeds, and (5) search for general principles and procedures to be applied in farming operations.[96]

In 1895 the Oklahoma staff made some specific recommendations regarding such things as plowing, the use of diseased chinch bugs to control the insect, grapes, garden vegetables, the use of insecticides, oats, and weeds. The staff recommended that when farmers were plowing late they should break the ground in a east-west direction so that accumulations of snow in the furrows would add to the soil moisture.[97] The station's preparation and distribution of diseased chinch bugs seemed to have been well received by farmers, according to a small note in The Oklahoma A. & M. College Mirror, which reported that farmers were procuring them from the station and scattering them in their fields.[98] The horticulture department was testing over two hundred varieties of grapes in the vineyard at Stillwater.[99] It also tested a number of varieties of vegetables — fifteen peas, twenty-six muskmelons, twenty-five watermelons, thirty-four cucumbers, thirty lettuce, eleven potatoes, fourteen tomatoes, ten onions, and four okra.[100] Investigations with insects indicated that odoriferous substances such as kerosene

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[96]True, Bulletin No. 26, pp. 5-12. The application of scientific principles and methods to the problems of agriculture was established as the primary object of an experiment station.

[97]The Edmond Sun Democrat, February 8, 1895, p. 2.

[98]The Oklahoma A. & M. College Mirror (Stillwater), June 15, 1895, p. 12.

[99]O.A.E.S., Bulletin No. 14 (1895), pp. 1-14.

[100]O.A.E.S., Bulletin No. 15 (1895), pp. 17-29.

emulsions were ineffective in preventing damage except where a Bordeaux mixture was applied to the seeds or the plants of watermelon.[101] Oats and its cultivation was the topic of Bulletin Number Sixteen. The department of agriculture tested eighty-five varieties of oats during the 1894 season. Treatment of smut, rolling the seed bed, broadcasting versus drilling, crossing, fertilization, and subsoiling were some of the other experiments conducted with oats.[102] Many weeds came to Oklahoma by careless experimenting with cheap and impure seeds; and others came with packaged trees and plants, freight trains and animals. The staff published Bulletin Number Seventeen to aid farmers in recognizing and taking preventive action against weeds.[103] These limited research efforts would expand again in 1896.

The years 1896 and 1897 saw improvements over 1895 despite the disruption caused by the retention of only one member of the staff from the previous year. The new members had varying lengths of service with the station — from three months to a year. This, together with a reorganization to meet a more systematic arrangement of work and the effect of the legislative investigation, limited accomplishments.[104] The relationship between the station and college was maintained, with seven out of the eight members of the staff being teachers.[105] During

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[101] Ibid., pp. 29-32.

[102] O.A.E.S., Bulletin No. 16 (1895), pp. 33-40.

[103] O.A.E.S., Bulletin No. 17 (1895), p. 4.

[104] O.A.E.S., Annual Report, 1897, p. 4.

[105] U. S. Congress, Senate, The Work and Expenditures of the Agricultural Experiment Stations for the Year Ended June 30, 1896, Senate Document No. 137, 54th Cong., 2nd Sess. (Washington, 1897), p. 65.

1896 the previous work was continued with soils and waters, feeding experiments and entomology.[106] In the area of soil and water the staff member working in the field that would later become agricultural engineering made investigations with irrigation, preservation of existing soil moisture, subsoiling, the addition of decayed vegetable matter, and shallow cultivation.[107] The chemist meanwhile was analyzing corn to determine the food value in the three conditions — scorched, matured, and fodder.[108]

Other areas received aid from new staff appointments. Animal husbandry obtained the addition of a veterinarian to the staff July 1, 1896.[109] The Board of Regents on June 1 and 2, 1896, approved the creation of the chair of veterinary science and appointed L. T. Lewis, D.V.M., of the Agricultural College of Iowa to that position.[110] In entomology the problem of chinch bugs came up again as the theme of Bulletin Number Nineteen, but little concrete data were available except for the suggestion that wheat fields be separated from corn by alfalfa or clover.[111] The horticulturalist, Henry Glazier, in Bulletin Number Twenty described some of the causes of failure with various fruits, methods of cultivation in orchards, dangers from late frosts,

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[106] Yearbook of Agriculture, 1896, p. 605.

[107] O.A.E.S., Bulletin No. 18 (1896), pp. 13-17.

[108] O.A.E.S., Bulletin No. 20 (1896), pp. 9-15.

[109] Ibid., p. 2.

[110] The Oklahoma A. & M. College Mirror, June 15, 1896, p. 7.

[111] O.A.E.S., Bulletin No. 19 (1896), pp. 4-8.

pruning, and desirable locations for orchards.[112] A portion of the latter bulletin described investigations with wheat. Trials involved sixty-five varieties in seventy-odd plats; methods of soil preparation and planting were items of interest at the time.[113] The agriculturalist also conducted trials with thirty-seven varieties of corn, two of which he had obtained as seed from the Minnesota station.[114] This was an early example of inter-station cooperation. Progress was made toward widening the coverage of the territory through establishment of twenty-one reporting stations to provide temperature records and seventeen stations to report rainfall. The latter figures averaged 24.69 inches, which was quite a bit below the 31.40 inches at Stillwater, yet considerably above the 15.04 inches at Beaver in the northwest.[115] This variation from conditions at Stillwater would add to the justification for special stations to be established at a later time.

Farmers' Institutes

To spread the new agricultural information more widely around the territory, farmers' institutes began to operate. Although lectures on agriculture came earlier, farmers' institutes had their origin in the United States about 1870.[116] The legislature of Oklahoma provided for

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[112] O.A.E.S., Bulletin No. 20, pp. 9-20.

[113] Ibid., pp. 3-9.

[114] O.A.E.S., Bulletin No. 21 (1896), pp. 3-12.

[115] O.A.E.S., Bulletin No. 22 (1897), p. 3.

[116] L. A. Clinton, "The Relation of the Experiment Station to Farmers' Institute Work," U. S. Department of Agriculture Office of Experiment Stations Bulletin No. 154 (Washington, 1905), p. 1.

a county program of farmers' institutes, and at one time $200 was allowed for maintenance from the county treasurers. In 1896 it was the policy of the college and station that only one member of the staff should attend these institutes at any one time.[117] It was the general practice throughout the county that the stations' administrative staff in the respective states and territories work to arouse interest for farmers' institutes, but they were limited as to the number of localities with which they could come in contact.[118]

Although close cooperation between station staff and farmers' institutes was needed, many times the staff did not provide the most interesting lectures. Specialized or popularized versions of information by able speakers were needed in place of formal talks by station personnel.[119] This difficulty would be remedied in the future by the creation of the Extension Service. However, a constant interchange of ideas was needed between researchers and farmers to create a wise and understanding attitude on the part of investigators, regardless of weaknesses in communication.[120]

In order to gain the attention and the acceptance of new concepts and practices by farmers, experience showed that best results were obtained through organized groups of farmers. One estimate of the situation was that:

117*The El Reno News*, November 27, 1896, p. 1.

118John Hamilton, *History of Farmers' Institutes in the United States*, U. S. Department of Agriculture Office of Experiment Stations Bulletin No. 174 (Washington, 1896), p. 76.

119Clinton, p. 72.

120Mumford, *The Land Grant College Movement*, Missouri Agricultural Experiment Station Bulletin No. 419 (Columbia, 1940), p. 111.

> The unorganized farmer has not the incentive to learn the fine points of farming that one has who is a member of an organization for that purpose. For the tendency is not to think and improve one's methods unless the incentive is thrust upon one, as it is when one is a member of an organization....[121]

Anticipating these conclusions, the staff of the Oklahoma station in the 1890's would encourage various agricultural organizations, hold larger numbers of short courses, and widen extension activities to include more farmers in the territory.

In general the research efforts at Stillwater were increasing with time. The actual duties and operating procedures were clearly enumerated in the annual report for the year ending June 30, 1897. The director stated that most of the work would be done at the station. However staff members would assist the various agricultural societies by attending meetings and helping with organization work. In addition the staff would identify specimens of plants and insects that were believed to be probably valuable or injurious. They would suggest possible action in either case, and they would give advice, especially in outbreaks of diseases in plants or animals. Further help would come through bulletins to any resident in the territory who supplied the station with his address.[122] It was the purposeful plan of the Oklahoma station, as with most stations, to provide as much practical information as possible. This position the director again emphasized: "Without losing sight of the fact that a chief duty laid on the station is to make scientific investigation, unusual efforts have been made to

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[121] James M. Williams, The Expansion of Rural Life: The Social Psychology of Rural Development (New York, 1926), p. 309.

[122] O.A.E.S., Annual Report, 1897, p. 4.

select as subjects those which promise to be of immediate value in their practical application."[123] Accordingly farmers' institutes and short courses were offered by the staff further to implement this policy. An announcement was made in the Stillwater Gazette that one or more of the stations would assist in forming farmer institutes in the different counties of the territory.[124] The Edmond Sun-Democrat advertised a college-sponsored institute which offered a free course of lectures on farm orchards and dairy matters during the first two weeks of the winter term.[125] Various members of the staff organized and participated in institutes and other agricultural organizations. Professor Glazier, for example, went to Enid on November 15, 1897, and President Morrow traveled to El Reno in December for a similar institute.[126]

This staff was occupied to a considerable extent with the dissemination of agricultural information, but scientific researches continued in many areas.[127] Over 2,500 determinations were made by the staff during 1896-1897. The staff had engaged in field experiments with corn and kaffir, feeding experiments with special emphasis on utilization of kaffir, various horticultural investigations, and botanical and entomological studies.[128] The work at the station for 1896-1897 was summarized in a bulletin from the national office which listed studies of

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[123] Ibid., p. 5.

[124] Stillwater Gazette, November 25, 1897, p. 2.

[125] The Edmond Sun-Democrat, December 17, 1897, p. 1.

[126] The Oklahoma A. & M. College Mirror, December 15, 1897, p. 8.

[127] O.A.E.S., Annual Report, 1897, p. 8.

[128] United States Congress, Senate, Senate Document No. 137, p. 45.

animal diseases; chemical examinations of corn, kaffir, alfalfa, castor beans, and irrigation and potable waters; botanical and entomological studies; soil investigations; field experiments with wheat, oats, corn, kaffir corn, cotton, sugar, beets, and forage plants; rotation experiments; feeding and breeding experiments with cattle and hogs; and horticultural investigations.[129]

More specific research entered a number of fields. Agronomists studied soil preparation and water conservation, and emphasized the need to prepare specific soils in different ways in order that they receive and conserve water most readily. Some soils had greater water-holding powers than others, and as a result different methods had to be employed.[130] The chemist and his assistants meanwhile investigated nutrition in animal foods and pointed out the great loss in nutrition of corn stalks when these were left out in the weather.[131] Station chemists also conducted various studies of irrigation in 1897 to determine the usability of certain water sources in northern, western, and central portions of Oklahoma. Some streams were considered safe, while others were unfit for use, and wells and ponds varied from place to place. Certain aspects of agricultural engineering in the construction of ponds and wells were also discussed.[132] Extensive soil analyses at the station and in the vicinity of Stillwater absorbed a portion of the

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[129]A. C. True, _A Report on the Work and Expenditures of the Agricultural Experiment Stations for the Year Ended June 30, 1897_, Office of Experiment Stations Bulletin No. 50 (Washington, 1898), p. 65.

[130]O.A.E.S., _Bulletin_ No. 24 (1897), pp. 3-17.

[131]O.A.E.S., _Bulletin_ No. 25 (1897), pp. 3-4.

[132]O.A.E.S., _Bulletin_ No. 29 (1897), pp. 3-14.

chemist's time. Under the direction of the station chemist investigators examined the soils to determine the relationship to moisture, manuring, texture, and methods of culture.[133]

At the same time the activities of the entomologist and veterinary surgeon also increased. The entomologist investigated the advantages of various kinds of insecticides and insecticide-dispensing sprayers, and insects harmful to orchards.[134] However, for identification and research purposes one thousand species of insects were added to the station's collection, the life histories of a number of insects were studied, and the "chinch bug" infection which had been sent to 142 farmers of the territory in 1896 was determined to have been applied to the fields without any evidence of success.[135] The station veterinarian expanded his activities when he assumed the duties of territorial veterinary surgeon. In this capacity he investigated outbreaks of Texas fever in cattle, cases of glanders, and several cases of symptomatic anthrax. These duties lasted until March, 1897, and although these efforts interfered with research in the department certain advantages came to the station through wider contacts with livestock producers and through personal observation of animal diseases present in commercial operations.[136] Little or no research information was provided in Bulletin Number Twenty-seven, which discussed glanders, Texas fever and symptomatic anthrax. This was another example of the

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[133]O.A.E.S., Annual Report, 1897, p. 6.

[134]O.A.E.S., Bulletin No. 26 (1897), pp. 3-23.

[135]O.A.E.S., Annual Report, 1897, p. 7.

[136]Ibid., p. 8.

dissemination of general textbook information.[137]

In the area of animal husbandry, research centered in feeding experiments with cattle and hogs, breeding of Jerseys and Short-horn grades, and crosses among cattle; and breeding and feeding of Berkshire, Jersey-Duroc, and Poland China hogs.[138] Since Texas fever was a serious problem at the time, the Board of Regents, meeting in December, 1897, authorized the station to undertake an extended series of experiments regarding the prevention of the disease.[139] In horticulture research centered around the care of the large apple and peach orchard, vineyards, and fruit tree nurseries. Good results were obtained with strawberries, but results with raspberries were unsatisfactory.[140] Truck gardening and floriculture were also areas of interest. Investigations included variety trials of garden vegetables and plantings of hardy bulbs and roses.[141] The staff, while looking for a locally good feed, investigated the possibility of the "pie melon".[142] The agriculturalist continued investigations with cotton, wheat, and kaffir. This latter sorghum crop had special characteristics which could possibly be used to develop a feed grain to replace corn, and the staff gave this plant special attention.[143] Little

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[137]O.A.E.S., Bulletin No. 27 (1897), pp. 3-18.

[138]O.A.E.S., Annual Report, 1897, p. 7.

[139]The Oklahoma A. & M. College Mirror, December 15, 1897, p. 6.

[140]O.A.E.S., Annual Report, 1897, p. 7.

[141]Ibid.

[142]O.A.E.S., Bulletin No. 25 (1897), pp. 5-6.

[143]O.A.E.S., Bulletin No. 22 (1897), pp. 5-13.

information of local origin was available for the cultivation of cotton, whereupon Bulletin Number Twenty-three was merely a summary of current practices of farmers around the territory; it suggested that those who wanted additional information should procure a copy of Bulletin Number Thirty-three issued by the Office of Experiment Stations.[144] Perhaps this absence of sufficient local information in regard to cotton would affect the later decline in production of this crop. Wheat experiments consisted of eighty-three plats with sixty-four varieties. In addition to testing of varieties, investigations were made of deeper plowing, subsoiling, time and rate of seeding, and continuous wheat culture. Surprising was the above-average yield from the plat of continuous wheat which had received no fertilizer.[145] The research that was in progress with field crops involved the comparison of varieties, methods of preparation of the soil; time, mode, thickness, and disposition of seed; deep, shallow, frequent and infrequent cultivation; time of harvesting of wheat, oats, corn, kaffir, sorghum, cotton, castor beans, cow peas, soybeans, rape, sugar and stock beets; alfalfa, red and alsike clovers, and a number of grasses.[146]

Lack of Territorial Support for the Station

One limitation placed on the station was the failure of the

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[144] O.A.E.S., Bulletin No. 23 (1897), pp. 3-14.

[145] O.A.E.S., Bulletin No. 28 (1897), pp. 1-8.

[146] O.A.E.S., Annual Report, 1897, p. 6. Soy bean trials were a disappointment, but good yields developed in potatoes, peanuts, sugar beets, and various melons. Wheat had the largest acreage in the territory, cotton acreage was also large, and a satisfactory cultivation of castor beans appeared -- O.A.E.S., Bulletin No. 30 (1898), pp. 6-8.

territorial government to provide direct assistance to the station. The legislature was also slow in providing funds needed for buildings. As a result many projects were slow in developing or were put off indefinitely. Research activities were limited in scope, since salaries, labor costs, scientific instruments, publications, and building and maintenance costs all had to come out of the $15,000 Hatch fund plus station sales of $554.38.[147] Indirect support through the maintenance of the college was relatively small also. Only $750.00 of the Hatch funds could be used for building and repair, which meant that the development of greenhouses and other needed buildings was extremely limited.[148] A small note of contrast might make the Oklahoma situation more realistic. Ohio, for example, had just added a state appropriation of $52,184.98 to Hatch funds.[149] A small token appropriation from the Oklahoma legislature would have meant much to the station at this time. However, despite the financial hindrance, the station obtained favorable evaluation from the Washington office. A. C. True, the Director of the Office of Experiment Stations, stated that: "The Oklahoma Station has made definite progress during the past year in organizing its work on useful lines and within proper limits."[150] The procurement of better trained staff members, improved operation of field experiments, and a definite division between station and college ground made for a much more efficient operation. Station funds were much more economically

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[147] O.A.E.S., Annual Report, 1896, p. 10.

[148] Ibid, p. 5.

[149] Senate Document No. 137, p. 44.

[150] True, Bulletin No. 50, pp. 45-55.

utilized, and accounting methods followed the rules established by the national office.[151]

The year 1897 saw a small start toward creation of a special station and the beginning of cooperative research efforts with other agencies. The director stated that although the chief work of the station had to be done at Stillwater, a number of cooperative experiments with farmers would be arranged where beneficial.[152] A second endeavor with cooperative research was conducted with the Division of Forestry of the United States Department of Agriculture.[153] The station also cooperated with the Department of Agriculture in experiments with the growth of sugar beets in various parts of the territory, tested varieties of Egyptian cotton, and conducted investigations with grasses and forage crops and researches with forest trees. In the latter area the Secretary of Agriculture assigned land for a rather extensive experiment.[154]

The facilities and staff had changed significantly from 1892 to 1897. Changes in personnel illustrated the national problem of fairly frequent turnover of staff and directors. George T. Holter, B.S., head of the chemistry department, was the only original staff member left. George E. Morrow, M.A., President of the college, was director and agriculturalist, and Henry Glazier was vice director and

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[151]Ibid. True went on to state: "It is hoped that this station will hereafter be able to maintain a consistent and permanent policy, and thus render services of increasing value to the agriculture of Oklahoma."

[152]O.A.E.S., Annual Report, 1897, pp. 3-4.

[153]Yearbook of Agriculture, 1897, p. 157.

[154]O.A.E.S., Annual Report, 1897, p. 6.

agriculturalist. Additional staff members included Lowery L. Lewis, M.S., D.V.M., veterinarian, John Fields, B.S., assistant chemist, John H. Bone, B.S., assistant in agriculture, and James T. De Bois, clerk.[155] Six of these members of the staff were also on the faculty of the college. President Morrow supported this arrangement as being effective for both research and instruction. He stated that the close relationship between the college and the experiment station was of great benefit in providing a specially trained staff to meet a rather diverse need, and that it also enabled research reports to be given more directly at farmers' institutes, meetings of agricultural societies, and short courses than was possible merely through the distribution of bulletins.[156] Facilities for the station were somewhat temporary, in that they occupied rooms in the new building of the college, and the staff were crowded in the facilities of "Old Central". This building provided office space and facilities for the indoor work of the agriculturalist, the botanist, the entomologist, and the horticulturist. Space was provided for the work of the assistant agriculturalist and the meterological observer in the chemical laboratory building.[157] A building was added to provide a laboratory for the veterinarian, a storage room for specimens and a small room for dairy work, and additional facilities for feeding experiments.[158] Despite these additions

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[155] O.A.E.S., Annual Report, 1898, pp. 4-5.

[156] O.A.E.S., Annual Report, 1897, p. 6. During 1897 one graduate of the college and several advanced students acted as assistants to researchers conducting the various station projects.

[157] O.A.E.S., Annual Report, 1898, pp. 4-5.

[158] Ibid.

the director stated a need for more land, a greenhouse for botanical and horticultural experiments, and an additional room for the entomologist to study the life history of insects. He pointed out that to depend for additions to facilities on the allowable annual sum of $750.00 provided by the Hatch Act, meant a slow acquisition of buildings.[159] Space and buildings would remain a continual problem until after the First World War, when the legislature began making a sizeable sum available to the station.

Other aspects of the Stillwater operation deserved critical examination. Bulletin Number Twenty-four was another example of a study of the soil in the immediate vicinity which had little application elsewhere in the territory except perhaps to encourage the spread of soil analyses and utilization of methods which would conserve soil moisture.[160] Bulletin Number Thirty, a general geographical and agricultural summary of the territory in 1897, was another indication that the program of the station did not consider the diversified terrain, soil, and climatic factors found in Oklahoma.[161] The rather optimistic picture of agriculture was also a naive assessment of the situation.

The above complaints and conditions were observed by the Director of the Office of Experiment Stations when he conducted an official investigation of the Stillwater operation during the 1896-1897 fiscal year.[162] In his report, which included the work during 1898, he stated

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[159]Ibid., p. 5.

[160]O.A.E.S., Bulletin No. 24 (1897), pp. 4-17.

[161]O.A.E.S., Bulletin No. 30, pp. 3-6.

[162]O.A.E.S., Annual Report, 1897, pp. 4-5.

that research was proceeding in an orderly and active manner, and that a consistent policy for obtaining greater efficiency was being maintained. Some new lines of investigation should prove beneficial to territorial agriculture, but the farm and garden operations were viewed as too extensive for the rewards reached. Funds could be diverted from the latter investigation to operations which would affect the general agricultural interest of the territory. He suggested that the college or some other agency assume the duties of popular agricultural education and other non-experimental activities designed for the advancement of agricultural interest.[163]

The activities of the station, 1897-1898, varied little from those of previous years except in the case of the study of San Jose scale (resulting from an outbreak of the disease in the territory) and a careful examination of bacteria in milk.[164] Meanwhile, sales of station products during 1897-1898 amounted to $1,150.29 and indicated successful small scale operations by the station staff.[165] According to the Yearbook of Agriculture, 1898, Oklahoma had 6,949,715 acres in Indian reservations, 26,880 acres in military reservations, and 230,565 acres of other reserved land.[166] In addition, 7,007,000 acres of

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[163] Alfred C. True, A Report on the Work and Expenditures of the Agricultural Experiment Stations for the Year Ended June 30, 1898, Office of Experiment Stations Bulletin No. 61 (Washington, 1899), pp. 78-79.

[164] O.A.E.S., Annual Report, 1898, p. 2.

[165] Ibid., p. 4.

[166] Yearbook of Agriculture, 1898, p. 330.

vacant public land remained for settlement.[167] Indian lands would be a hindrance to scientific farming and ultimately would slow the adoption of methods discovered through research. Perhaps this situation and other factors contributed to research investigation being devoted to the Stillwater and Payne County area. In any case the main areas of concern at the station in 1898 were botany, soils, field experiments, horticulture, digestion experiments, stock feeding, entomology, and irrigation.[168] The staff called attention to the generally poor breeding methods in livestock, but the staff themselves expended little effort with dairy cattle or sheep, while devoting time to the grazing of cattle, production of hogs, and poultry raising.[169]

Texas Fever

Livestock producers were concerned about Texas fever, and as a result the station built a dipping vat in the summer of 1898 at Noble. Here 240 cattle were dipped in insecticide under the supervision of the station staff.[170] The veterinarian reported in Bulletin Number Thirty-nine the research efforts with inoculation against Texas fever that had been conducted at other state stations.[171] Dr. Lewis also conducted dipping experiments at Noble with extra dynamo oil containing sulfur.

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[167]Ibid., p. 345. The western third of the territory had cattle raising as the leading industry. Wheat, other cereals, and cotton were the main crops in central and eastern Oklahoma at the time.

[168]Ibid., p. 600.

[169]O.A.E.S., Bulletin No. 30, pp. 8-9.

[170]O.A.E.S., Bulletin No. 39 (1898), p. 6.

[171]Ibid., pp. 15-28.

These were successful in killing ticks on the cattle tested.[172] Dipping to control the disease was especially important, as cattle losses had been large and the potential was larger.

Other work in 1898 at Stillwater included digestion trials with steers, experiments with corn and kaffir, and with combinations thereof. The latter showed that a feed consisting of a mixture of corn and kaffir was superior to either corn or kaffir alone.[173] Horticulture studies involved strawberries, grapes, and various fruit trees.[174] Nineteen varieties of strawberries produced varying amounts of berries.[175] Research with grapes continued with the vines planted in earlier years. The staff planted 134 varieties in the spring of 1894, and 21 varieties in the spring of 1896. Three canes of each variety had been set except those of 1894, when only two canes were set.[176]

In agronomy workers reported activities in soil conservation, seed grains, corn, oats, wheat, and general crop production techniques. Bulletin Number Thirty-two was a practical essay on soil conservation and fertility, with a short discussion of the advantages for growing castor beans and returning the pods to the soil as fertilizer.[177] Agriculturalists had experimented with kaffir, milo maize, and sorghum in a search for a good fodder crop in 1897. The tests with twelve

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[172] The El Reno News, November 11, 1898, p. 2.

[173] O.A.E.S., Bulletin No. 35 (1898), pp. 1-4.

[174] O.A.E.S., Bulletin No. 31 (1898), pp. 3-18.

[175] Ibid., p. 7.

[176] Ibid., p. 10.

[177] O.A.E.S., Bulletin No. 32 (1898), pp. 3-15.

varieties of kaffir, sorghum, and milo were also conducted in terms of thickness of rows which varied from six inches to three feet apart.[178] The staff also reported that corn tested on forty-four plots in 1897 illustrated the impractibility of regular corn in a dry climate.[179] The experiments with corn investigated thickness of planting, depth and method of plowing, root pruning, methods of cultivation, and tests of varieties.[180] Investigators examined kaffir corn to find its value for digestion in adding poundage or gain for steers and for analyses of the chemical composition for nutrition.[181] Wheat tests continued with 56 varieties in 86 plats.[182]

Forestry was finally growing in importance for commercial purposes and for research. Professor Glazier, writing in 1898, cited the increased interest in forest trees of the part of the U. S. Secretary of Agriculture and stated further that four acres of station land had been planted in trees and tree seeds. The amount of seeds and trees by varieties involved were 1,815 mulberry, 1,815 catalpa, 404 hickory, 2,000 burr oaks, 500 black cherry, 2,000 butternut or pignut, about 4,000 black walnut, nearly 3,000 red maple, about 4,000 pecan, 500 white ash, 1,800 silver maple, 1,000 white and red oak, and 3,000 black locust.[183] Farmers were given general information concerning the

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[178] O.A.E.S., Bulletin No. 33 (1898), pp. 3-8.

[179] O.A.E.S., Bulletin No. 33, pp. 8-10.

[180] O.A.E.S., Bulletin No. 36 (1898), pp. 2-4.

[181] O.A.E.S., Bulletin No. 37 (1899), pp. 1-20.

[182] O.A.E.S., Bulletin No. 36, pp. 1-2.

[183] The Oklahoma A. & M. College Mirror, February, 1898, p. 4.

procurement, care, and use of trees on their farms as well as an indication of research results at the station with a number of varieties.[184] The first tree plantings for wood lot research were made in the spring of 1898. Plat number 35 contained 1,599 catalpas, 270 black cherries, 270 burr oaks, and space for 1,599 Russian mulberries, although these were never planted. Of those planted in this plat 1,538 catalpas, 188 black cherries, and 142 burr oaks would be living in December of 1903.[185] In plat number 36 the staff planted 1,500 white elms, 1,500 soft maples, 600 burr and red oaks, and 330 black locust. Those which remained in the plat in December, 1903, were 329 black locust and 260 oaks.[186] In plat number 37 the horticulturalist placed 2,558 red maples, 511 black birches, 374 pecans, and 320 white ash. Of these 310 white ash, 76 pecans, and 126 black walnut trees were living in December, 1903.[187] All of the black birch had died in plat number 37.

A number of problems arose in regard to free services and publications of the experiment station. Although the station provided a variety of service to territorial farmers, many of these individuals retained the mistaken idea that the experiment station was distributing free seeds to all who would ask for them. Such requests reached the point that the staff had to issue Bulletin Number Thirty-three which explained that seeds could be obtained only from the territorial

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[184] O.A.E.S., Bulletin No. 60 (1903), pp. 1-19.

[185] Ibid., p. 12-13.

[186] Ibid., p. 13.

[187] Ibid.

delegate in Washington.[188] The mailing list for all station bulletins numbered 13,000 as of June 30, 1898.[189] The further expansion was temporarily halted by printing difficulties.

Legal Battle Over Printing of Bulletins

A legal battle before the Oklahoma Supreme Court over the printing of college and station publications reduced the bulletins to mere summaries in 1898.[190] The publication of bulletins of extended nature was prevented until April, 1899, by this legal controversy. The contest arose over the unreasonably high prices charged for work under the contract for printing made by the Territorial Legislature in 1897.[191] Printed materials cost amounts which varied widely; for example 4,000 bulletins 16 pages in length cost $29 when given to an individual printer. Another bulletin, 4,000 copies and 17 pages long printed by the contractor assigned by the legislature, cost $115.97. In another case a private printer produced 13,000 bulletins, eight pages long, for $46.50, while the contractor printed 14,000 bulletins, four pages in length at a cost of $100.12.[192] This addition of graft to expenses of the station brought the censure of the national office. If the Hatch funds were to be used in the proper manner at the Oklahoma station publications had to be either suspended or greatly reduced in size. This

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[188] O.A.E.S., Bulletin No. 33 (1898), p. 18.

[189] O.A.E.S., Annual Report, 1898, p. 1.

[190] O.A.E.S., Bulletin No. 35 (1898), p. 1.

[191] O.A.E.S., Annual Report, 1898, pp. 10-11.

[192] O.A.E.S., Biennial Report, 1899-1900, p. 21.

situation then complicated the transmission of research information to local farmers.[193]

Reorganization of 1899

The work of the station had become so large by 1899 that considerable reorganization was needed. This task was accomplished after the resignation of President Morrow from his positions at the college and the subsequent resignation of the vice director and associate agriculturalist.[194] John Fields, B.S., the associate chemist, became director and chemist, and A. C. Scott became president of the college.[195] These arrangements were looked upon with favor by the national office, which considered them a step in the right direction toward more definite separation of the college from the station. The reorganization of the station appeared to promise greater efficiency and usefulness.[196]

Six departments were created as part of the reorganization. The agricultural department was investigating soils, temperature, moisture, effects of plowing, and tests of varieties of corn, wheat, alfalfa, grasses, and forage crops. Feeding experiments with cattle, hogs, and sheep were the main efforts in the second department, animal husbandry.

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[193] O.A.E.S., Annual Report, 1899, p. 3.

[194] O.A.E.S., Annual Report, 1899, p. 15. President Morrow retired because of ill health and died at the age of 60 in March, 1900. The El Reno News, March 29, 1900, p. 1.

[195] Ibid., p. 2. A stenographer was added sometime in April or May of 1899 - O.A.E.S., Bulletin No. 40 (1899), p. 2. The Board of Regents had appointed Henry M. Hand as clerk the previous March (1898) --- The Stillwater Gazette, March 24, 1898, p. 2.

[196] Alfred C. True, A Report on the Work and Expenditures of the Agricultural Experiment Station for the Year Ended June 30, 1899, Office of Experiment Stations Bulletin No. 83 (Washington, 1900), p. 70.

The horticulture department was involved with problems concerning orchards, pruning, potatoes, cabbage, onions, blackberries, and raspberries. The department of chemistry was working on such projects as digestion trials with sheep, examination of rocks and minerals of the region, and fodder analyses. The fifth and sixth departments were entomology and veterinary science.[197] The station veterinarian, in addition to being professor of veterinary science, was also professor of zoology.[198] Research in this last department involved tick fever, dipping vats, and dairying. The veterinarian emphasized the need for greater information concerning Texas fever, validation of the tick theory, methods of control-dipping, and inoculation experiments.[199] The station provided plans for the construction of dipping vats, the necessary chutes, pens, and methods of dipping cattle.[200]

The station veterinarian conducted investigations during 1899 into such special areas as the bacterial factors of milk.[201] The chemist extended his services in the territory by analyzing water for irrigation taken from more widely scattered areas such as Alva, Woodward, Waynoka, El Reno, Pond Creek, and Pawnee, but this was far from adequate.[202] The station botanist produced Bulletin Number Forty-one to replace the out-of-print Bulletin Seventeen devoted to weeds and the

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[197]O.A.E.S., Annual Report, 1899, p. 13.

[198]Oklahoma Agricultural and Mechanical College, College Announcement, 1898-89, p. 1.

[199]O.A.E.S., Bulletin No. 39, pp. 1-28.

[200]Ibid., pp. 6-15.

[201]O.A.E.S., Bulletin No. 40, pp. 3-16.

[202]O.A.E.S., Bulletin No. 38 (1899), pp. 3-7.

need for their continuous eradication from the fields. This investigator listed the more abundant types of weeds in the territory and the best means of control of each.[203] In the area of horticulture the staff reported successful cultivation of fruits and berries in thirteen counties.[204] Meanwhile researchers at Stillwater continued experiments with fruit trees; care of potatoes, cabbage, onions, tomatoes, beans, and berries; and the conducting of trials of the forestry plantation under the direction of the U. S. Department of Agriculture.[205]

The agriculturalists meanwhile conducted soil studies which emphasized the need for special plowing techniques, addition of humus materials, and special cultivation to profit best from available moisture.[206] Field crop experiments centered around five varieties of oats; kaffir, with experiments in thickness of planting, depth of plowing, and methods of cultivation; castor beans, especially time and thickness of planting; cotton; and cowpeas.[207] In addition to the continuous wheat plat, other plats contributed information concerning continuous cotton culture, continuous culture of castor beans, continuous culture of corn; and one, two, and three-year rotations — corn, cowpeas, wheat, cotton, and kaffir.[208] In addition to the above investigations work was continued with diseases among horses, climatic

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[203] O.A.E.S., Bulletin No. 41 (1899), pp. 1-12.

[204] O.A.E.S., Bulletin No. 43 (1899), pp. 3-12.

[205] O.A.E.S., Annual Report, 1899, p. 13.

[206] O.A.E.S., Bulletin No. 42 (1899), pp. 3-26.

[207] O.A.E.S., Bulletin No. 44 (1899), pp. 3-12.

[208] O.A.E.S., Annual Report, 1899, pp. 12-13.

conditions of Oklahoma and animal breeding. The breeding experiment with Shorthorn cattle began in 1899 with the purchase of three animals from T. J. Wallace of Bunceton, Missouri. These two registered cows and a registered bull were shipped to Perry by railroad and then led across country to Stillwater, October 31, 1899.[209]

The college and station operations continued to be intertwined despite the reorganization during the year. Although the staff desired a separation in administration and permanent plots for experimental purposes, the practice at Stillwater and other states and territories remained that of using buildings and farms jointly by the colleges and stations.[210] The reorganization of the station may have contributed to the absence of farmers' institutes during the year.[211] Contact was maintained with farmers through press bulletins, which were a more convenient way to answer questions than by corresponding with individual producers.[212]

The Oklahoma Agricultural Experiment Station appeared to be in good condition in 1900. Research activities continued along the lines of earlier years. The chemistry department was not yet burdened with inspection duties as was true of other states, and thus could continue

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[209] W. L. Blizzard, "Shorthorns at Oklahoma Agricultural College," The Oklahoma Agriculturalist, V (1917), p. 7. The College Paper reported the purchase of a bull and two heifers of Hereford breed as well. The six head of cattle were reported to cost $1,800 - The College Paper (Stillwater), October 1, 1899, p. 56.

[210] Yearbook of Agriculture, 1899, p. 675.

[211] O.A.E.S., Press Bulletin No. 50, July, 1899, p. 1.

[212] Yearbook of Agriculture, 1899, p. 541.

various analyses unhampered by the burden.[213] Digestion analysis of feeds used with chickens and sheep was one area of study in the field.[214] The entomologist examined root rot fungus found on fruit trees.[215] Tests with bees during 1899 and 1900 resulted in the staff considering beekeeping unprofitable for the territory.[216] This opinion may have been an important factor in the small amount of interest shown in this farm operation in later years.

Evidently as late as 1900 the flora of Oklahoma had not been catalogued except where surrounding regions had similar plant life. Bulletin Number Forty-five provided available information in regard to plants of the territory and acted as a basis for further classification. This evolved into a forty-two page list of plants.[217] The horticulture division of the station had fifty acres for testing varieties of orchard and small fruits. This orchard was to be given to the college upon completion of experiments.[218] In the spring of 1900 the staff planted trees in thirty-four plats. The varieties placed in these plats were white ash, boxelder, catalpa, white elm, black locust, honey locust, and soft maple.[219] In the area of field crops wheat and forage

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[213]Alfred C. True and V. A. Clark, The Agriculture Experiment Stations in the United States, Office of Experiment Stations Bulletin No. 80 (Washington, 1900), p. 373.

[214]O.A.E.S., Bulletin No. 40 (1900), pp. 3-8.

[215]O.A.E.S., Bulletin No. 48 (1900), pp. 3-32.

[216]O.A.E.S., Circular of Information ([n. d.]), p. 4.

[217]O.A.E.S., Bulletin No. 45 (1900), pp. 4-48.

[218]True, Bulletin No. 80, p. 372.

[219]O.A.E.S., Bulletin No. 60, p. 13.

crops were of major interest. Experiments with wheat suggested that July plowing would capture more moisture from rains, seeding in September would also add to the yield; in addition, eleven varieties were recommended for areas with conditions similar to those of Stillwater.[220] The acre of continuous wheat production continued to produce comparison information such as that involving the use of manure.[221] An area was set aside for small plats, ten feet by twenty feet, for variety trial with grass. A number of tests were made here before the plants were grown in larger areas.[222] The staff conducted some trials with rape for a forage crop, but hot dry weather in July killed the plants. Field peas, sugar beets and cowpeas were other forage crops that were tested in 1900.[223]

Despite all of these determinations with crops and animals, farmers and stockmen in the western portion of the territory exerted pressure for a sub-station in their area. Director John Fields replied that all the work of the station was valuable to them except for field trials.[224] However, this opinion was not quite correct and the criticism was warranted, for apparently little of the station research applied to or was of value to the drier and colder areas in the western portion of the territory. The director's own statement, to the effect that the main work of the station in 1900 centered around experiments

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[220] O.A.E.S., Bulletin No. 47, pp. 26-27.

[221] Ibid., pp. 30-39.

[222] O.A.E.S., Bulletin No. 48, p. 4.

[223] Ibid., p. 9.

[224] O.A.E.S., Biennial Report, 1899-1900, p. 22.

in animal husbandry and the production of orchards and small fruits seemed to bear out the criticism.

This situation could have warranted sub-stations in the territory, but the creation of sub-stations was contrary to Washington policy. A United States Department of Agriculture ruling issued March 10, 1896, stipulated that the establishment of sub-stations was contrary to the spirit and intent of the Hatch Act; furthermore, Hatch funds were not to be used for the purchase or rental of land, and only those farm operations that constituted a legitimate part of agricultural investigations or experiments were permissible. Bulletin Number Seveny-four of the Office of Experiment Stations required research to be limited to one station in each state or territory.[225] Finally, the station had the right to retain for its own use those funds received from the sale of farm products or other properties in the possession of the station.[226] This last policy would create problemsbetween the Oklahoma station and the state government.

Conditions within the territory were not the best for the greatest expansion of the station program or the wide utilization of research contributions. Various disappointments occurred despite the advancement in the size of the staff. From the time of first settlement to 1900 tenancy in Oklahoma rose to twenty-one percent. The expense of machinery, the land monopoly of Indians in certain areas, and other

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[225]U.S.D.A., Office of Experiment Stations, Bulletin No. 74, (Washington, 1900), pp. 101-2.

[226]Yearbook of Agriculture, 1899, p. 521.

factors contributed to this situation.[227] In general scientific or book-farming was subordinate to mechanical improvements in the improved production of agriculture.[228] Efforts of the station staff to organize farmers' institutes met with failure during 1899-1900.[229] The station staff nevertheless had increased to nine, while the addition of two more persons with Master of Science degrees indicated a more advanced state of research.[230]

Evaluation of Facilities

The growth of the staff in 1900 also reflected increases in the financial support and the number of farmer patrons. The college and station had an income from various sources of $50,000.[231] The sale of produce by the station during the period between November 30, 1898, and October 6, 1900, amounted to $4,472.48.[232] The circulation of Bulletin Number Forty-seven of September, 1900 reached 15,000.[233] The director of the national office and the staff at Stillwater criticized the territorial government for failing to provide sufficient numbers of buildings for the college and station. In comparison with other

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[227]Fred A. Shannon, The Farmer's Last Frontier - Agriculture 1860-1897, Vol. V, The Economic History of the United States, (New York, 1945), p. 146.

[228]Ibid., p. 147.

[229]O.A.E.S., Annual Report, 1900, p. 18.

[230]Ibid., p. 4.

[231]Ibid., p. 6.

[232]O.A.E.S., Biennial Report, 1899-1900, pp. 28-29.

[233]The College Paper (Stillwater), July 25, 1900, p. 58.

western states or territories, Oklahoma had the smallest amount of money invested in buildings per number of students. The value of A. and M. College buildings was $35,000, as compared to $43,000 for New Mexico, $86,000 for Arizona, $92,000 for Oregon, $232,358 for Kansas, and $299,015 for Texas.[234] The value of instructional equipment compared more favorably -- $60,363 to $21,500 for Oregon and $49,807 for Arizona. Yet the Oklahoma figure did not compare well with the $165,841 for Kansas.[235] Facilities in general at the Oklahoma college and station were not very extensive in 1900. Only four buildings were occupied for instruction and experimentation, and the grounds contained only two hundred acres.[236]

Indoor accommodations were not as satisfactory as those for outdoor investigations. One wing of "Old Central" was used by the staff and had two laboratories, a balance room, a library, a sample room, and offices of the director and clerk. The basement under this wing provided space for a workroom equipped with grinding mills and a motor.[237] These accommodations housed a collection of 2,400 specimens of native plants, a similar collection of insects, samples of grain and straw of more than 200 varieties of wheat, a collection of native grasses, and a library of 1,000 volumes exclusive of bulletins.[238] New construction at the time was to provide added facilities during the year. The

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[234]O.A.E.S., Biennial Report, 1899-1900, p. 8.

[235]Ibid., p. 15.

[236]O.A.E.S., Annual Report, 1900, p. 6.

[237]True, Bulletin No. 80, p. 372.

[238]Ibid., pp. 372-73. The college had 4,000 volumes in its library at the time.

station laboratories and offices took over one-third of the new buildings occupied by the chemistry department. The agriculture department then occupied the space in "Old Central" formerly used as a chemistry laboratory. The station veterinarian obtained facilities in the new library building. Sheds and feed yards were constructed for steers. Other sheds provided shelter for forage supplies and implements, and a small piggery was added to the facilities of the college and station.[239] The horticulture department obtained the use of a new hothouse completed in August, 1900.[240]

After eight years of work the station was not only getting more adequate facilities, but it was also being more readily accepted by the farmers; furthermore, it had collected sufficient information so that programs could be developed for the particular needs of Oklahoma. These conditions were reflected in a number of factors. Correspondence coming to the station was changing from requests for seeds and plants to more specific questions relating to farm problems.[241] The amount of native grasses in Oklahoma was probably a factor in the station director's hope that every farmer would have a herd of steers.[242] Another factor was the suggestion of diversified farming, made by the director in the annual report for 1900. The practice of planting a single crop

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[239] Alfred C. True, A Report on the Work and Expenditures of the Agricultural Experiment Stations for the Year Ended June 30, 1900, Office of Experiment Stations Bulletin No. 93 (Washington, 1901), p. 133.

[240] The Stillwater Gazette, August 23, 1900, p. 3.

[241] O.A.E.S., Annual Report, 1900, p. 17.

[242] Ibid., p. 21.

alone was condemned.[243] Peanuts were suggested as an additional crop for those areas having moist sandy loam soils.[244] With the increased patronage the director began to stress the value of the station to the individual farmer.

Evaluation of the First Eight Years

The philosophy behind the research activities of the Oklahoma station in 1900 was expressed by the director, John Fields. He stated that:

> The work of the station is to discover new truths or new applications of old ones, connected in any way with the great many-sided industry of farming, and to publish the results which it has secured. The work of the college, on the other hand, is to place systematized knowledge bearing in any way upon agriculture or the mechanical arts, in a shape available for those who wish to acquire it.[245]

The director evaluated the first eight years of the program by answering the question, "What value was the station?" Pointing out various activities that more than paid for its operation, he cited the discovery of the value of castor bean pods for fertilizer; fifteen thousand tons of these pods at the current price of $10.00 a ton would pay for the whole operation of the station for a year, which was all the more important since more than that tonnage was wasted by farmers. Secondly, the advantages of kaffir meal over kaffir grain was another discovery which more than paid for all research. The saving of horses from smut on grass in Garfield county was a third example in which the

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[243]Ibid., pp. 33-44.

[244]Ibid., p. 49.

[245]Ibid., p. 19.

losses prevented could easily have matched the station's operating costs.[246] The research program at Stillwater had likewise aided farmers in the introduction of crops adapted to the region, especially alfalfa, cowpeas, sweet potatoes, and kaffir. It also had assisted the farmer in discoveries of improved varieties of wheat, maize, and oats. A significant contribution had come from information suggesting greater care in the cultivation of crops. Livestock producers had obtained considerable assistance through the investigations with the culture and nutritional value of kaffir.[247] Since a portion of the territory was semi-arid, the investigations with the cultivation of forage plants adapted to local conditions were also an important area of work.[248] The national office recognized the problems created by the variations in soil and climatic conditions, called attention to the accomplishments then achieved by the station, and was aware of the necessity for determining the natural conditions of climate, soil, vegetation, and the adaptability of different varieties of cultivated plants to these factors in this new agricultural region.[249]

The general conditions of the experiment station were good in 1900. Research was centered on topics of popular interest considered to be of immediate importance to farming in the territory — questions dealing

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[246]Ibid., pp. 20-21.

[247]True, Bulletin No. 80, pp. 374-75.

[248]Ibid., p. 373. The average annual rainfall in Oklahoma was 35 inches and decreased from that figure in the western half of the territory. The principal crops at the time — maize, wheat, oats, sorghum, kaffir, and cotton — reflected the decreasing rainfall from east to west. Ibid., p. 371.

[249]Ibid., p. 373.

with animal science, the production of orchard and small fruits, and especially the values of greater diversified farming.[250] The equipment of the facility was more adequate, investigations turned toward the most important areas for study, and the operations of the station were systematized to a greater extent. The general population was interested in the affairs of the station, its reputation was good, and the future had never looked better.[251] The general areas of investigations were: field experiments, forestry, diseases of plants, digestion and feeding experiments, animal husbandry, diseases of animals, and entomology.[252] In 1900 the station had approximately 170 acres for its use, and the campus absorbed the other 30 acres of college land. Nine of the 170 acres were divided into a series of half-acre plots for tests of rotations or continuous culture of different field crops. A pasture of 30 acres containing native grass provided feed and the location for feeding experiments. No general field crops were grown except for an experimental field of alfalfa.[253] The soil at Stillwater was described as medium upland type with an average fertility; the topsoil was four to twelve inches deep and, although it worked fairly well, it had a tendency to pack after a rain.[254] The station kept a small flock of sheep and purchased varying numbers of hogs and steers as needed for

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[250]True, Bulletin No. 93, p. 133.

[251]Ibid., pp. 133-34.

[252]Yearbook of Agriculture, 1900, p. 640.

[253]True, Bulletin No. 80, p. 372.

[254]O.A.E.S., Bulletin No. 48 (1900), pp. 3-4.

feeding experiments, but it did not have a dairy herd in 1900.[255] This absence of dairy cattle was one measure of insufficient research during the initial years of the station's development.

It had been unfortunate during these early years that individual interests of researchers and popular demands had governed the direction and depth of agricultural research at the Oklahoma facility. The emphasis on horticulture, which would later be an important part in the state's economy, was in advance of technology. Researchers failed to realize the diversity within the territory and assumed that whatever was true at Stillwater would apply throughout Oklahoma. Experience with the territorial government appeared to bear out the conclusion that political leaders had no real knowledge or understanding of what was involved in agricultural research and merely wanted to obtain the federal funds made available by the Hatch Act. Even local farmers who stood to gain the most were slow to realize the potential that existed in the experiment station. Although much progress had been made during the years 1892 to 1900, much more could have been accomplished with direct grants from the territorial legislature, creation of sub-stations with territorial appropriations, and a complete evaluation of soil types, climate patterns, rainfall, temperature variations, and vegetation regions. With such information many of the farming concepts of the northeast might not have been emphasized, and the program of research might have been more realistic. However, the trial-and-error method had produced some information that alleviated the wholesale application of eastern farming practices and crop production. Early

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[255]True, Bulletin No. 80, p. 372.

trials with wheat, kaffir, cotton, and sorghums would have important effects in later years, as would feeding and breeding work with livestock.

In many cases research efforts were not conducted by a clearly defined expert. Individual staff members crossed boundaries between departments, and the published results in the form of station bulletins might not always fall into the obvious category. In some cases research in various areas was conducted without bulletins or other publications that would show progress or accomplishments. In other cases research would be of such a continuous nature that no definite conclusions were ever reached in a form that could be published. Some information would go directly to the classroom without an attempt at publication, while in other cases research results would find an outlet in scientific journals. Of course true agricultural research carries little of the sensational, and rarely have important discoveries occasioned loud public applause. Periodic presentation of new information involved a gradualism that would also create a condition inhibiting the sensational. A tabulation made of publications printed during the first eight years with classification determined by the obvious catetory rather than by the identity of the researcher or the department doing the work, revealed emphasis and supposedly accomplishments centering first on agronomy, and then equally on chemistry, entomology, horticulture, and animal science.

CHAPTER III

EXPANDED OPERATIONS 1901 TO 1920

The first twenty years of the twentieth century would see the Oklahoma Agricultural Experiment Station grow in size of staff, physical facilities, cropland acreage, federal financial support, and territorial and state assistance. The nature of research orientation would change with new problems, national guidance, and territorial and state interference. Serious problems would arise as to administrative policy, personnel, state and national financing as well as political manipulation of station monies and policies. Congressional legislation, notably the Adams Act, the Smith-Lever Act, and the Smith-Hughes Act would be a large influence on the work of the station. The college and station would obtain more adequate housing, and the station would also receive a small amount of direct financial support from the territory and state. The erection of an agricultural building and its subsequent loss by fire would also have far-reaching effects on the station. The First World War would influence the affairs of the Oklahoma station both in manpower and in areas of research. Like agriculture in general, research in agriculture would also be disrupted by the unsettling effects of the war and the postwar economic adjustments.

The Oklahoma Agricultural Experiment Station expanded and made wider contacts with farmers during the first years of the century. Director John Fields, in an address at the inspection of the college and station February 1, 1901, called attention to the fact that 12,000 farmers received guidance and advise from the bulletins. He further stated that although instruction was not the purpose of the station the short courses in the winter served as connecting links between farmers and the station. He enjoined members of the legislature to provide more facilities and to raise the limit (then 24) on the number of participants taking the short course.[1] Members of the station staff also participated in five successful farmers' institutes during the 1900-1901 fiscal year.[2]

However, these efforts in public education prevented attention to a number of areas of research. For example, research in the area of poultry science had not been started, even though a number of persistent and insistent demands had been made for information concerning poultry. The director was forced to request a supply of Farmers' Bulletin Number Forty-one from the national office in order to provide some information for those interested in poultry raising.[3] Information was also solicited from various farmers around the state to ascertain the various practices for wheat production. Bulletin Number Forty-seven of the Oklahoma station contained a collection of comments by individual farmers as to their experiences in growing wheat. Seventeen counties and the Osage Nation were represented. Each farmer answered

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[1]The Stillwater Gazette, February 7, 1901, p. 1.

[2]U.S.D.A., Office of Experiment Stations, Annual Report, 1901 (Washington, 1902), p. 170.

[3]John Fields, Director, O.A.E.S., March 29, 1901. Letter to Alfred C. True, correspondence and memoranda of Office of Experiment Stations and O.A.E.S., 1893-1941, National Archives.

thirteen questions and made comments on his experience with such matters as variety, time of planting, and ten other specific practices.[4] The station chemist gave a number of suggestions in the use of manure, sources of manure, green manure, and the effects of the absence or the adequate use of manure.[5]

The agriculturalist was doing research both in agronomy and in animal husbandry during the period. In 1901 he conducted experiments with the feeding of cottonseed meal to hogs and illustrated the economy of using a mixture of one-fifth cottonseed meal and four-fifths corn meal. The chemical composition of cottonseed meal was such that prolonged feeding of cottonseed meal killed hogs, but with the recommended practice of two or three weeks of the mixture and then a discontinuation of the cottonseed meal for a few weeks the same gain could be reached more economically.[6] The station horticulturist considered that potatoes could be grown profitably in sandy loam soil. He discussed the general practices of planting, cultivation, and harvesting, as well as yields, seed potatoes, and tests of thirty-seven varieties during 1900 and 1901.[7] The horticulturist also experimented with thirty-five varieties of cabbage during the two seasons of 1900 and 1901.[8] The drought during the summer of 1901 afforded ample opportunity for testing a number of drought-resistant varieties in both fields of horticulture

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[4]O.A.E.S., Bulletin No. 47 (1901), pp. 4-25.

[5]O.A.E.S., Bulletin No. 50 (1901), pp. 3-11.

[6]O.A.E.S., Bulletin No. 51 (1901), pp. 3-15.

[7]O.A.E.S., Bulletin No. 52 (1901), pp. 3-4.

[8]Ibid., pp. 15-16.

and agronomy.[9] The national office assessed the work of the Oklahoma station as well directed although confined to a few areas involving animal husbandry, crop and forage experiments, the study of animal diseases, and fruit growing. Favorable comment was apparent concerning the reduction of fruit experiments and the increase of those involving diseases, methods of culture, and management.[10]

In 1902 the investigations of the Stillwater facility continued along lines similar to previous years -- chemistry, field experiments, horticulture, forestry, botany, diseases of plants, animal husbandry, diseases of animals, and entomology. The staff consisted of nine people, six of whom were also on the faculty of the college.[11] In the area of horticulture the station had fifty thousand trees and vines in addition to a plantation of forty thousand forest trees with which to conduct research.[12] Forestry remained an important aspect of research both with experimental plantings at the station and in the study of native timber and commercial plantings elsewhere in the territory.[13] In the area of garden vegetables experimentation led to a number of suggestions as to methods of planting and cultivation. The best methods for growing tomatoes, egg plants, onions, lettuce, radishes,

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[9]U.S.D.A., Office of Experiment Stations, Annual Report, 1902 (Washington, 1903), p. 156.

[10]U.S.D.A., Office of Experiment Stations, Annual Report, 1901 (Washington, 1903), p. 156.

[11]Yearbook of Agriculture, 1902, p. 669.

[12]O.A.E.S., Annual Report, 1902, p. 10.

[13]Ibid., p. 17.

salsify, beans, and peas were summarized in Bulletin Number Fifty-six.[14] The staff also made studies of castor bean varieties, cotton varieties, potatoes, vineyards and orchards.[15]

Most of the work of the station at the time was directed toward the study and development of methods of culture adapted to the Oklahoma climate, although variety tests were made where doubt existed as to most suitable strains.[16] The agronomist grew cowpeas, sorghum, peanuts, field peas, oats, wheat, rye, and rape for hog pasture trials. Sugar beets and mangels were grown for winter feed, and experiments were conducted with grasses and alfalfa for pasture and hay.[17] The agriculturalist pointed out the value of bermuda grass for lawns and permanent pastures; local research and observation in other parts of the state suggested its culture under a wide range of varying conditions in all parts of Oklahoma.[18] The botanist suggested to farmers that an improvement in the castor plant was needed and that Oklahoma growers should seek more information concerning varieties and seed selection. Results of local research was included for those interested.[19] Plant scientists also obtained inconclusive evidence concerning the eradication of loco plants during the year.[20]

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[14]O.A.E.S., Bulletin No. 56 (1902), pp. 1-14.

[15]O.A.E.S., Annual Report, 1902, pp. 16-17.

[16]Ibid., p. 14.

[17]Ibid., pp. 14-15.

[18]O.A.E.S., Bulletin No. 55 (1902), pp. 1-2.

[19]O.A.E.S., Bulletin No. 54 (1902), pp. 3-10.

[20]O.A.E.S., Annual Report, 1902, p. 16.

In the fields of animal husbandry and veterinary medicine staff members conducted researches with parasites in horses, hogs, and cattle, and the effect of the loco plant. A dipping vat was constructed and utilized with different preparations in attempts to learn the most effective control over given parasites.[21] In Bulletin Number Fifty-three the veterinarian summarized the basic information available concerning various types of parasites that were harmful to domestic farm animals and poultry; and he gave a description of a number of these, together with methods of prevention and cure.[22] In 1902 the animal husbandry department and the veterinarian had available for breeding and other research one breed of horse, the Percheron; two types of sheep, Shropshire and Cotswold breeds; three kinds of hogs, Poland Chinas, Duroc Jerseys, and Chester Whites; and four breeds of cattle, Short-horns, Herefords, Aberdeen Angus, and Red Polls.[23] The veterinarian, like the botanist above, gave considerable time to the loco plant and its effect on animals.[24] The station distributed 123,620 doses of blackleg serum to 1,552 stockmen during the year.[25] To assist in livestock operations the staff suggested one of its early efforts in agricultural engineering, recommending in December, 1902, that farmers erect stock ponds on their farms.[26]

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[21]O.A.E.S., Bulletin No. 53 (1902), p. 16.

[22]Ibid., pp. 3-24.

[23]O.A.E.S., Annual Report, 1902, p. 9.

[24]U.S.D.A., Office of Experiment Stations, Annual Report, 1902 (Washington, 1903), p. 156.

[25]O.A.E.S., Annual Report, 1902, p. 16.

[26]O.A.E.S., Press Bulletin No. 91 (1902), p. 1.

Much research information went out to the farming population through press bulletins sent to newspapers around the 15th of each month during the 1901-1902 period.[27] With the expanded activities in the area of veterinary medicine, the department of zoology and veterinary science had a laboratory for experiment station work in one of its rooms in the library building in 1902.[28] The completion of a new barn during 1901-1902 was of help in conducting feeding experiments. Storage facilities for the required types of feed had been inadequate.[29] Greater facilities came, with the library building ($17,000), the two-story brick barn ($6,500), and an engineering building, together with the erection of a substantial wire fence which enclosed the station grounds.[30] The layout of the station in 1902 is illustrated in Figure 1.

During the 1902-1903 fiscal year the staff investigated improvements of the castor bean and cotton, made studies of the Hessian fly, cottonboll weevil, and the melon louse, and continued in the previously worked areas of chemistry, horticulture, forestry, diseases of plants, feeding experiments, and the diseases of animals.[31] An opportunity for greater research with beef cattle and pasture studies came during the year with the purchase by the college of an additional 160 acres of land. This acquisition was of special interest for pasture, forage

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[27]O.A.E.S., Annual Report, 1902, p. 24.

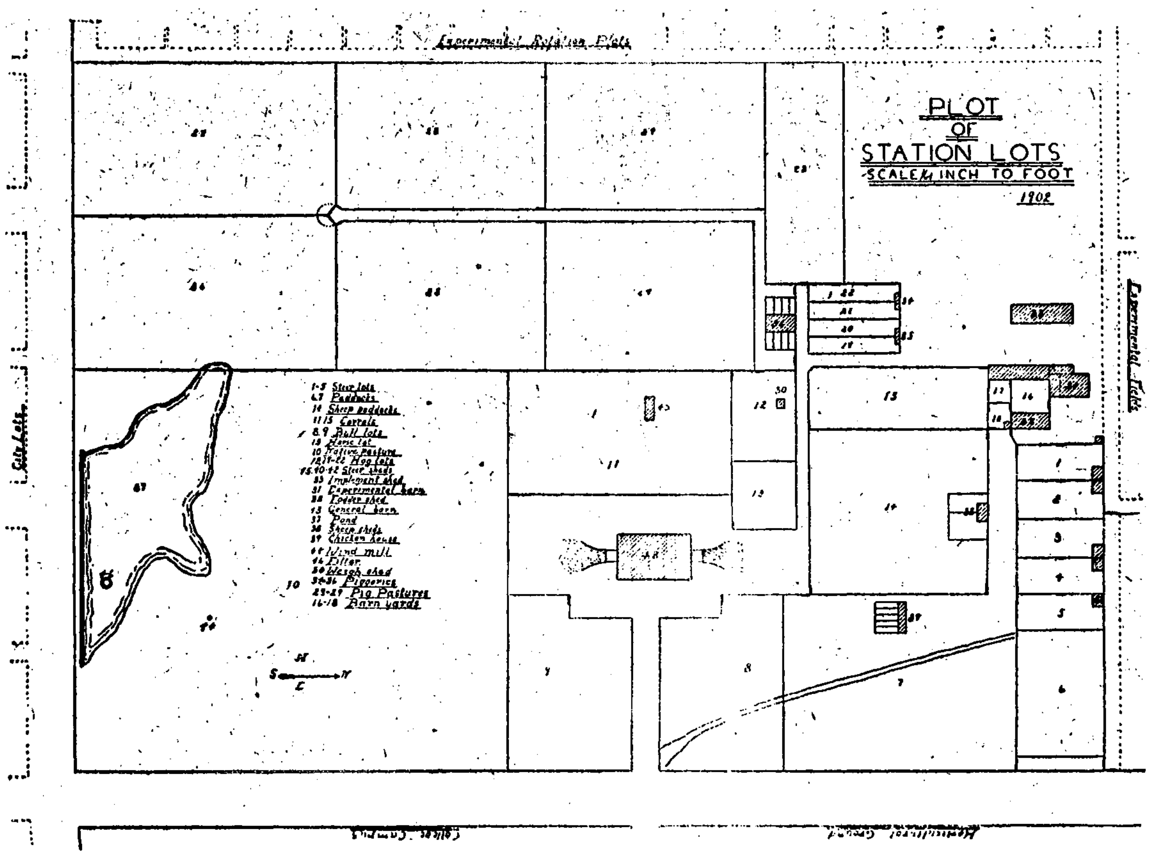
[28]O.A.E.S., Annual Report, 1902, p. 9.

[29]Ibid., p. 19.

[30]Office of Experiment Stations, Annual Report, 1902, p. 156.

[31]U.S.D.A., Office of Experiment Stations, Annual Report, 1903 (Washington, 1904), p. 160.

Figure 1*



*O.A.E.S., Annual Report, 1902, p. 20.

crops, and pasture experiment with steers.[32] It also relieved the need to rent pasture at a distance from the college farm.[33] During the same period ten acres of bottomland was leased for use with experiments in alfalfa and other crops, since this location had better soil than the station.[34] Research in the area of horticulture continued to be emphasized, and the objectives in this field seemed to ignore the climate and the current state of technology within the state. The basic idea, that "/every/ farm should have an orchard and a vineyard as one of its improvements," was suggested by the staff.[35]

More effective results were obtained in the area of veterinary investigations which brought a solution for the blackleg disease in cattle. The veterinarian prepared general information concerning the use of a vaccine for prevention of the disease and distributed the vaccine and sold the necessary vaccinating outfit to livestock operators for $4.50. Bulletin Number Fifty-seven gave detailed instructions for use of the kit and preparation of vaccine.[36] The Office of Experiment Stations called for an end to the use of Hatch funds for this purpose, however, and suggested that the territory provide the necessary funds for the service.[37] As a result, the legislature appropriated $2,500

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[32]O.A.E.S., Annual Report, 1903, p. 15.

[33]Office of Experiment Stations, Annual Report, 1903, p. 168.

[34]O.A.E.S., Annual Report, 1903, p. 15.

[35]Ibid., p. 59.

[36]O.A.E.S., Bulletin No. 57 (1903), pp. 1-15.

[37]Office of Experiment Stations, Annual Report, 1903, p. 157.

for the continuation of the distribution.[38]

Investigations with the feeding of steers was evidently a more legitimate use for Hatch funds. Bulletin Number Fifty-eight was devoted to a detailed report of a feeding experiment with groups of five steers and two shoats, including a summary of the different results with cotton seed, cottonseed meal, wheat meal, straw, and hay. This particular experiment illustrated the advantages of some whole-grain roughage in the feed.[39] The reports of these investigations would be of considerable influence on agricultural operations in the state.

The distribution of public information of interest to farmers remained an important task of station personnel. One press bulletin called attention to a fraudulent preparation for insect control. The promoter of this substance claimed in his advertisement that the Experiment Station had offered $3,000 for a half interest in his patent.[40] The mailing list for bulletins contained 19,000 names, but at the time station personnel considered further expansion doubtful since funds were available for only 20,000 copies.[41] The increasing demand for publications of the station and the failure of the legislature to appropriate additional funds resulted in a partial reprint of Bulletin Numbers Forty-seven, Fifty, and Fifty-two as Bulletin Number

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[38]Experiment Station Record, XIV (1903), p. 824.

[39]O.A.E.S., Bulletin No. 58 (1903), pp. 1-39.

[40]O.A.E.S., Press Bulletin No. 96 (1903), p. 1.

[41]Office of Experiment Stations Annual Report, 1903, p. 168. There were approximately 63,000 farm homes in the territory, however; U.S.D.A., Office of Experiment Stations, Annual Report of Farmers' Institutes, 1904 (Washington, 1905), p. 660.

Fifty-nine.[42] The director called attention to the excess burden of instruction. "Long days of work have been required of the station workers," he reported, "and too often they have been burdened with a large amount of teaching in excess of what should have been required of them."[43]

Yet the national office reported that the Oklahoma enterprise was making good progress in general development, and that its work which was especially adapted to the farmers' immediate needs had increased the prestige of the station. On the other hand, insufficient territorial support was pointed out as undermining effectiveness of the station:

> Although the work is well systemized [sic] and funds are handled in a very economical manner, they are not adequate for the payment of such salaries as will secure and keep the best investigators and capable assistants. Neither is the station suitably provided with laboratories for the department of agriculture, chemistry, and horticulture, or office room for the officers. It needs additional funds for printing, for buildings, and for the extension of important lines of investigations.[44]

This criticism of conditions at Stillwater in 1903 was repeated in 1904.

Although the national office acknowledged the efficient operation of the station in 1904, it also pointed out that the rapid increase in demands upon the station by Oklahoma agriculturalists further compounded the problems of inadequate financial support from the territory, inadequate facilities, and the inability to extend investigations into areas equally as important as those currently under way. It was further suggested that offices and laboratories were too widely scattered through

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[42] O.A.E.S., Bulletin No. 59 (1903), p. 3.

[43] O.A.E.S., Annual Report, 1903, p. 19.

[44] Office of Experiment Stations, Annual Report, 1903, p. 168.

a number of different buildings, and the urgent need remained for additional funds for laboratories, salaries, printing, and the extension of station investigations.[45]

The work of the station continued to grow in scope, with studies of the hog cholera germ and bacterial analyses of drinking water as two indications of such expansion.[46] Various field experiments involved sugar beets, stock beets or mangels, kaffir, Indian corn, and oats.[47] The veterinarian reported investigations in connection with various types of stock dips. Of special attention were the coal-tar disinfectants for sheep and hogs.[48] He also ran a tuberculin test of the college herd, finding that only two cows were infected.[49]

Additional facilities made another indication of the expansion in 1904. One cattle loafing shed, a new dairy building for $4,000, and greenhouses costing $3,000 were added. Nevertheless, the director requested additional buildings to house the agriculture, horticulture, and chemistry departments as well as for administrative offices. Increased work resulted from a division of salaries between teaching and experiment station duties.[50] The new buildings relieved some of the congestion and allowed more expansion of the program.[51] The new construction

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[45]U.S.D.A., Office of Experiment Stations, Annual Report, 1904 (Washington, 1905), pp. 149-50.

[46]The Perkins Journal, August 19, 1904, p. 1.

[47]O.A.E.S., Bulletin No. 61 (1904), pp. 1-22.

[48]O.A.E.S., Bulletin No. 62 (1904), pp. 1-16.

[49]O.A.E.S., Bulletin No. 63 (1904), p. 1.

[50]O.A.E.S., Annual Report, 1904, pp. 22-23.

[51]Office of Experiment Stations, Annual Report, 1904, p. 149.

during 1904 was a start for the more extensive building program that was to begin in 1905.

Additional facilities afforded only small relief from the inadequate territorial support. The station received a paltry $1,421.78 from the territorial appropriation for 1903-1904 -- a little more than half of the $2,598.67 gained from the sale of station products.[52] The general prosperity of the territory and the popularity of the college and station evidently were largely responsible for the large appropriations from the territorial legislature.[53] It authorized and appropriated $92,500 for the construction of Morrill Hall on March 4, 1905.[54] In addition, it provided $8,000 for acquiring rights of lessees on the section of land granted to the college by Congress and an $5,500 annual increase in the maintenance fund.[55] However, this was still far behind the national situation, where funds for the state stations had more than doubled from 1888 to 1905.[56]

The acreage at the college station had grown from 80 in 1891 to 1000 in 1905.[57] The staff were devoting their attention to the development of new lines of farming, the work was wisely administered, and the

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[52]Ibid., p. 150

[53]U.S.D.A., Office of Experiment Stations, Annual Report, 1905 (Washington, 1906), p. 119.

[54]Oklahoma, Session Laws, 1905, pp. 49-51.

[55]Office of Experiment Stations, Annual Report, 1905, p. 119.

[56]Alfred C. True, A History of Agricultural Experimentation and Research in the United States 1607-1925, U. S. Department of Agriculture Misc. Pub. No. 251 (Washington, 1937), p. 138.

[57]Oklahoma Agricultural and Mechanical College, Annual Catalogue, 1904-1905, p. 11.

future looked bright with the station making a strong impression on farmers and gaining their support and confidence.[58] This acceptance came as a result of such bulletins as Numbers Sixty-six and Sixty-seven, which gave practical information concerning building of farm ponds, cisterns, wells, and procedures for obtaining the best results from various sources of water.[59] Bulletin Number Sixty-four summarized experiments with spraying problems that were affecting fruit growing in the territory, and the staff provided special suggestions to destroy insects and fungus, including what sprays to use and how to make the mixtures for specific insects.[60] Research continued with various small fruits -- blackberries, raspberries, strawberries, gooseberries and currants. A handbook of the culture, cultivation, pruning, and treatment of diseases of these plants appeared as Bulletin Number Sixty-nine.[61] The horticulturalist was also attempting to obtain a strain of currants that would be successful in Oklahoma.[62]

The permanent program in wheat progressed with investigations seeking answers to questions such as the results of continuous vs. rotated cropping, manured vs. non-manured soils, variety tests, time of plowing, time of seeding, amount of seed per acre, pasturing, improvement in

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[58]Office of Experiment Stations, Annual Report, 1905, pp. 119-20.

[59]O.A.E.S., Bulletin No. 66 (June, 1905), pp. 23-26; O.A.E.S., Bulletin No. 67 (1905), pp. 16-18.

[60]O.A.E.S., Bulletin No. 64 (1905), pp. 1-19.

[61]O.A.E.S., Bulletin No. 69 (1905), pp. 1-20.

[62]Office of Experiment Stations, Annual Report, 1905, p. 119.

tillage, and seed selection.[63] Dairy research had turned toward investigation of the value of native cows for milk, and butter production with a small herd at the station.[64] The agriculturalist was improving this native herd by selective breeding and feeding experiments with the steers using kaffir heads, cotton seed, and ground kaffir.[65]

The veterinarian, meanwhile, conducted a number of researches with hogs to determine their susceptibility to tuberculosis and the easiest source of transmission.[66] The veterinarian, acting also as bacteriologist, completed his studies of drinking water, continued his investigations of the artificial impregnation of mares, and examined the biology of the organisms of root tubercules on soy beans, alfalfa, and crimson clover.[67] This latter research sought to determine circumstances whereby bacteria were present in soil and attached to legumes to form tubercules.[68] The veterinarian and the assistant in bacteriology investigated the various sources of drinking water in the Stillwater area, analyzing the water for bacteria and suggesting reasons for their presence. The spread of intestinal parasites by the drinking water of livestock was also illustrated.[69] The chemist as well was involved in multiple research areas. Chemical analyses were made from various sources and

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[63]O.A.E.S., Bulletin No. 65 (1905), pp. 1-35.

[64]Experiment Station Record, XVI (1905), p. 412.

[65]Office of Experiment Stations, Annual Report, 1905, p. 119.

[66]O.A.E.S., Bulletin No. 64, pp. 1-8.

[67]Office of Experiment Stations, Annual Report, 1905, p. 119.

[68]O.A.E.S., Bulletin No. 68 (1905), pp. 1-30.

[69]O.A.E.S., Bulletin No. 66, pp. 1-22.

some 126 samples sent in by various citizens.[70] An added service responsibility of the station chemist came with the inspection of commercial fertilizers and feeds. The Oklahoma legislature passed a law in 1905 requiring that fertilizers and feeding stuffs be analyzed by the station under the direction of the Board of Agriculture.[71]

In 1906 great changes occurred at the experiment station. John Fields, the director, resigned on September 1, and W. L. English took his place October 1.[72] The resignation of F. C. Burtis, professor of agriculture, on August 1, 1906, to enter commercial work, was a deciding factor in the reorganization.[73] With these resignations the department of agriculture was discontinued and the new departments of agronomy, animal husbandry, and dairying were created in its place.[74]

The work in horticulture was unaffected by these changes, but facilities of the department were much improved with the completion in November, 1906, of a solid cement-wall storage cave.[75] A frame horse barn was added to the station facilities during the fall of 1906. This two-story building, 26 feet by 50 feet, contained facilities for 14 horses, a hay mow, feed bins, a harness room, and a well equipped laboratory for work in artificial impregnation.[76] Morrill Hall was

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[70]O.A.E.S., Bulletin No. 67, pp. 1-18.

[71]Office of Experiment Stations, Annual Report, 1905, p. 119.

[72]O.A.E.S., Annual Report, 1907, p. 58.

[73]Ibid.

[74]U.S.D.A., Office of Experiment Stations, Annual Report, 1907 (Washington, 1908), p. 155.

[75]O.A.E.S., Annual Report, 1907, p. 53.

[76]Ibid.

completed October 15, 1906. The business office of the station as well as the offices of the departments of agronomy, animal husbandry, chemistry and horticulture were moved into this building. The central location of all of these offices was thought to expedite research activities.[77] Of indirect assistance to the station was the passage of legislation by Congress giving to Oklahoma all lands not settled or previously reserved, to be used by the state for the various colleges and university. The act provided that the Agricultural and Mechanical College and the Colored Agricultural University would receive one-third of such lands or the proceeds.[78] The Agricultural and Mechanical College received 250,000 acres of land by this congressional grant of 1906.[79]

The work of the station during the year 1906 centered around the preparation of the 640-acre farm for research use, the erection of a new agricultural building, and the rearrangement in other buildings. The office and laboratory activities of the enterprise were in preparation in the new agricultural building Morrill Hall.[80] Investigations in the areas of agronomy and veterinary medicine were some of the research highlights during the year. The semi-arid conditions of Oklahoma necessitated an adequate variety of grass for lawns and pastures. Bulletin Number Seventy became a handbook for the growing of bermuda grass and a propaganda leaflet for its wider use in the prevention of soil

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[77]Ibid., p. 52.

[78]U. S. Statutes at Large, Vol. XXXIV (1906), p. 273.

[79]Ibid., p. 275.

[80]U.S.D.A., Office of Experiment Stations, Annual Report, 1906 Washington, 1907), pp. 144-45.

erosion.[81] Bulletin Number Seventy-one likewise proved to be a general handbook for the growing of alfalfa. This publication described yields at the station, and suggested good preparation of the soil for planting of this slowly starting legume.[82] In the field of veterinary investigations efforts continued in the eradication of lice and ticks by disinfectants and dips.[83] The station maintained the distribution of blackleg vaccine, which preventive action amounted to an estimated $100,000 annual saving for livestock producers.[84] Some of the public service activities of the staff included supplying eight different speakers for farmers' institute sessions, with one to four attending the twenty-two meetings.[85] The station had also supplied judges for five county fairs during the fall of 1905.[86] Although expenses in travel and time were met by the fair associations, time was lost from research activities. The public information efforts continued, with the circulation of station bulletins reaching 25,000 copies.[87] Interest in the college and station was increasing despite the uncertainties as to policies and status under the new state government.[88] In general, the Oklahoma facility was evaluated as having sufficient equipment

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[81] O.A.E.S., Bulletin No. 70 (1906), pp. 1-8.

[82] O.A.E.S., Bulletin No. 71 (1906), pp. 1-12.

[83] O.A.E.S., Bulletin No. 72 (1906), pp. 1-8.

[84] O.A.E.S., Annual Report, 1906, p. 18.

[85] O.A.E.S., Annual Report, 1906, p. 17.

[86] Ibid.

[87] Office of Experiment Stations, Annual Report, 1906, p. 145.

[88] Ibid.

to develop and strengthen its research efforts materially. It was suggested that every effort be made to conduct thorough and substantial investigations in light of the rapidly expanding agriculture of the territory. To accomplish this goal the federal authorities emphasized that it would be necessary "to maintain a consistent policy of management and to employ thoroughly trained experts in the varied lines of agricultural research."[89] Despite all of the local changes and suggestions for improvement in the administration of the Oklahoma enterprise, the greatest influence would come from new national legislation designed to give great support and direction to the state research operations.

The Adams Act

The Adams Act of 1906 came out of research experience and power differentials that resulted from the Hatch Act of 1887. Three interrelated areas of power complicated the work of the Hatch Act. First, the experiment stations, the agricultural colleges, the Department of Agriculture, and the Office of Experiment Stations, proved to be both complementary and conflicting to each other's needs and programs. Second, the individual state stations and colleges acted as lobbying agents with state officials and with state representatives in Washington. Third, the institutional values and attitudes of the scientific disciplines were now important enough to direct and motivate American scientists to promote the Adams Act.[90]

Many aspects of the Hatch Act had been unsatisfactory. It was

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[89]Ibid.

[90]Charles E. Rosenberg, "The Adams Act: Politics and the Cause of Scientific Research," Agricultural History, XXXVIII (1964), p. 3.

ineffective as an administrative tool to control station research and as a source of sufficient funds to subsidize the kinds of research so badly needed. Nevertheless, great interest in the whole field of agricultural research had resulted from the early efforts of the experiment stations. The solutions to a number of immediate problems in agriculture and the discovery of more basic questions in agricultural science added to the evidence supporting the passage of the Adams Act.[91]

The Adams Act made provision for additional support for the state stations comparable to that of the Second Morrill Act for the state colleges. It provided:

> That there shall be, and hereby is annually appropriated...to each State and Territory, for the more complete endowment and maintenance of agricultural experiment stations now established or which may hereafter be established ...the sum of five thousand dollars in addition to the sum names in the /Hatch Act/ for the year ending June Thirtieth, nineteen hundred and six, and thereafter for five years by an additional sum of two thousand dollars over the preceding year...the annual amount thereafter to be paid to each State and Territory shall be thirty thousand dollars, to be applied only to paying the necessary expenses of conducting original researches and experiments bearing directly on the agricultural industry of the United States, having due regard to the varying conditions and needs of the respective States or Territories.[92]

Two provisions of the Act would cause serious problems for Oklahoma. In regard to the utilization of federal funds by the state stations, the law provided:

> That if any portion of the moneys received by the designated officer of any State or Territory...shall be diminished or lost or be misapplied, it shall be replaced by said State or Territory to which it belongs, and until

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[91]F. B. Mumford, "Growth of State Agricultural Experiment Stations," The U. S. Egg and Poultry Magazine, XLIII (1937), p. 731.

[92]U. S. Statutes at Large, Vol. XXXIV (1906), p. 63.

> so replaced no subsequent appropriation shall be apportioned or paid to such State or Territory....[93]

A second section placed a limitation on moneys used for land and buildings, placing a limit of five percent of each annual appropriation that could be spent for building, maintenance, or the purchase or rental of land.[94] With additional funds for research activities, but without additional state funds to provide more facilities, the Oklahoma station would be hindered in its development. The new legislation not only made available additional funds for research operations, but it also provided for greater control over expenditures of these funds.[95] This legislation provided the necessary funds that would enable agricultural scientists to raise their status in the scientific world by writing books and articles for recognition.[96] The project system, implemented by the Office of Experiment Stations under the Adams Act, became an administrative tool for enforcing specific research projects rather than individual interests.[97] Wider research areas were possible under the new legislation which counteracted the limitations placed by the director of the Office of Experiment Stations, Alfred C. True, who interpreted station research as legitimate only in the area of natural science and not in marketing or farm management.[98]

Despite the need for additional facilities, the station staff used

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93 Ibid., pp. 63-64.

94 Ibid., p. 64.

95 Rosenberg, p. 5.

96 Ibid., p. 8.

97 Ibid., pp. 11-12.

98 Ibid., p. 12.

the new funds to embark on research projects that would be of benefit to Oklahoma agriculture in its broadest sense. Three distinct lines of work emerged: (1) a cooperative venture by veterinary science and animal husbandry in breeding animals and the effect of feeding meal upon fecundity, (2) investigation of the cause of non-setting of fruit on the tomato plant at blossoming time, (3) breeding of a strain of corn that would adapt to western Oklahoma.[99] Additional funds for the first area, breeding of animals, came from a separate appropriation to the Department of Agriculture for such cooperative research in animal breeding and feeding. Twenty-five thousand dollars was appropriated for such work at the various state stations.[100]

Research at Stillwater continued at an ever-increasing pace during 1906 and 1907. During the period the college gave the station an additional 150 acres of first-class land for its exclusive use. This tract was to be fenced and then devoted to field experiments by the agronomy department.[101] This department laid out the acreage into permanent plats for variety and cultural tests with wheat, kaffir, castor beans, cotton, broom corn, sorghum, barley, oats, spelt, soy beans, and cowpeas.[102] The potentials of soy beans and the increasing number of inquiries led to an information bulletin concerning this plant and also cowpeas.[103] The work in entomology in 1907 centered around extensive

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[99]O.A.E.S., Annual Report, 1907, pp. 48-50.

[100]U. S. Statutes at Large, Vol. XXXIV (1906), p. 674.

[101]O.A.E.S., Annual Report, 1907, p. 53.

[102]Office of Experiment Stations, Annual Report, 1907, p. 155.

[103]O.A.E.S., Bulletin No. 74 (1907), pp. 3-22.

nursery and orchard inspection, researches with cotton boll weevil, San Jose scale, codling moth, and green bugs.[104] The station horticulturist, in a station bulletin, presented a discussion of hardy trees, shrubs, and vines especially adaptable to Oklahoma climate and soils. This information was designed to assist those who wanted to establish windbreaks and woodlots, or to add to ornamental varieties.[105] Bulletin Number Seventy-five attacked the practical problems of the manufacture of butter and gave a discussion of the critical features in the process -- cream free from lactic acid, age, temperature, and freedom from foreign germs. (This bulletin also contained the suggestion that a central creamery for butter making be established.)[106] With the completion of Morrill Hall, the chemistry department had expanded its operations with new quarters and new laboratory equipment.[107] Like the entomologist, the station chemist was to a large extent involved during 1907 with the inspection of feeding stuffs and fertilizers.[108]

Outside duties of the station absorbed a great amount of time. In addition to state-assigned duties of inspection and testing, the staff were burdened by requests from individuals to analyze water, rocks, soils, and seeds.[109] Another service which was looked upon with more favor was the distribution of roots of Bermuda grass. These were given

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[104] Office of Experiment Stations, Annual Report, 1907, p. 156.

[105] O.A.E.S., Bulletin No. 73 (1907), pp. 1-6.

[106] O.A.E.S., Bulletin No. 75 (1907), pp. 1-16.

[107] Office of Experiment Stations, Annual Report, 1907, p. 155.

[108] Ibid., p. 156.

[109] O.A.E.S., Annual Report, 1907, pp. 54-55.

to farmers and the opportunity was considered of great value in making contact with constituents.[110] Several members of the staff assisted in farmers' institute work during the year, and a short course held at the station was attended by over 500 farmers — an unprecedented number for the Oklahoma station.[111]

In 1907, the station engaged in three major projects supported by Adams Act funds — factors affecting the setting of fruit on the tomato under semi-arid conditions; an examination of drought-resistant corn in relationship to breeding; and the effect of cotton-seed meal and other highly nitrogeneous feeds on prepotency in regard to cattle and hogs.[112] State appropriation for the station during the year amounted to $2,500 while funds from federal appropriations, station sales, and other sources added to this provided a total operating budget of $28,838.42. This last amount was not much different from sums given other new states and in states of the region.[113] Additional indirect assistance would come as a result of the Nelson amendment to the Department of Agriculture appropriation for further support to Agricultural Colleges. This legislation gave to each state and territory an additional $5,000 for 1908 and increasing amounts for the next four years, until 1912 when the additional income would reach $25,000.[114] Various facilities

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[110] Office of Experiment Stations, Annual Report, 1907, p. 156.

[111] Ibid.

[112] Ibid., pp. 155-56

[113] Ibid., p. 156. These sums were quite in contrast to the Ohio station, for example with a $89,231.49 state appropriation and $126,056.06 in total funds - Ibid., p. 154.

[114] U. S. Statutes at Large, Vol. XXXIV (1907), p. 1281.

were added to the Stillwater plant in 1907, including a two-story horse barn for breeding and feeding experiments, a cement storage cave for horticultural work, and a laboratory for seed testing.[115]

However, the physical plant of the college and station in 1907 apparently was lacking in aesthetic beauty. According to one account: "The A. & M. College at Stillwater had an old central building of quaint design and away from it walk-ways across the grass led to a few other buildings that were repelling to the eye because of their lack of interesting columns or arches on pleasant lines."[116] Yet with all the problems on the state level, the station continued to grow with federal assistance, and there were three additions to the staff -- an animal husbandman, an agronomist, and a financial secretary.[117] The national office reported that the station had made substantial progress in improving equipment, enlarging its working force, and extending the scope and increasing the efficiency of both its practical and scientific activities. Although these achievements were mainly the result of increased federal aid, it was also a fact that continuity of policy was preserved despite a change in organization and personnel.[118]

Research During Early Years of Statehood

The station would have additional issues to face with Oklahoma becoming a state November 16, 1907. Political conditions would further

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[115]Office of Experiment Stations, Annual Report, 1907, p. 155.

[116]Charles Evans, "The Old North Tower and Chimes at Edmond," The Chronicles of Oklahoma, XXIII (1945), p. 22.

[117]O.A.E.S., Bulletin No. 74 (1907), p. 2.

[118]Office of Experiment Stations, Annual Report, 1907, p. 157.

complicate the giving of technical assistance to farmers scattered throughout the state's 44,341,120 acres or 69,283 square miles. However, no drastic change in the operation of the station came as a result of statehood. During 1908 the work of the station continued on the same general lines as in 1907, and several original research investigations made satisfactory progress.[119] The Altus Times favorably reviewed a circular on green bugs by the director, W. L. English.[120] Sheep production in Oklahoma was relatively unimportant in comparison to other states. Bulletin Number Seventy-eight illustrated the advantages to be gained by increased sheep operations, and described the experimentation that had been done with various feeds for sheep.[121] While standing 41st in the nation in sheep production, Oklahoma stood 11th in pork. Hog production came from all areas of the state, and thus experimentation with this meat animal provided an example of research which would be profitable for large numbers of Oklahoma farmers.[122] The veterinarian gave a considerable amount of attention to Texas fever and in one publication gave a history of the disease, methods of treatment, procedures in obtaining immunity for cattle, and methods of eradication of the ticks and control of the disease.[123]

Horticulture and entomological investigations of field insects remained an area of heavy research emphasis. Bulletins were distributed

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[119]U.S.D.A., Office of Experiment Stations, Annual Report, 1908 (Washington, 1909), p. 155.

[120]The Altus Times, March 19, 1908, p. 4.

[121]O.A.E.S., Bulletin No. 80 (1908), pp. 57-64.

[122]O.A.E.S., Bulletin No. 80 (1908), p. 89.

[123]O.A.E.S., Bulletin No. 81 (1908), pp. 3-32.

which discussed the advantages of spraying insecticides, the various insects to be controlled on various trees, the best procedures in spraying, the most effective solutions, and the results at the station with plats sprayed and not sprayed.[124] Bulletin Number Seventy-nine contained an examination of experiments with San Jose scale and a discussion of the best methods for the control of this insect.[125] Cotton was the subject of another publication during the year. This bulletin directed attention to its value as a cash crop, time for rotation with other field crops, variety tests, seed selection, culture, and the cotton bollworm (not the boll weevil) and its control.[126]

In 1909 seven specific projects were under way with Adams funds.[127] Highlights of the research program were in the fields of entomology, horticulture, dairying, agronomy, animal husbandry, and veterinary medicine. Work during the year in entomology consisted of ninety-seven inspections of nursery productions, studies of the hibernation of the chinch bug, spraying for the destruction of orchard insects, and investigations of the disease of the San Jose scale.[128] The station horticulturist was able to illustrate that the spraying of apples could save from fifty to ninety percent of the crop. Further research showed that by spraying with arsenate of lead, 90 percent of the apricot crop could

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[124] O.A.E.S., Bulletin No. 76 (1908), pp. 1-32.

[125] O.A.E.S., Bulletin No. 79 (1908), pp. 67-88.

[126] O.A.E.S., Bulletin No. 77 (1908), pp. 33-56.

[127] Office of Experiment Stations, Annual Report, 1909, p. 169.

[128] O.A.E.S., Annual Report, 1909, p. 11.

be saved from the plum curulio.[129] A brief description of the number of varieties of peaches tested at the station orchard gave some practical guidelines for peach growers in Oklahoma. Evidently peaches had been of interest commercially in Oklahoma as early as 1896, when the first crop was produced.[130] Other work in horticulture emphasized the identification of weeds; the planting and testing of various forest trees; testing of fruit tree varieties; orchard cultivation and cover crops; experiments with potatoes, cabbages, and tomatoes; the reasons for tomatoes failing to set fruit; and bud development of peaches and apples.[131] In dairying, work involved cooperative creamery investigations, a cow census, and tests of all bottles, pipettes, and other equipment used by the creameries of the state in testing milk and cream.[132] Activities in agronomy centered around Bermuda grass and alfalfa, with considerable attention to the benefits derived from the latter as a forage crop. Bulletin Number Eighty-two provided a general history of alfalfa and a discussion of the best practices to be used in its culture and a short summary of station experimentation.[133]

The station agronomist had tested more than four hundred samples of alfalfa seed for farmers of Oklahoma. Various impurities, inert material, and weed seeds appeared in these samples, and the purity and

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[129] U.S.D.A., Office of Experiment Stations, Annual Report, 1909, (Washington, 1910), p. 155.

[130] O.A.E.S., Bulletin No. 84 (1909), pp. 3-8.

[131] O.A.E.S., Annual Report, 1909, p. 8.

[132] Ibid., p. 9.

[133] O.A.E.S., Bulletin No. 82 (1909), pp. 3-31.

germination quality also were evident from these tests.[134] Similar problems arose with the planting of Bermuda grass. The station agronomist gave farmers a general description, list of uses, methods of planting and care, and control of this cover crop as well as a brief account of the experimentation at the station.[135] Other investigations conducted by the department included the establishment of Bermuda grass pastures; the distribution of improved seeds to eighty farmers for trial; alfalfa seed testing, continuous culture of grain; the testing of grains, grasses, and clover varieties on 600 plots, experiments with the depth of plowing for wheat; fertilizer tests with cotton, alfalfa, and Indian corn; rotation of crops; and plant breeding and selection.[136]

In the area of animal husbandry the highlights for the year included hogs and the feeding of cottonseed meal to this animal. Digestion work with sheep involved Bermuda grass, alfalfa, and other common fodders.[137] The staff also conducted breeding studies to develop a breed of sheep combining mutton, wool, and early breeding qualities.[138] The director and long-time teacher of agricultural education, J. A. Craig, was impressed with the potential for sheep raising in Oklahoma at the time. He stated: "The State is eminently adapted to sheep, the winter conditions are favorable for winter lamb production, and there

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[134] O.A.E.S., Bulletin No. 83 (1909), pp. 3-23.

[135] O.A.E.S., Bulletin No. 85 (1909), pp. 3-14.

[136] O.A.E.S., Annual Report, 1909, pp. 8-9.

[137] Ibid., p. 9.

[138] Office of Experiment Stations, Annual Report, 1909, p. 169.

are large, profitable markets for lambs at that time of the year."[139] Craig then proceeded to direct the breeding or cross-breeding of Shropshires, Merinos, and Dorsets to get an animal best suited for Oklahoma production. The station had purchased fifty imported purebred Dorset ewes and an imported Dorset ram from the flock of Flowers D. Merson of England in the summer of 1909. In addition to these, twenty-four purebred Shropshire ewes and an imported Minton ram were obtained the same summer from Thomas Buttar of Scotland. During the next year the station secured twenty-five black-topped Delaine Merino ewes and a black-topped ram from Ohio through the agency of S. M. Cleaver.[140] Veterinary research meanwhile continued with efforts toward prevention of hog cholera, tests of the bacterial content of butter and bacteria analysis of water, and the influences of artificial insemination in animal breeding.[141] This latter work in veterinary research was much more effective with the erection of additional buildings -- an experimental hog barn and bricked feeding yards by the station at a cost of $1,370.70.[142] All in all, conditions at the station were "apparently tending toward a better and more permanent organization. . . ."[143] These tendencies would be disrupted in the following year because of political maneuvering within the state government.

In 1910 conditions at Stillwater took a turn for the worse. As a

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[139] Don M. Orr, "Sheep Breeding at the Oklahoma Experiment Station," The Oklahoma Agriculturalist, V (1917), p. 15.

[140] Ibid.

[141] O.A.E.S., Annual Report, 1909, pp. 7-8.

[142] Ibid., pp. 37-40.

[143] Office of Experiment Stations, Annual Report, 1909, p. 170.

result of administrative difficulties the director resigned, and subsequently the agronomist, the assistant agronomist, the horticulturalist and botanist, the assistant bacteriologist, and several members of the clerical force also resigned. Owing to difficulties in obtaining trained personnel, some of these positions were filled with men of little experience.[144] The state appropriation also stopped, and no state funds were available except indirectly through the dairy commission, nursery inspection and the pure feed and fertilizer funds. Political corruption within the state included activities within college administration. Evidently state officials attempted to have the federal government pay for all research at the Oklahoma station and even for some of the instruction in the college, as research funds were used to carry on instructional functions. A large number of the staff resigned from the A. and M. College in protest, yet the state policy of economy retrenchment led to the end of all state support for the experiment station.[145] The college under the supervision of the State Board of Agriculture would suffer from the alleged corruption of these officials and their desire to implement a state department of agriculture with greater possibilities for patronage.

However, research efforts continued regardless of the difficulties listed above. Of the one thousand acres of the college farm, the agronomy department was conducting studies of farm crops on 160 acres, and the horticulture department utilized an additional fifty acres for experiments in the study of fruits, forest trees, vegetables, and plant

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[144]U.S.D.A., Office of Experiment Stations, Annual Report, 1910 (Washington, 1911), p. 219.

[145]Ibid., p. 220.

diseases. In agronomy investigations involved such work as continuous culture with and without farm yard manure; variety tests with wheat, oats, cotton, and cowpeas; rotations of three, five, and six years; plant breeding with corn and cotton; alfalfa fertility; depth of plowing for corn, oats, and cotton; breeding of drought-resistant corn; and breeding of non-saccharine sorghums for drought resistance.[146] By 1910 corn was the leading grain of Oklahoma, yet little attention was directed toward good farming methods. In Bulletin Number Eighty-seven the agronomist pointed out the need for intensive types of cultivation, use of fertilizers, following procedures according to the soil and rainfall, and adequate care from seedbed to final cultivation.[147] The value of kaffir corn was investigated from all sides. In addition to variety testing and feeding experiments, the chemist analyzed the chemical composition of this corn kernel to determine its feed value in comparison to Indian corn, and concluded that it contained a close equivalent in food value for cattle and was perhaps slightly superior to regular corn for poultry.[148] The chemist likewise examined Bermuda grass for its use, chemical composition and digestibility with sheep eating the hay produced.[149]

The work in veterinary science concentrated on questions regarding physiology, the vitality of sperm and egg cells, and on experiments

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[146] Oklahoma, State Board of Agriculture, Biennial Report, 1909-1910, p. 121.

[147] O.A.E.S., Bulletin No. 87 (1910), pp. 3-46.

[148] O.A.E.S., Bulletin No. 89 (1910), pp. 3-15.

[149] O.A.E.S., Bulletin No. 90 (1910), pp. 5-19.

relating to the effect of feeds on breeding animals.[150] Experiments in animal husbandry centered on investigations to determine the relative value of sorghum as a forage crop for hogs, the conomy of "hogging off" corn, a comparison trial with alfalfa hay in various forms as supplementary feed, of ear corn with hogs, and comparing green alfalfa and corn in varying rations with green rape in combination with similar rations of corn.[151] A dog-proof fence was added to a fifty-acre Bermuda grass pasture designed for sheep breeding research.

The entomology department continued investigations of insect pests and nursery inspection.[152] The entomologist, in one publication, summarized the life history of the Southern Plum Aphis, the plants it attacked, and methods for their control.[153] Other researches in this field devoted attention to chinch bug, and food for certain strains of bees.[154] In Bulletin Number Eighty-six the horticulturist provided a general manual for the selection, planting, and care of shade and forest type trees.[155] In Bulletin Number Ninety-three the station veterinarian gave complete instructions for use of the instruments in artificial insemination with horses. Instruction was given for collection of semen and for administering to mares. Experiments were also discussed concerning the optimum time for collection of semen and the vitality of

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[150] State Board of Agriculture, Biennial Report, 1909-1910, p. 120.

[151] Ibid.

[152] Ibid.

[153] O.A.E.S., Bulletin No. 88 (1910), pp. 3-8.

[154] U.S.D.A., Office of Experiment Stations, Annual Report, 1911 (Washington, 1912), p. 181.

[155] O.A.E.S., Bulletin No. 86 (1910), pp. 3-35.

sperm cells.[156] In attempts to discover more information concerning the use of artificial insemination in hogs, the station staff conducted a number of experiments related to the determination of the vitality of semen and eggs cells in the womb of hogs and in laboratory conditions, and to the determination of what time was best for the union of the two reproductive cells.[157] During this period the staff provided a supply of hog cholera serum to farmers in response to state legislation and a $6,000 appropriation for this purpose. This program enabled livestock producers to inoculate 34,000 hogs against this disease.[158] In Bulletin Number Ninety-five the station horticulturist gave an answer to requests for the best types of fruit. He compiled a list of the various fruits with indications as favorable or unfavorable for use by Oklahoma farmers as judged by 1200 producers who checked query sheets sent out to them by the station.[159]

The facilities at Stillwater continued to grow in 1911, and contact with agricultural producers expanded. A new sheep barn provided more satisfactory facilities for sheep-breeding experiments. Animal husbandry workers made crosses between Shropshire, Merino, and Dorset, and in turn the lambs from these became the basis for further research.[160] The erection of additional buildings contributed to the

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[156] O.A.E.S., Bulletin No. 93 (1911), pp. 5-13.

[157] O.A.E.S., Bulletin No. 96 (1911), pp. 3-47.

[158] Oklahoma, State Board of Agriculture, Biennial Report, 1910-1911, p. 65.

[159] O.A.E.S., Bulletin No. 95 (1911), pp. 3-48.

[160] Office of Experiment Stations, Annual Report, 1911, p. 180.

greater success of research efforts of the station, especially in regard to experiments with livestock. The college added a sheep barn, and a greenhouse provided additional facilities for the department of horticulture.[161] More than 100,000 people were in contact with the work of the experiment station through farmers' institutes where the staff gave lectures. Station personnel were also called upon to attend other meetings, such as those for good roads, dairy meetings, and county fairs.[162] Short courses were another method of keeping researchers close to practical problems and practical application of new information, thus affording a "give and take" between farmers and researchers.

The highlights of station activities in 1911 centered around entomology, veterinary medicine, horticulture, and public information. In Bulletin Number Ninety-one the entomologist described the life cycle, actions in types of wood, and methods of control of the twig girdler.[163] Bulletin Number Ninety-two consisted of a manual and calender for the application of chemical sprays to control insects in trees and in vegetable and truck gardens.[164] These activities became known to Oklahoma farmers, not only from the station publication, but also from state government publications and personal contacts. The station staff published a considerable amount of general and specific information in the Biennial Report of the State Board of Agriculture. This was especially

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[161]Office of Experiment Stations, Annual Report, 1910, p. 220.

[162]State Board of Agriculture, Biennial Report, 1909-1910, p. 103.

[163]O.A.E.S., Bulletin No. 91 (1911), pp. 3-12.

[164]O.A.E.S., Bulletin No. 92 (1911), pp. 3-16.

true of dairy investigation discussed in the 1910-1911 report.[165] Personnel of the station reached 77,026 people, who attended lectures and demonstrations given from an agricultural train operated over the Santa Fe, Frisco, Katy and Fort Smith and Western Railways.[166] The staff made contact with youth on the farms by organizing county "Boys" and "Girls" clubs in fifty-eight counties with a membership of 30,517 from 1277 local clubs.[167]

However, these diverse activities seemed to have been insufficient, in the estimate of the national office. According to a letter by A. C. True, conditions at the Oklahoma station in 1911 had reached a point where research effort had ceased and the station had lanquished. He stated that little evidence was available that a vigorous policy for improvement had been begun. Federal fund projects were not progressing along the original specified lines, and no report had been made of progress in horticulture. Salaries for those in both the college and the station were taken in excessive amounts from station funds. True further stated that work of the station was further hindered by the excessive teaching loads of the staff.[168] With entrance of new personnel after the resignations of the previous year, some progress was made in

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[165] State Board of Agriculture, Biennial Report, 1910-1911, pp. 148-61.

[166] Ibid., p. 65. This operation was sponsored by the various railroads, the State Corporation Commission, and the A. & M. College.

[167] Ibid., p. 64. A total of 11,200 persons attended lectures and demonstrations at five Encampment Schools of six-day sessions per school. These schools were held in Choctaw, Adair, Kiowa, Kingfisher, and Grady Counties.

[168] Alfred C. True, Director, Office of Experiment Stations, May 10, 1911, letter to James A. Wilson, National Archives.

the reorganization of both the work and administration of the staff.[169]

These late changes in 1911 continued in 1912 with reports of improvement in research activities and efficiency of operation. However, the national office remained critical of conditions at Stillwater. In the annual report the direct stated that:

> The influences which have controlled it have, however, been far from satisfactory, and have been a serious handicap to its development and to the provision of conditions essential to its best work. The situation became such during the year as to arouse public concern, and an effort was made after the close of the fiscal year to recall the board of agriculture, which is in control of the college station, and secure the election of a new board more competent and more sympathetic in its attitude. While partially successful, the degree of improvement remains to be demonstrated. Pending this, the Oklahoma station must be regarded as in an unfortunate and unsatisfactory condition.[170]

The state board of agriculture during 1911 and 1912 was alleged to be little concerned with the scientific investigations of the station and attempted to manipulate the college and station for personal gain and political patronage. In addition to these problems in administration the Stillwater staff was taken to task for using federal research funds to purchase books of a general academic nature which should have been provided by the college library.[171] Despite all these problems, a number of research projects continued during the year. Experiments with feeding of hogs consisted of tests with alfalfa forage, with and without grain. Suggestions as to general care of hogs appeared in

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[169] Office of Experiment Stations, Annual Report, 1911, p. 181.

[170] U.S.D.A., Office of Experiment Stations, Annual Report, 1912 (Washington, 1913), p. 186.

[171] Alfred C. True, Director, Office of Experiment Stations, March 9, 1912, letter to James A. Wilson, National Archives.

Bulletin Number Ninety-four. The station entomologist discussed, in Bulletin Number Ninety-eight, the life cycle of the cotton or melon aphis (louse) and the methods of control experiments with use of lady bug larva and chemicals. Greenhouse experiments involved kaffir corn, broom corn, and milo maize, all of which used different percentages of soil moisture to determine wilting coefficients and transpiration.[172] Bulletin Number Ninety-seven contained a description of variety tests, preparation of seedbed planting, cultivation, fertilization, rotation, and insects affected and their control with cotton.[173] This, activities in research during 1912 continued along similar lines to earlier years. Publication of the station retained the practical aspects necessary to give the individual farmer specific remedies for his problems and special procedures for given crops and growing circumstances.

Earlier lines of investigations were continued in 1913 with efforts in some fields obtaining more publicity through various station publications. Some of these subjects were the life history and control of poultry vermin and orchard field pests, the alfalfa webworm, the corn leaf-louse, the cowpea aphis, the reproduction of bees, the culture of field crops, and the breeding and feeding of sheep.[174] Research activities employing Adams Act funds were devoted to such studies as the influence of nitrogenous rations on poultry breeding stock, sheep breeding, feeding of kaffir-corn silage and cotton-seed meal, drought-resistant sorghums, and corn versus kaffir-corn. Hatch funds contributed to

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[172] Office of Experiment Stations, Annual Report, 1912, p. 183.

[173] O.A.E.S., Bulletin No. 97 (1912), pp. 3-23.

[174] U.S.D.A., Office of Experiment Stations, Annual Report, 1913 (Washington, 1915), pp. 71-72.

research with cotton and melon aphis, feeding experiments with dairy cows, and trials with Bermuda grass.[175] Bulletin Number Ninety-nine devoted to dairy production in Oklahoma, feeding experiments, milk production procedures, and the general care of dairy cattle. Many suggestions were included for the best dairy operations.[176] Bulletin Number One Hundred was likewise a manual for use by farmers. This was a handbook listing the description and methods of control of insects found in gardens and truck crop acres.[177] These practical publications filled a need, but little effort was taken to encourage new areas of research or to have more efficient use of available staff.

The administration of the station remained in a state of confusion during 1913 as a direct result of outright interference with policy matters and in regard to personnel of the station by the state board of agriculture. The secretary of this state agency wrote to James A. Wilson, the current director of the station, and informed him that because of the lack of harmony between Wilson and the president of the board, the Board of Agriculture had decided to replace him as director.[178] The national office remained critical of the situation at the station. The national director pointed to general progress in improving conditions during the year, but with continued interference in administration and inconsiderate action on the part of the state board of

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[175]Ibid., p. 72.

[176]O.A.E.S., Bulletin No. 99 (1913), pp. 3-54.

[177]O.A.E.S., Bulletin No. 100 (1913), pp. 4-76.

[178]Benjamin Hennessy, July 5, 1913, letter to James A. Wilson, National Archives.

agriculture. He stated further that: "Until a liberal and settled policy is adopted toward the station which will recognize its administrative and its technical needs its funds cannot be used in a way to give the return which should be expected from them."[179] Circumstances surrounding the state board of agriculture became so bad that first, the board of agriculture was recalled by popular vote, and then came court action with restraining orders against the new board of agriculture appointed by the Governor. These affairs prevented administrative action, and as a result some station personnel left during the confusion.[180] Despite all of these problems with the state board of agriculture, the legislature consented to a direct appropriation to the station in 1913 amounting to $5,000 for the first year and $10,000 for the following fiscal year.[181]

The station meanwhile got into difficulties with the national office because of a lack of efficient accounting procedures. The staff had failed to maintain vouchers for each of three sources of income: Hatch Act funds, Adams Act funds, and station sales.[182] As a result of these shortcomings and the general situation at Stillwater federal funds were withheld for nine months. The Director of the Office of Experiment Stations evaluated the situation by stating:

> The Oklahoma station has passed through a very trying experience marking the culmination of a mistaken policy of

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[179]Office of Experiment Stations, Annual Report, 1913, p. 72.

[180]U.S.D.A., Office of Experiment Stations, Annual Report, 1914 (Washington, 1915), p. 191.

[181]Office of Experiment Stations, Annual Report, 1913, p. 72.

[182]E. W. Allen, Director, Office of Experiment Stations, December 21, 1914, letter to L. L. Lewis, National Archives.

> management which has centered the administration in the board instead of the director, has shown small regard for the rights or welfare of the station, and has deprived positions on its staff of the security which justice and merit demand. It is hoped that it has now been removed from the strife of the past and provided with a greater measure of opportunity and of freedom from unwarranted interference in its management and its funds and greater security of position. Prospectively, the outlook seems improved for the station to be allowed to realize the opportunity which is open to it.[183]

Considerable changes occurred at the Oklahoma facility during 1914. Progress was made in current areas of research, and new areas would gain greater importance. The continued interference with the affairs of the station by the state board of agriculture and an unfortunate fire which destroyed the interior of Morrill Hall on August 6, 1914, contributed to a considerable amount of confusion for the staff. Morrill Hall, erected in 1906, was burned out with a loss of practically the entire station property -- bulletins, library, mailing lists, and office materials.[184]

Some of the highlights of activities at the time were in the fields of agricultural engineering, veterinary medicine, and poultry. Those members of the staff associated with agricultural engineering investigated silo construction. Bulletin Number One hundred-one was devoted to a summary of the various types of silos, advantages of their use, and methods of construction.[185] In the area of veterinary medicine the staff of the laboratory conducted various experiments with hogs, and experiments with cholera which involved tests of blood, vaccines, and

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[183] Office of Experiment Stations, Annual Report, 1914, p. 194.

[184] Experiment Station Record, XXXI (1914), p. 300.

[185] O.A.E.S., Bulletin No. 101 (1914), p. 3.

urine.[186] Investigators called for greater knowledge of hog cholera, earlier diagnosis of the disease, and more knowledgeable vaccination procedures. To facilitate earlier diagnosis symptoms of the disease were outlined in a station bulletin.[187] The veterinary department also continued to manufacture and distribute blackleg vaccine free of Oklahoma livestock producers. A total of 1,300,000 doses had been supplied by the station during the period July, 1900, to March, 1914.[188] This was an especially important service in the control and eradication of the diseases in the state and had saved the livestock producers from very severe economic losses. Poultry science investigations centered around breeds and breeding of chickens, methods of poultry housing, and procedures for incubation and brooding of poultry. This information and a general summary of the best methods of poultry production formed Bulletin Number One hundred-six.[189] A poultry processing plant for use by both the college and the station was added to research accommodations for 1914.[190]

Meanwhile in agronomy two researchers called attention to the grain sorghums and suggested their special value as a replacement for corn in western Oklahoma.[191] Investigation with grain sorghums had involved variety tests, breeding, drought resistance studies, continuous

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[186] O.A.E.S., Bulletin No. 104 (1914), pp. 14-30.

[187] Ibid., pp. 3-14.

[188] The Times - Record (Blackwell, Oklahoma), March 26, 1914, p. 4.

[189] O.A.E.S., Bulletin No. 106 (1914), pp. 3-32.

[190] Office of Experiment Stations, Annual Report, 1914, p. 191.

[191] O.A.E.S., Bulletin No. 102 (1914), pp. 3-4.

culture, soil management after a sorghum crop, rotations with cowpeas sown between rows, moisture requirements, proportion of grain to head, and yields as compared with corn yields.[192] Along with sorghums the station agronomist reported various experiments with cowpeas -- varieties, rotations, selection and breeding, and planting in corn and kaffir. Various varieties proved more valuable for special purposes such as for pastures, forages, and soil improvement. Stress was made for a wider cultivation of sorghums in the state.[193]

Smith-Lever Act

The publication and distribution of various bulletins, circulars and news releases was a time-consuming activity for the station staff. The promotion of new crops, techniques, and specially bred animals together with the publication of information of a practical nature to farming greatly detracted from the main work of the station. The passage of national legislation on May 8, 1914, would permit the station to return to its main duty, that of collecting scientific information about agriculture.[194] The Smith-Lever Act of that date relieved the station of much routine work in distributing information. This act provided:

> That in order to aid in diffusing among the people of the United States useful and practical information on subjects

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[192]Ibid., p. 9.

[193]O.A.E.S., Bulletin No. 105 (1914), pp. 3-22.

[194]True, A History of Agricultural Experimentation and Research, p. 235.

> relating to agriculture and home economics, and to encourage the application of the same. there may be inaugurated (in conjunction with the Land Grant Colleges) agricultural extension work which shall be carried on in cooperation with the United States Department of Agriculture.[195]

This legislation removed the need for staff concern with immediate application of research information, dispensing of practical information and procedures, sponsoring of agricultural societies, and conducting farmer institutes. However, the removal of the actual work was all that was wanted, since the staff wished to have some voice in extension activities. As early as 1908 Oklahoma had eight Farmer's Cooperative Demonstration Agents, and by 1913 Texas and Oklahoma had a few cotton clubs and kaffir corn clubs. The agricultural colleges and experiment stations were not favorable to these activities when they had no part in the supervision of them.[196]

Regardless of the progress in research, a direct state appropriation, and the indirect assistance through the Smith-Lever Act, the station remained in turmoil in 1914. The effects of the upsetting events of 1913, with the removal of the director, departure of some of the staff, and the loss of federal funds for nine months greatly hindered the work of the station and especially those projects of a long range nature.

Conditions were somewhat unsettled during the first part of the fiscal year 1914-1915, but with the appointment of a new director, W. L. Carlyle, with power to administer the work and funds, the situation

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[195] U. S. Statutes at Large, Vol. XXXVIII (1914), pp. 373-74.

[196] Alfred C. True, A History of Agricultural Extension Work in the United States 1785-1923, U. S. Department of Agriculture Miscellaneous Publication No. 15 (Washington, 1928), pp. 63-71.

began to improve, and the station regained federal funds.[197] New men replaced those who had resigned in the departments of poultry, dairy husbandry, and agronomy.[198]

However, adjustments were made and research efforts proceeded. Under Adams Act funds research continued with sheep breeding, breeding of corn and sorghums, investigations of the chemical composition of grain sorghums for silage, the effect of cotton seed meal upon breeding stock, and the fruit of the tomato.[199] The staff had first planted Sudan grass at the station in the spring of 1912, but its value as hay and pasture was not apparent until subsequent research pointed out this fact. The assistant agronomist in Bulletin No. 103 gave a general description of the Sudan grass plant, method of preparing the seedbed, planting procedure, methods of cultivation, harvesting techniques, and a comparison with Johnson grass.[200] With Hatch and other funds research extended to feeding experiments with pigs, a comparison of alfalfa hay and cotton-seed meal as feed. In agronomy investigations centered on continuous culture of wheat, variety tests of corn, legumes, sorghums, and sweet clover, and on cotton breeding.[201] In the area of chemistry researches centered around miscellaneous analyses of fertilizers, feeds, and other materials; analytical work with cottonseed

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[197]U.S.D.A., Office of Experiment Stations, Annual Report, 1915 (Washington, 1916), p. 218.

[198]Ibid.

[199]Ibid., pp. 218-219.

[200]O.A.E.S., Bulletin No. 103 (1915), pp. 3-12.

[201]Office of Experiment Stations, Annual Report, 1915, p. 220.

meal, crude-fiber determinations; and analyses in cooperation with other departments, including feeds with animal husbandry and cold storage experiments with sweet-potatoes for the horticulture department.[202] Veterinary research continued in the area of hog cholera immunity. The horticulturalist was engaged in researches with grapes, small fruits of different varieties, comparison of the planting of one year and three year apple trees for orchards, and grafting methods for superior varieties of pecans on native trees.[203] Legislation providing for nursery inspection by the state board of agriculture relieved the station entomologist from this routine activity, with the result that more time could be devoted to research. During the 1914-1915 period the entomologist conducted experiments with different breeds of bees, and made studies of the life history of the false chinch bug, alfalfa webworm, and locust-tree borer.[204]

With a new administration, new staff members, and with the entomologist relieved of inspection duties, the station began to progress despite the trying period of the previous years. It had, moreover, secured the recognition of the need for proper administration the necessity for the absence of state interference in the use of funds and in policy decisions. Much was achieved even with new and inexperienced staff members, and general conditions were vastly improved. The future appeared good, with increased financial support by the state and with

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[202]Ibid.

[203]Ibid., p. 221.

[204]Ibid.

a constructive plan of operation.[205] However, another incident occurred that detracted from these advances. The college, in an attempt to cut costs, made W. L. Carlyle both director of the station and dean of agriculture without providing for paying the college portion of his salary. The president's offer of $1,000 was only one-fourth of the salary -- an unequal share for the duties as dean.[206]

Other state activities that were designed to obtain added revenue worked to detract the disadvantage of the station improvement in 1916. The State Depository Law of 1916, which required that proceeds from all sales at state institutions be returned to the state treasury, created a number of problems. The decision by the state attorney general that this statute applied to the college creamery and feeding experiment livestock led to an order by the Board of Agriculture to President J. W. Cantwell that both these operations be closed.[207] Another problem arose in 1916 with the transfer, contrary to regulations, of station funds to the college to ease a temporary shortage. This situation was further compounded by the visit of a federal inspector, who called for the fund's immediate return, and by the inability of the college to repay the money until the next legilslative appropriation.[208] The president of the college and the director of station suggested other problems that needed correction. President Cantwell pointed to the arbitrary

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[205]Ibid.

[206]L. L. Lewis, Acting President, Oklahoma A. & M. College, February 24, 1915, letter to A. C. True, National Archives.

[207]E. W. Allen. Chief, Office of Experiment Stations, June 6, 1916, letter to W. L. Carlyle, National Archives.

[208]W. L. Carlyle, Director, Oklahoma Agricultural Experiment Station, November 3, 1916, letter to E. W. Allen, National Archives.

and frequent changes in staff and the low salaries that contributed to making the research projects of short duration. He recalled the lack of any direct state appropriation until 1914 and asked for a regular appropriation every biennium.[209] Director Carlyle included a table in his report to the state board of agriculture showing appropriations made to experiment stations in other states.[210] President Cantwell went on to state:

> The aim of the Experiment Station has been to anticipate the problems of the farmers of the state of Oklahoma and to assist in solving them, to provide such information on the various subjects relating to agriculture in all its branches as would best serve the people of this great state.[211]

President Cantwell further suggested that to accomplish these goals the state needed to cooperate with the federal government in conducting soil surveys in all areas of the state. He recommended an appropriation of $10,000 for two years to do this work. He asked that the state provide additional buildings for the use of the station, especially a granary or grain laboratory for storage of grain in winter and a cottage for the farm foreman. Director Carlyle requested that sub-stations be established so that results of experimentation could be checked for application in the various sections of Oklahoma. Four such stations would cost an estimated $7,500 for two years.[212]

Contrary to the implications of these problems, however, the Oklahoma station improved both in the quality of its experimental work and

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[209] Oklahoma, State Board of Agriculture, Annual Report, 1916, p. 54.

[210] Ibid., p. 55.

[211] Ibid., p. 57.

[212] Ibid., pp. 59-62.

in its efficiency of administration. Morrill Hall, previously gutted by fire, was rebuilt and made fireproof. A poultry house, a work office, and an implement shed for the horticultural department were also added to available facilities.[213] The dairy department made a study of ice cream production and of market cream, both indications of greater affluence. The state appropriation reached $5,891.46 for the year, and several factors indicated a better prospect than in the preceding years. All investigations were conducted on a project basis, and thus research efforts improved in quality whil the staff's esprit de corps was good.[214]

The smoother operation of 1916 was shaken somewhat with the resignation of Director Carlyle after President Cantwell and the board of regents decided against the director's wishes to retain sheep in the breeding experiments and disposed of one hundred head.[215] Correspondence continued between the director and the office of experiment stations concerning $2,041.59 taken from the station incidental fund in 1916 and used to pay past due bills. This procedure without specific vouchers was questioned by the national office.[216]

Regardless of these problems research activities continued. The dairy was experimenting during 1917 with the manufacture of ice cream under commercial conditions, while it also made studies of the

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[213] U.S.D.A., Office of Experiment Stations, Annual Report, 1916 (Washington, 1918), p. 223.

[214] Ibid., pp. 226-27.

[215] W. L. Carlyle, Director, Oklahoma Agricultural Experiment Station, October 1, 1917, telegram to E. W. Allen, National Archives.

[216] E. W. Allen, Chief, Office of Experiment Stations, March 21, 1917, letter to W. L. Carlyle, National Archives.

manufacture of butter and conducted investigations of the marketing of dairy products in Oklahoma.[217] The horticulture department during the year engaged in experiments with the growing of trees for fence posts, conducted pecan investigations, made a study of the sweet potato and its diseases, and conducted variety tests with vegetables, bush fruits, orchard fruits, and grapes.[218] In 1917 the entomologist isolated the germ of the honey bee paralysis and began trials to determine the best commercial varieties of bees for Oklahoma.[219] At the same time the staff made a study of the economic value of a tractor on a seventy-three acre plot. Careful records of the costs and the work done by this machine were maintained.[220]

These highlights of research indicated the continued slow growth of the station and the small amount of state support. The legislative appropriation for the year was $5,154.26. A favorable evaluation from the national office at the time suggested a progressive policy and a research program of direct benefit to Oklahoma agriculture.[221] Of indirect assistance to all stations and perhaps of greater benefit to the newer states was the Smith-Hughes Act of February 23, 1917. Federal assistance to vocational education would combine as an educational force for further support for research and at the same time would use research

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[217] O.A.E.S., Annual Report, 1917, p. 27.

[218] U.S.D.A., Office of Experiment Stations, Annual Report, 1917 (Washington, 1918), p. 221.

[219] Ibid.

[220] Ibid.

[221] Ibid., p. 222.

information and would call for more.[222] The agricultural college would need more information with which to develop courses in vocational agriculture and home economics; and once teachers were put in the field they would seek answers to questions arising from their students.

As indicated by station publications, state reports, and reports of the national office, research activities during 1918, 1919, and 1920 followed the lines previously established without much change to highlight the investigations. Little writing appeared about activities at the station during the above years except for those aspect repetitious of other years.

President Cantwell, writing in the Annual Report for 1918, suggested a number of necessary characteristics for a successful research operation. He stressed that these were the most important: secure tenure for experimenters, and an understanding by staff members that definite experimental results rather than general college service were desired. He cautioned further that teaching and extension must not interfere with the experiment station staff and its work.[223] Perhaps through these comments some indication could be seen why little publicity was given to the station and why little was recorded of research activities. During World War I the Oklahoma station had difficulty in maintaining an adequately trained staff. It was not able to secure men for certain positions; chemists, for example, were hard to locate, and agricultural engineers were extremely rare.[224] The staff in 1918 was composed of

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222U. S. Statutes at Large, Vol. XXXIV (1917), p. 929.

223Oklahoma, State Board of Agriculture, Annual Report, 1918, p. 12.

224U.S.D.A., Office of Experiment Stations, Annual Report, 1918 (Washington, 1920), p. 61.

twenty members, with fifteen of these also serving on the faculty of the college.[225] The staff at the Oklahoma station directed its attention toward the goals suggested for the farmer by one writer, L. H. Bailey:

> The ability to make a full and comfortable living from the land; to rear a family carefully and well; to be of good service to the community; to leave the farm more productive than it was when he took it.[226]

Not only was the state station attempting to define its goals, but also the national office was defining concepts:

> Research from its nature involves considerable negative and inconclusive work - of prowling in blind alleys. But it is important to recognize when the blind alley has been reached. Productive investigation needs to be constantly of the nature of inquiry, and each step examined as to what it is contributing or bids fair to add.
>
> The larger function of the station expert does not end with making substantial contributions to science, even agricultural science, but it seeks through them to make science practical and practice scientific. Hence specialists need not only know their science but to visualize its application to useful ends.[227]

A significant increase in state appropriation came in 1920, with $10,000 granted as opposed to $5,000 in 1919.[228]

It had been a hard task for the staff to change the status of the station from the situation in 1913 where research funds had been diverted to instruction or had gone for political offices, to a condition in 1920 where the state legislation had appropriated a fairly large sum for its direct use. The staff had surmounted a number of trying

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[225]Ibid., p. 71.

[226]G. F. Warren, Farm Management (New York, 1918), title page.

[227]Experiment Station Record, XL (April, 1919), p. 406.

[228]U.S.D.A., Office of Experiment Stations, Annual Report, 1920 (Washington, 1921), p. 4.

difficulties such as the withholding of federal funds on occasion, the loss of the facilities of Morrill Hall and the records housed in it, and the intervention of state officials in the administration of the station. Problems with state officials and the necessities brought by World War I undermined the basic research program. However, many of the problems of earlier years with administrative policies were alleviated through the intervention of the Office of Experiment Stations and by the specific provisions of the Adams Act. The expansion in the number of publications produced at Stillwater gave some indication of research accomplishments. These had slowly increased from a total of approximately fifty in 1900 and a total of one hundred eighty-seven by 1920. Research in the area of agronomy produced the most publications, with entomology second, animal science third, horticulture fourth, and chemistry fifth. The staff in some areas such as chemistry conducted experiments in many other fields, and as a result the list of publications assigned to these fields was not as large as in some of the others. Although few activities stand out prominently, several projects were extremely important during the first two decades of the twentieth century, and much basic research laid the foundation for later accomplishments and applications of information. The staff dispensed a great amount of general information of a rather practical nature to meet the needs of a new agricultural region and a new farming population. Much time was spent with farming procedures, adaptable varieties of plants, breeding of animals for the climate, and the utilization of agricultural technology.

The staff served the farming community in many capacities. They acted as lecturers and speakers at farmers' institutes, short courses, and agricultural society meetings; they acted as judges at county fairs; they distributed Bermuda grass roots; they analyzed water and other substances; they inspected livestock, plants, seeds, and fertilizers; and they dispensed a great amount of general and specific agricultural information. The operation of the extension service in connection with the college in the later years of the period relieved staff members of a large part of this burden of public service and provided a better link between individual farmers and research efforts. However, the distribution of blackleg vaccine, the operation of dipping vats for Texas fever, conducting of farmer institutes, nursery inspection, and the identification and diagnosis of specimens, diseases, or special problems of individual farmer did provide a service that would not have been performed at all if the staff had not done so. This special attention and the distribution of practical information was also a means for obtaining financial support through the legislature.

Specific research areas of importance for the period 1901-1920 and for later utilization were those dealing with sorghums and other feed grains; cotton seed meal; soil analyses and conservation; use of hog cholera vaccine and the prevention of Texas fever in cattle; Bermuda grass culture; wheat and cotton variety trials; control methods for chinch bugs, San Jose scale, and other diseases or insects that attacked horticultural crops; and variety tests of fruits, berries, and vegetables. In some cases specific research was not geared to practical farming in the state. Geography and climate were not always considered when decisions were made as to which projects would receive the greatest research emphasis. This was especially true in regard to horticulture, when transportation was not available for rapid shipment of perishable fruits. In general experimentation during the two decades before 1920 lacked long-range planning and organization. Only in the continuous wheat experiments, cotton variety trials, and pasture improvement studies did research workers begin to examine the basic agricultural resources of the state.

CHAPTER IV

THE STATION DURING THE TWENTIES, THIRTIES, AND FORTIES, 1921-1950

Like agriculture in general, the research program at Stillwater during the period 1921-1950 came out of the doldrums of token financial support and limited investigations to a greatly enlarged state financial support and a complex program with special experiment stations in several areas of the state. Federal support would grow likewise and with it a stimulation for expanded areas of investigation. Research emphasis would grow to include practically all areas of rural life as well as to continue the efforts in areas more closely related to agricultural production. The problems of agricultural surpluses and inefficient distribution would lead to efforts to obtain better marketing, better farm management, and more uses for raw products and by-products from agriculture. The Oklahoma station's program followed along in these efforts with an expanding staff in agronomy, agricultural economics, agricultural engineering, and sociology and rural life.

The Twenties

The future of the college and station appeared somewhat dim in the spring of 1921. A memorandum from the president announced that the legislature had adjourned without providing an appropriation for the college, and asked that the staff remain at their posts and not be too discouraged.[1] A deadlock between the two political parties in the state had contributed to this and other difficulties of the college and station during 1921.[2] The appropriation problem was quickly solved at the Extraordinary Session of the Eighth Legislature which started April 25 and continued until May 21, 1921. Both the college and the station received appropriations from this session, the college receiving $464,850 for each of two following fiscal years, while the station received $10,500 for each of the same years.[3]

Another problem that faced the station during the early 1920's was the interference by the dean of agriculture in its affairs. According to the college administrative policy, the dean of agriculture would have to approve all appointments to the staff, all requisitions, and all projects of the station.[4] Not only did this policy undermine station morale, but, as the director pointed out, it also contributed to a situation in which ninety percent of the staff were so overburdened with instructional and other duties that little time was left for research.[5] This problem was further emphasized by the fact that the staff produced only seven publications during the year. These latter reported research with chemical studies of broom corn and broom corn silage,

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[1]J. W. Cantwell, President, Oklahoma Agricultural and Mechanical College, April 8, 1921, memorandum to faculty and staff, National Archives.

[2]Henry G. Knight, Director, Oklahoma Agricultural Experiment Station, April 11, 1921, letter to E. W. Allen, National Archives.

[3]Oklahoma, Session Laws, 1921, p. 236.

[4]C. T. Dowell, Director, Oklahoma Agricultural Experiment Station, September 15, 1921, letter to J. B. Eskridge, National Archives.

[5]O.A.E.S., Annual Report, 1921, p. 5.

sheep feeding, stomach worm in sheep, alfalfa, cattle feeding, and continuous wheat cultivation.[6] The director also referred to the poor comparison with the Texas operation, stating that the latter state spent nine times as much for agricultural experimentation as did Oklahoma. The number of the staff who devoted all their efforts to research was quite small in comparison to other state stations. The national average listed forty-three percent as devoting full time to research, while only two of the twenty-one members of the Oklahoma facility worked in this capacity.[7]

The Drive for More State Support

Criticism of the situation at Stillwater continued in 1922. In a report to the Office of Experiment Stations, the local director drew a comparison of state support for 1919. The national average for state support to experiment stations that year was $56,871.00, or 12.1 times as large as the Oklahoma appropriation. This disparity was further compounded by the fact that the average total income for state stations was $141,583.90, while that of Oklahoma was only $40,000.[8] *The Oklahoma Farmer* Stockman contained an article in 1922 also calling attention to the inadequate state support. It suggested that the $10,000 in 1919 was merely five cents a farm if divided by the 191,988 farmsteads of the state. Even these funds had not come from real estate taxes, as taxes on petroleum and other minor levies had been the source of this

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[6]O.A.E.S., *Bulletin* Nos. 135-140 (1921).

[7]O.A.E.S., *Annual Report, 1921*, pp. 3-5.

[8]C. T. Dowell, Director, Oklahoma Agricultural Experiment Station, November 9, 1922, letter to E. W. Allen, National Archives.

support. The writer of the above article called for an appropriation of at least twenty-five cents per farm. He justified this recommendation by stating that: "Experiment work in agriculture is vital; it is fundamental. It goes to the root of things. When experiments are conducted with the needs of the men in mind, its value is above estimate." Not only was state support inadequate, but also, according to this writer, the emphasis on the college and extension in the ratio of $10,000 for research to $150,000 for the college and extension was misplaced.[9] The contribution of only six publications was another illustration of the generally poor state of research at Stillwater. The bulletins produced during the year dealt with such subjects as sheep feeding and winter breeding ewes, the effect of time and organic matter on the so-called hardpan subsoils, the effects of protein and minerals on the development of swine, oats rotation versus continuous culture, and cattle feeding.[10] However, various research projects continued without report of progress because of their repetitious nature in some cases, while in other cases results could not be determined for a number of years.

Despite the problems of the initial years of the decade, the 1920's would see rapid growth in agricultural experiment stations in general as well as the Oklahoma station in particular. Agricultural stations adapted and expanded their programs to meet the needs of the times. Accomplishments grew as the "project" method became the universal procedure. Although the station staffs were rather restive under federal

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[9]"What Our State Experiment Station Needs," The Oklahoma Farmer Stockman, November 10, 1922, p. 7.

[10]O.A.E.S., Bulletin Nos. 142-147.

authority, they were placated a bit by increased funds that were available for research.[11] The aggregate income for the five years 1921 to 1926 would rise nearly sixty percent. Nationally direct state aid would nearly double at the same time.[12] County agents and extension specialists would take over the responsibility for the dissemination of knowledge acquired at the station. This shift would leave the station with only the extra duty to print bulletins and circulars.[13] One of the changes to be seen in the stations during the twenties was the development of specialists who were occupied with intensive research in certain narrow fields.[14] This situation would incite a certain amount of criticism then and years after.

The Purposes of Agricultural Research and Research Orientation During Early Twenties

In answer to the question of whether duplication at state stations was wasteful, one writer at the national office suggested that:

> ...The stations are not only concerned with the search for new truths but the larger and better use of truths and facts already known. This requires experiments of a kind which may be viewed as repetition but are in fact quite essential to the safe propagation of knowledge. Again, the results of research need to be restudied from time to time in the light of the progress of science or of changed conditions which affect their relationships. The earlier conclusions and deductions need to be tested

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[11] Edward D. Eddy, Colleges for Our Land and Time (New York, 1957), p. 166.

[12] Ibid.

[13] Ibid., p. 166.

[14] Ibid., p. 167.

> in the light of investigation which has penetrated more deeply, in order to correct possible error and to make further advances.[15]

Much of the research during 1923 and 1924 at the Stillwater facility was of the type in which repetition was necessary. Bulletins published during these years illustrated this duplication in such areas as cotton variety tests, swine feeding, and cattle feeding.[16] The Oklahoma station produced only five bulletins in 1923 and none in 1924. These years saw a great amount of confusion at Stillwater and elsewhere resulting from the victory of the Farmer-Labor Reconstruction League in the 1922 governor's race. The governor in turn then appointed one of his promoters to the post of president of the college. This man, George Wilson, was ill suited for such a position, and the national office became quite concerned over the situation that arose. Chief E. W. Allen of the Office of Experiment Stations was critical of the frequent changes in directors and the inadequate program of research as a result of the political manipulations. In fact, he stated: "The Department regards the present situation a very serious one in the history of the station."[17] Nevertheless, staff size rose from twenty to twenty-seven in 1924, with twenty-one of these teaching as well.[18] State support for the station meanwhile had reached $12,500.[19]

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[15]Experiment Station Record, XLVI (1922), pp. 402-3.

[16]O.A.E.S., Bulletin Nos. 141, 148, 149 (1923).

[17]E. W. Allen, Chief, Office of Experiment Stations, July 3, 1923, letter to George Wilson, National Archives.

[18]U. S. Department of Agriculture, Office of Experiment Stations, Annual Report, 1924 (Washington, 1925), p. 107.

[19]Ibid., p. 109.

Conditions in general changed for the better in 1925. While the staff had written no publications in 1924, they produced five in 1925. These were concerned with researches in the areas of cultural methods for corn and grain sorghums, sheep breeding, nutrition, cotton varieties and soil fertility.[20] Tick fever research remained an important part of activities at the Oklahoma station, as well as at stations in Arkansas, Louisiana, Mississippi, Missouri, and Texas.[21]

Meanwhile research interests on the national level turned to include those facets of the farming community which involved economic change, economic welfare, and social welfare. The tripling of farm acreage from 1860 to 1920 was a significant factor in agricultural abundance.[22] This abundance, with the readjustment that came after World War I when Europe again began to produce its own foodstuffs, created serious agricultural problems in the United States. Those areas such as Oklahoma without a broad economic base were more seriously affected.

The personnel of the stations became aware, through the effects of the agricultural depression of the twenties, that their program of research lacked certain important aspects. Little had been done in the areas of economic and social research. Then in the 1920's the problem of marketing and rural social conditions posed a more important

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[20] O.A.E.S., Bulletin Nos. 150-155 (1925).

[21] Alfred C. True, A History of Agricultural Experimentation and Research in the United States 1607-1925, U. S. Department of Agriculture Miscellaneous Publication No. 251 (Washington, 1937), p. 58.

[22] Byron T. Shaw, "Research Planning and Control in the United States Department of Agriculture: The Experience of an Old and Well-established Research Agency," The Annals of the American Academy of Political and Social Science, CCCXXVII (January, 1960), p. 96.

challenge than production.[23] Special problems arose -- prices, marketing efficiency, and methods of social control.[24] This growing interest would rekindle ideas of the progressives and stimulate national and state research programs. However, on the state level such research would be limited because few of the early station directors knew what good research in the social sciences entailed. These men were grounded in the natural sciences and had little understanding of the social sciences.[25] One of the early steps toward an organized program came with the meeting of federal and state station administrators at St. Louis, April 20 and 21, 1925. This group formulated six national projects to be explored. These were listed as (1) distribution and marketing of farm products, (2) the problem of surpluses of farm products, (3) vitamin content of food in relation to human nutrition, (4) rural home management studies, (5) rural social organizations and agencies essential to a permanent and effective agriculture, and (6) factors influencing the production and quality of meats.[26] The problem of gaining support for research in these areas would be solved in part by the passage of the Purnell Act. This act allowed the scope of investigations to be broadened to meet the needs in general economic and social research. As a result of the passage of the Purnell Act and subsequent [illegible]

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[23]Eddy, p. 167.

[24]Murray R. Benedict, "The Social Sciences in Experiment Station Research," <u>Journal of Farm Economics</u>, XXXI (1949), p. 256.

[25]Ibid., p. 258.

[26]H. C. Knoblauch, et al., <u>State Agricultural Experiment Stations, A History of Research Policy and Procedure</u>, U. S. Department of Agriculture Miscellaneous Publication No. 904 (Washington, 1962), p. 192.

administrative planning, a nationwide program of cooperative research and patterns for regional research developed.[27]

With the additional funds available the stations embarked on the study of questions such as farm management, grading and standardization, transportation, storage, the marketing of farm products, the financing of agricultural enterprises, home economics, and social problems of country life.[28] The effect of the additional funds manifested itself in an increase in permanent station personnel, better facilities, and more prompt publication of research results.[29] As a result of all the diverse activities of the stations the Office of Education estimated that for the year 1928 alone, the stations had a value to the general population of $841,470,000.[30] Continued interest would be shown by later enactments such as the Bankhead-Jones Act of 1935 and the Marketing and Research Act of 1946.

The Purnell Act and Social Science Research

The growing general interest in social science led research from that dealing only with plants, animals, and soils, to the totality of rural life. To provide funds for this broad range of research Congress passed the Purnell Act. This law of February 24, 1925, provided:

> That for the more complete endowment and maintenance of agricultural experiment stations ... There is hereby authorized to be appropriated [an additional sum of]

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[27]Ibid.

[28]Eddy, p. 167.

[29]Ibid., p. 168.

[30]Ibid., p. 170.

> $20,000 for the fiscal year ending June 30, 1926; $30,000 for the fiscal year ending June 30, 1927; $40,000 for the fiscal year ending June 30, 1928; $50,000 for the fiscal year ending June 30, 1929; $60,000 for each fiscal year thereafter.[31]

The funds received by each state from this act in 1929 would be five times the amount provided by the Hatch Act. The specific provisions for research were as follows:

> The funds appropriated pursuant to this Act shall be applied only to paying the necessary expenses of conducting investigations or making experiments bearing directly on the production, manufacture, preparation, use, distribution, and marketing of agricultural products and including such scientific researches as have for their purposes the establishment and maintenance of a permanent and efficient agricultural industry, and such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life, and for printing and disseminating the results of said researches.[32]

The legislation also had a stipulation preventing expenditures above ten percent for buildings, repairs, or the purchase or rental of land.[33] This provision followed the official current interpretation of the Hatch Act and prevented the creation of sub-stations with federal funds. However, more funds were available for the experiment stations to expand the program of research on the economic and social problems of agriculture.[34]

Research in this new area of social science would center attention on the basic problems that prevented wider application of the knowledge

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[31] U. S. Statutes at Large, Vol. XLIII (1925), pp. 970-71.

[32] Ibid., p. 971.

[33] Ibid.

[34] Murray R. Benedict, Farm Policies of the United States, 1790-1950 (New York, 1953), p. 237.

gained in research and on the creation of economically, socially, politically, and culturally sound farming units. Research in the area of social science would be limited by the lack of comprehensive data, refined methods of statistical analysis, and an understanding of the objectives of such research. At the Oklahoma station support for such research in the two fields of agricultural economics and rural sociology would develop slowly. While agricultural economics would ultimately expand greatly, rural sociology would generate only a small amount of interest despite a number of important research accomplishments.

On the national level thinking in the mid-twenties suggested certain goals in this new research direction. One writer stated: "The basic purpose of research is to increase understanding of our environment, both physical and social."[35] With this in mind a second step was then to proceed from research to the use of the understanding so derived in the devising of practical solutions to current problems.

One basic source for information needed for this new research effort was the United States census. This composite of information had achieved a more scientific basis in 1880, but until this new research orientation it had provided few agencies with working data. Information of this sort together with data accumulated by the Department of Agriculture, the Interstate Commerce Commission, the Bureau of Corporations, and the Comptroller of the Currency could be used as the basis for regional, state, and local research by the various state stations.[36]

Some precedents for this type of research had been established by

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[35] Benedict, "The Social Sciences in Research," p. 256.

[36] Ibid.

the national Country Life Commission of 1909. According to this group:

> Country life must be made thoroughly attractive and satisfying, as well as remunerative and able to hold the center of interest throughout one's lifetime ... The first condition of a good country life, of course, is good and profitable farming. The farmer must be enabled to live comfortably.[37]

With these ideals in mind, the Commission was comprehensive in its examination of life in the rural areas. It observed all aspects of country life such as the social, cultural, economic, and religious, included the position of women, and stressed the need for cooperative efforts.[38] This agency was one of the first not only to include social science in the area of research, but it had also suggested the creation of an extension service in connection with agricultural colleges.[39] More and more people began to view agriculture as something more than an occupation; it was a way of living that needed to be investigated in all its facets. Research into agricultural production had to take into consideration such features as types of houses and surroundings, furnishings, conveniences, rural manners, morals, social customs, and religious practices. A basic problem that arose was how to reach the poorer, less educated farmer with research information.[40] However, little research in the social sciences had been accomplished, as only a small amount of pressure had been applied to provide the necessary funds during the period of prosperity, 1900 to 1920. As economic conditions became

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[37]U. S. Congress, Senate, Report of the Country Life Commission, Senate Document No. 705, 60th Congress, 2nd Session (Washington, 1909), p. 48.

[38]Ibid., pp. 50-65.

[39]Ibid., p. 56.

[40]Lauren Soth, Farm Trouble (Princeton, 1957), p. 91.

difficult for farmers in the early twenties various people began to re-examine the ideas expressed by the Country Life Commission.

Station Growth in the Late Twenties

In 1926 Oklahoma state appropriations rose as had the federal funds, with the sum jumping from $12,500 to $30,000.[41] The staff moved the offices of the Experiment Station into the newly constructed Whitehurst Hall in August, 1926. This building also housed the station library as well as the departments of agricultural chemistry, agricultural economics, crops and soils, entomology, home economics research, horticulture, and plant pathology.[42] Area research within the state was conducted through an agreement in 1924 with ten farmers to carry on a simple type of experimentation with field crops and soils. These farms were mostly in the eastern portion of the state, since the Department of Agriculture had established experiment stations at Lawton and Woodward. The Boys State Reformatory at Granite served as another site for conducting agricultural research. A third location was at Henryetta, where the local chamber of commerce gave the horticulture department permission to supervise its five-acre vineyard.[43] The staff had grown to forty-three by 1926, and thirty-four of this group were members of the college staff.[44] During the 1924-1926 biennium the department of

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[41]U. S. Department of Agriculture, Office of Experiment Stations, Annual Report, 1926 (Washington, 1927), p. 114.

[42]O.A.E.S., Biennial Report, 1924-1926, pp. 5-6.

[43]Ibid. The Woodward station would become a center for cooperative research in 1929 as discussed below.

[44]Office of Experiment Stations, Annual Report, 1926, p. 113.

agricultural economics had conducted research in the areas of tenancy and ownership, farm taxation, cooperative agricultural marketing, the effects of membership in farm organizations, the business of the farm and the standard of living, and the types of farming in Oklahoma.[45] In one publication the director called attention to the value of good roads for the farmers' use, good construction methods, preventive maintenance, the exceesive width of some roads, and the need for adequate road-making machinery. Other research reported in 1926 concerned commercial buttermilk, the boll weevil in Oklahoma, ice cream improvers, seed treatment of grain sorghums, pecans, silos and silage, cattle testing, grapes, the quality of flour, alfalfa, and the Babcock test.[46]

Reports of activities at Stillwater during the years 1927, 1928, and 1929 were rather brief and without significant information. The publication Oklahoma Current Farm Economics began as Circular Number Forty-nine on April 9, 1927. This became a monthly publication of the department of agricultural economics, then a bimonthly circular, and later a quarterly publication by the department of agricultural economics and extension economics. Articles in this publication involved the economic aspects of farm activities in Oklahoma as well as research of the station and its economic effects.[47] The state appropriation for experiment station was $40,000 in 1928.[48]

While the Oklahoma station had made progress in gaining additional

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[45]O.A.E.S., Biennial Report, 1924-1926, p. 10.

[46]O.A.E.S., Bulletin Nos. 156-159; and Circular Nos. 59-65.

[47]O.A.E.S., Circular No. 49 (1927).

[48]U.S.D.A. Office of Experiment Stations, Annual Report, 1928 (Washington, 1929), p. 96.

state support new national problems required addition investigations. Changing living conditions and dietary habits in the United States created certain economic problems that were harassing farmers during 1928. The per capita wheat consumption had declined 1.1% from the high period of 1885-1889 to the period 1920-1924, and as a result of this factor, the shortened work day, and a change in diet the wheat farmer's income was reduced. Farmers faced other problems such as inequitable taxes, payment for rural roads, urban use of rural-produced labor, and a tariff policy that was favorable to business and industry.[49]

Research in agricultural economics which could have eased some of these economic problems of the farmer was badly burdened with conditions brought on by piece-meal policies geared to producing cheaper foods and raw materials without consideration of the farmers' welfare. The studies made by chemists, biologists, and engineers emphasized the efficiency of the farmer and his operations without consideration of added economic benefit to him for this performance.[50] One writer in 1929 suggested that the needs for agricultural economics that year were (1) collection of data as a basis for a rational production program, (2) creation of agencies for orderly marketing, (3) elimination of excessive competition between farmers and the teaching of farmers to insist on a high standard of living, (4) creation of agencies to facilitate removal of excess farm population, (5) gearing of economic legislation involving industries to the benefit of farmers, (6) encouragement of more farmer

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[49]C. G. Williams, "The Responsibility of the Agricultural Experiment Station in the Present Agricultural Situation," Science, LXVII (1928), pp. 520-21.

[50]H. C. Taylor, "The New Farm Economics," Journal of Farm Economics, XI (1929), pp. 361-63.

cooperation, and (7) clear thinking on economic problem with the destruction of false doctrines such as the value of high tariffs.[51] These various economic problems greatly influenced research activities at the Stillwater facilities. Although more funds from both the federal and state governments came to the station, the number of publications, after an increase in 1927 and 1928, fell off again in 1929. Publication of bulletins emphasized the work in the fields of agricultural economics, agricultural engineering, agronomy, animal science, chemistry, poultry science, and sociology and rural life.

The Oklahoma station had made great strides during the Twenties, especially after 1924. The station staff reached forty-two in number by 1926.[52] A breakdown of the various positions and the degrees held showed this expansion and the upgrading of the staff:

Administration
President of the College - Bradford Knapp, D.Agr.
Director - Carr T. Dowell, Ph.D.
Secretary to the Director
Assistant Librarian in charge of the Agricultural Library.

Agricultural Economics
Jesse T. Sanders, Ph.D. - Head
Ph.D. - Professor in charge of Marketing
M.S. - Associate Professor, Rural Sociology
Ph.D. - Associate Professor, Farm Management

Crops and Soils
M.S. - Head
Ph.D. - Professor of Plant Breeding
Ph.D. - Professor of Soils
M.S. - Associate in Soils
M.S. - Assistant in Cotton
Ph.D. - Assistant, Forage Crops and Pastures
B.S. - Assistant, Outfield Experiments

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[51] Ibid., p. 364-67.

[52] O.A.E.S., Biennial Report, 1924-1926, pp. 2-3.

B.S. - Director of Experiment Station work at Goodwell
B.S. - In charge of Outfield Experiments at Granite

Animal Husbandry
B.S. - Head
M.S. - Professor in charge of Hogs
M.S. - Associate Professor in charge of Sheep
M.S. - Associate, Animal Breeding
M.S. - Assistant in charge of Horses

Chemistry
Ph.D. - Head
Ph.D. - Assistant
B.S. - Assistant

Dairy
B.S. - Head
M.S. - Associate, Dairy Manufacturing
Ph.D. - Associate, Dairy Husbandry
B.S. - Assistant Professor, Dairy Husbandry

Entomology
M.S. - Head
M.S. - Assistant
B.S. - Assistant

Home Economics
M.S. - Associate, Human Nutrition and Dietetics
M.S. - Assistant, Household Arts

Horticulture
M.S. - Head
M.S. - Associate, Pomology
M.S. - Assistant, Sweet Potato and Nut Crops
M.S. - Assistant, Vegetable Gardening

Plant Pathology
Ph.D. - Head

Poultry
B.S. - Head
M.S. - Assistant, Poultry Breeding
B.S. - Assistant, Poultry Nutrition[53]

The increased number of Ph.D. and M.S. degrees indicated the simultaneous upgrading of the college and station. The chemistry department was upgrading itself in quality and depth of research activities, although

[53]Ibid.

it was losing out in numbers to agronomy and agricultural economics.

Expanding Research Facilities

The staff was trying also to diversify its work by spreading out into the various areas of the state. In addition to the outfield experiments mentioned earlier for the period, further arrangements were made with the agricultural college at Goodwell to carry on research for the station in the Panhandle.[54] In the late 1920's this college would have its own experiment station and would be responsible for research in the Panhandle portion of the state. The station staff also made arrangements with the owners of the 101 Ranch near Ponca City to conduct research with native pastures.[55] The State Board of Agriculture purchased a section of land near Perkins for the college July 3, 1929. The Perkins farm was Section 36, Township 18 North Range 2 East. The sum required to pay for this land, the school land lease, and tenants' rights, was $31,751.00. The land was obtained for agricultural and horticultural purposes; and as a result these activities could expand beyond the limitations of Stillwater acreage.[56] In order to obtain greater financial support for area investigation, the college turned over a portion of a section of land at Woodward to the United States Department of Agriculture for a cooperative experiment station. The State Board of Agriculture approved this lease September 3, 1929, for one dollar per year. This land had been purchased earlier in 1929 by the

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[54]Ibid., p. 6.

[55]Ibid.

[56]Oklahoma State Board of Agriculture, Biennial Report, 1929-1930, p. 5.

A. & M. College out of an appropriation of $24,000 made by the legislature.[57] To continue the advantages from area researches the Oklahoma State Board of Agriculture authorized the president of the college to locate special stations around the state according to types of soils and cropping areas. These sub-stations, containing from eighty to one hundred and sixty acres, were to be provided by communities on a long-time lease.[58] Research in home economics meanwhile showed a change in the purpose of the station and a broadening of the scope of farm research. Investigation in this field went into the part played by the farm woman in establishing the economic status of the family.[59] Knowledge gained in this area could be applied by demonstrations in the various localities similar to the field crop and livestock displays at the sub-stations.

General Situation at Stillwater in 1929

Progress of the station and college seemed to go hand in hand during the twenties. This was necessarily so, with the staff serving also as faculty in the college. With increased urbanization the college was forced to change, but at the same time the station began to branch out into areas that would serve the whole population as well. The director concluded that: "Agricultural research is the foundation of agricultural education. It is the basis of agricultural prosperity."[60] State

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[57]Ibid., p. 6.

[58]Ibid., p. 7.

[59]O.A.E.S., Biennial Report, 1924-1926, p. 43.

[60]O.A.E.S., Report, 1926 to 1930, p. 6.

legislators gave support for this valuation of research by providing an appropriation of $109,000 in 1930.[61] Some of the bulletins published during the last three years of the decade echoed the increased interest and support given the broader areas of agricultural research. Some subjects of these bulletins were church activities of farm women and their families, periodical reading in farm homes, types of farming in Oklahoma, farmers' status in relationship to membership in organizations, economic and social aspects of mobility of Oklahoma farmers, and farm women's management. However, the major research area continued to function, with publications being concentrated in the areas of agronomy, agricultural economics, animal science, and chemistry.[62]

Research in the Thirties

The 1930's, as the 1920's, were years of trouble for agriculture. The efforts of the agricultural experiment stations were channeled toward greater attacks on the old problems and toward vigorous measures against the new agricultural, economic, and social problems of the ever-changing nation. Station staff published little information concerning their activities during the first four years of the decade. The Great Depression contributed to the decline in state support for the Oklahoma station, yet the appropriations remained much more impressive than those during the early 1920's. State appropriations for the station fluctuated from $107,690.34 in 1931 to $131,811.96 in 1932 to $103,067.08 in

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[61] U. S. Department of Agriculture, Office of Experiment Stations, <u>Annual Report, 1930</u> (Washington, 1931), p. 7.

[62] O.A.E.S., <u>Bulletin</u> Nos. 170 - 198 (1927-1930).

1933 to $61,733.41 in 1934.[63] The station did receive a small financial grant through the creation of the Mary Pemberton Nourse Memorial Fellowship of the American Association of University Women. This fund allowed the creation of a full-time staff position with the station in the area of home economics.[64] The staff in 1932 contained sixty-six members, with forty-three of these on the faculty of the college.[65] The payment of expenses in 1934 illustrated quite a contrast with the earlier years of the station, when the state was attempting to have federal funds cover all expenditures. This was especially true in regard to salaries, for in 1934 state funds amounted to $63,015.65, while federal funds were only $29,521.65. However, labor costs amounted to $15,428.93 for federal expenditures, and state-paid labor amounted only to $11,637.87. The $4,500.10 of federal funds and $5,566.57 of state funds for feedstuffs illustrated the importance of livestock investigations during the year.[66] The seven publications from the area of animal science during the years 1933, 1934 and 1935 also attested to this fact. The field of research ranked first, with agricultural economics producing six publications, agronomy producing only four in 1933, and the number of publications from other areas being inconsequential. Meanwhile, two improvements enhanced the facilities of the station. Through the

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[63] U.S. Department of Agriculture, Office of Experiment Stations, Annual Report, 1931 (Washington, 1932), p. 134; Office of Experiment Stations, Annual Report, 1932 (Washington, 1933), p. 50; Office of Experiment Stations, Annual Report, 1933 (Washington, 1934), p. 66; Office of Experiment Stations, Annual Report, 1934 (Washington, 1935), pp. 107-9.

[64] Experiment Station Record, LXLV, June, 1931, p. 798.

[65] Office of Experiment Stations, Annual Report, 1932, p. 49.

[66] Office of Experiment Stations, Annual Report, 1934, pp. 114-16.

cooperation of the Civil Works Administration and the young men from a Civilian Conservation Corps camp located on station land, the station obtained a graveled road which formed a two-mile connecting link among all the barns. Likewise the station acquired a new greenhouse with four sections, each thirty-three feet by one hundred feet; these added approximately 14,000 square feet of floor space.[67]

One area of research that was becoming increasinly important during the thirties was that of agricultural engineering. Periodic publications of the Oklahoma station and certain efforts in one section of agronomy illustrated research in this area at Stillwater. Although publications in this area would not become numerous until during the Second World War and thereafter, much research was devoted to such problems in various departments of the station. Agricultural engineering was a field that would be slow to attain coordination with other departments to achieve the greatest possible results. The 110 percent drop in the volume of farm tractors and machinery from 1921 to 1933 together with a similar reduction in marketable production throughout the nation was a reflection of both economic problems and the absence of research to determine what technology could best be applied to the farm most efficiently.[68] The natural inclination for specialized farming in Oklahoma would warrant an extensive research effort in this field. An adverse climatic cycle which hit Oklahoma in the thirties also pointed to the need for machinery and techniques to soften nature's attack on

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[67] Experiment Station Record, LXX, May, 1934, p. 734.

[68] Martin R. Cooper, Glen T. Barton, and Albert P. Brodell, Progress of Farm Mechanization, U. S. Department of Agriculture Miscellaneous Publication No. 630 (Washington, 1947), pp. 10-11.

farming. Erosion in Oklahoma had reached the stage in 1931 that saw 13,000,000 acres of cultivated land either gullying or subject to sheet erosion. At the same time six million acres were in gullies, of which 374,000 acres were so bad as to prevent passage of farm machinery across them, while 1,359,000 acres had been abandoned during a four-year period.[69]

By the mid-thirties a considerable number of changes had taken place in American society and in agriculture. These in turn led to new economic, scientific, and technological problems. Some of the changes that were having the greatest impact upon agriculture were related to such developments as the increased application of scientific inventions, changes in the size and geographic distribution of the American population, continual changes in dietary habits, increased costs of manufactured items, and greater utilization of by-products formerly wasted such as fats and oils from vegetables.[70]

The increasingly urban population was more susceptible to fads such as vegetarianism and the substitution of sea foods and health foods, and as a result the traditional heavy foods were consumed in lesser amounts. General economic conditions during the period encouraged more people to grow their own food.[71] With these changes and advances came such difficulties as adapting machines to perform with precision on highly

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[69]N. E. Winters, "Washing Robs Oklahoma Farmers," The A. and M. College Magazine, II (February, 1931), p. 172.

[70]Otis D. Duncan, "Social Changes in Relation to the Agricultural Situation," Oklahoma Current Farm Economics, VIII (1935), p. 67.

[71]Ibid., p. 69.

variable organic materials and highly varied types of terrain.[72] Four broad fields of agricultural engineering developed to meet these needs. These were power and machinery, farm structures, electric power and farmstead processing, and soil and water conservation.[73] With the state's great problem with erosion, it was natural for much work to be devoted to the latter area.

The many problems brought by the depression very likely contributed to a situation in which the horticulture departments of the various state stations received criticism for early release of products in 1935. Some stations sent seedlings out to nurseries and growers before final lists and eliminations were made.[74] This situation created bad public relations as well as hindering the final development of the varieties. To what degree this haste to get the results out in the field for the ultimate tests was present at the Stillwater department was not determined. With the variation in size of appropriations from the Oklahoma legislature during these years, some abuses might well have occurred. Such activities in other parts of the country illustrated what economic pressures were present at the state stations.

The Bankhead-Jones Act and New Research Emphasis

The year 1935 saw additional legislation that would further expand

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72Fred W. Kohlmeyer and Floyd L. Herum, "Science and Engineering in Agriculture: A Historical Perspective," Technology and Culture, II (1961), pp. 368-69.

73Ibid., p. 378.

74W. H. Alderman, "Accomplishments in Fruit Breeding by State and Federal Experiment Stations," Proceedings of the American Society for Horticultural Science, XXXIII (1935), p. 14.

research in the areas of economics and rural sociology. Congress appropriated money for these expanded investigations in the Bankhead-Jones Act passed June 29, 1935. The funds, to reach $3,000,000 within five years, were to be apportioned among the states according to rural population.[75] The new research orientation under the act went as follows:

> The Secretary of Agriculture is authorized to conduct research into the laws and principles underlying basic problems of agriculture in its broadest aspects; research relating to the improvement of the quality of, and the development of new and improved methods of production of, distribution of, and new and extended uses and markets for agricultural commodities and by products and manufactures thereof; and research relating to the conservation, development, and use of land and water resources for agricultural purposes.[76]

This research authorization was to be in addition to that research in pregress, but yet it was to be coordinated with that research as far as possible.[77] Section two of the act specified that the state agricultural experiment stations conduct research along lines prescribed for the department of agriculture. These obtained sixty percent of the funds provided by the Bankhead-Jones Act. Two differences between this act and previous legislation were the lack of any limit on the amounts spent for the purchase or rental of land or the construction of buildings needed in research, and the provision for equal matching funds from the respective states. The amount of funds depended upon the relative population of the given state in ratio to that of Puerto Rico.[78] The whole sum of the appropriation amounted to one million dollars the first

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[75] V. O. Key, The Administration of Federal Grants to States (Chicago, 1937, p. 321.

[76] U. S. Statutes at Large, Vol. XLIX (1935), p. 436.

[77] Ibid.

[78] Ibid., p. 437.

year, and an added million a year for four years. Then the appropriation for the sixth year would be five million.[79] The sums appropriated by federal legislation down to 1936 were broken down as follows:

Hatch Act	1888-1936	$34,106,185
Adams Act	1906-1936	20,113,413
Purnell Act	1926-1936	23,988,801
Bankhead-Jones Act	1936 only	600,000
		$78,808,399[80]

With the funds provided by the Bankhead-Jones Act and the Purnell Act, researchers were no longer limited to investigations of technical production problems, and the staffs of the various stations could investigate the broad economic and social relationships. The 1935 legislation did not even limit research to these areas as had the Purnell Act.[81] As a result of the broader aspects of research being encouraged, it was natural that the Oklahoma station staff would accept studies in these areas for publication. Occasionally other areas of the college produced materials, one example from geography being _A Socio-Economic Atlas of Oklahoma_, published in June, 1936, by Meredith F. Burrill.[82] Indicative of the time was the creation of the department of sociology and rural life, effective September 1, 1936.[83] Another example of this new line of research was _The Theory and Consequences of Mobility of Farm Population_.[84] One station bulletin, _Legal Aspects of Landlord-_

79Ibid.

80Eddy, p. 170.

81Benedict, _Farm Policies of the U.S._, p. 393.

82Meredith F. Burrill, _A Socio-Economic Atlas of Oklahoma_, Oklahoma Agricultural Experiment Station Misc. Paper (Stillwater, 1936), p. 1.

83O.A.E.S., _Biennial Report, 1936-1938_, p. 145.

84O.A.E.S., _Circular_ No. 88 (1940), p. 1.

Tenant Relationships in Oklahoma, illustrated the great need for research in agricultural economics. Sixty-one percent of Oklahoma farmers, the bulletin showed, were tenants in 1935, while sixty percent of the land was rented. Only three farmers out of ten owned all the land they operated. The percentage of tenancy was greatest in the cotton area of the state.[85] Thus the station was aware of the serious problem of tenancy and the nature of the laws that were discriminating against the tenant. The philosophy of these laws was described as "tenant, beware!"[86] One problem for general improvement and protection was the provision for shade trees. The lessened effects of the depression along with changing building designs encouraged rural and municipal plantings. Interest in this area appeared in the station bulletin, A Program for Shade Trees in Oklahoma.[87] Another investigation of state laws effecting agriculture was the bulletin, Results of the Regulation of Cotton Gins as Public Utilities in Oklahoma. Oklahoma was the only state to have such a law, it having been in effect since 1915.[88] Such a bulletin as Population Trends in Oklahoma illustrated the growth of research in the area of rural sociology.[89] Another such bulletin was The Construction and Standardization of a Scale for the Measurement of the Socio-economic Status of Oklahoma Farm Families.[90]

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[85] O.A.E.S., Bulletin No. 241 (1940), pp. 5-6.

[86] Ibid., p. 22.

[87] O.A.E.S., Bulletin No. 234 (1938), p. 3.

[88] O.A.E.S., Bulletin No. 230 (1936), p. 3.

[89] O.A.E.S., Bulletin No. 224 (1935), p. 3.

[90] O.A.E.S., Technical Bulletin No. 9 (1940), p. 3.

This research was novel and received considerable attention, but the regular research more closely associated with agricultural production continued at an accelerated rate. Wheat and cotton continued to be important areas of investigation at the Oklahoma station. Research efforts with cotton beginning in 1914 were yielding impressive returns. Progeny row testing, begun at that early date, had produced a hybrid, Oklahoma Triumph 44, which was acceptable to local conditions and less susceptible to weevil. By 1935 this hybrid was grown on 400,000 acres of Oklahoma cotton land.[91] The objectives of cotton research in 1936 were to obtain characteristics such as earliness, large bolls, high lint percentage, inch lint length, uniformity, and high quality of fiber.[92] These efforts plus those of the staff interested in the agricultural engineering phase of cotton production gained added momentum through the erection of a gin building. The station, with the cooperation of the U.S.D.A. Bureau of Plant Industry, erected this structure with two gin stands, a drier, and an electric motor to operate the machinery and thus aid in making the building fireproof.[93] Another cooperative venture in 1936 was that work conducted with the Regional Swine Breeding Laboratory at Ames, Iowa. The states of Illinois, Indiana, Iowa, Minnesota, Missouri, Nebraska, Oklahoma, and Wisconsin cooperated in this endeavor as provided for in the Bankhead-Jones Act.[94] However, state support for research at Stillwater for 1936 was only $54,527.04,

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[91] Yearbook of Agriculture, 1936, p. 708.

[92] Ibid., p. 743.

[93] Experiment Station Record, LXXV (1936), p. 895.

[94] Gladys L. Baker, et al., Century of Service: The First 100 Years of the United States Department of Agriculture (Washington, 1936), p. 227.

seven thousand dollars less than the appropriation for 1934.[95]

The work of the Oklahoma station and the state agricultural experiment stations in general during the thirties and during the prior fifty years was summarized by F. D. Fromme, Director of the West Virginia Station, on January 11, 1938. He stated that:

> The past half century has witnessed many changes of a revolutionary character in agriculture. Among these we may note a three-fold gain in the labor output of the farmer which has released labor for industrial enterprises and lowered production costs; a marked reduction in the hazards of production brought about the control of diseases and pests of domestic animals and crop plants, and the development of hardy high-yielding varieties and breeds; the more exact knowledge of the nutrition of animals and plants which has replaced rule-of-thumb practices; the maintenance and even augmenting of yields despite the natural trend of soil wastage and depletion; a great improvement in the quality of products and the newer knowledge of the health promoting qualities of foods...[and] the introduction of new crops for food and industrial uses replacing the few staples of earlier days, [whereby] the average American home of today is supplied with an abundance, variety, and quality of food without parallel in the history of the world.[96]

These statements parallel the estimates of the Oklahoma station except for certain trends as a result of geographic factors. There was a trend away from the earlier forms of general farming and a stress on diversification. Research gradually began to center on problems of specialized farming and basic or fundamental research. The laboratory techniques of research overshadowed the physical handling of plants and animals.

One indication of research accomplishments during the nineteen thirties was the nature and numbers of station publications. The staff published ninety-seven bulletins in the twenties and one hundred twenty-

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[95]U.S.D.A., Office of Experiment Stations, Annual Report, 1937 (Washington, 1938), p. 199.

[96]Experiment Station Record, LXXLX (1938), pp. 1-2.

nine during the thirties. The area of most extensive publication in the latter period was animal science. Agronomy and entomology came second in number of bulletins produced; agricultural economcs came third with twelve; poultry science came fourth with ten; and sociology and rural life, chemistry, horticulture and botany lagged in order of the number of publications.

The new research emphases created by funds provided through the Purnell and Bankhead-Jones Acts not only helped to direct attention to serious economic and sociological problems, but they also contributed a number of new problems. Research designed to promote the greater utilization of agricultural products did not receive the general support of industry because of the close connection between the experiment stations and the U. S. Department of Agriculture. These industrial firms feared intervention and examination of company bookkeeping and internal management practices as expressed by the poultry packing industry. Some industrial concerns wanted to cooperate with the stations for propaganda and advertising rather than for education and real research. Other industries mistakenly associated the control of product uniformity with research.[97] The economists in industry and those at the stations also tended to disagree over marketing research and its application.[98]

A second basic problem, but one with innumerable smaller issues, was that of weeding out undesirable producers and strengthening those operators whose methods were ineffective or inefficient without destroying many of the traditional patterns of farm life. Large numbers of

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[97]R. E. Buchanan, "Industrial Research in Agricultural Experiment Stations," The U.S. Egg and Poultry Magazine, XLIII (1937), p. 739.

[98]Ibid., pp. 770-71.

people have found farming to be extremely attractive, despite the risks, hardships, and low financial returns from capital and labor invested. Certain features of farming have encouraged this situation, including the ease of entrance, lack of a need for extensive training, closeness to nature and open country, and more recently the availability of practically all the modern conveniences of city living.[99] Those who have stayed on the farm and newcomers need assistance not only for their own sakes but for the collective good through increased production and enlarged rural consumption. "Efforts to make farming profitable for all who may choose to farm," wrote one observer, "are foredoomed to failure."[100] Research, by this argument, should assist the elimination of small inefficient farmers from the business. One writer of the period suggested that since agriculture has had and probably always will have an important place in the life of every country, efforts must be made to protect agricultural resources from needless depletion; to facilitate physical and economic processes of agricultural production and marketing; to mitigate the severity of fluctuations in farm income; and to raise the plane of living among farmers. Although these are in the general interest, they are justified on grounds independent of an allegedly peculiar importance of agriculture or farmers.[101] Another writer summarized the changing emphasis of research and stated that:

> Of late the planning of research projects and the interpretation of results have been more consciously

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[99]Joseph S. Davis, On Agricultural Policy, 1926-1938 (Stanford, [c. 1939]), pp. 34-35.

[100]Ibid., p. 43.

[101]Ibid.

> designed to effect the solution of economic and social problems, and recognition has been given to technical studies in the physical and biological sciences to parallel and supplement and agricultural economic and rural sociological fields as contributing factors in economic and social progress. Consequently, the sciences are being brought to bear more and more on the objectives of making farming more successful and rural life more livable under the conditions of today and those of tomorrow.[102]

Such research was of a nature that would be conducive to cooperative efforts between various state stations. Opportunities afforded by the Bankhead-Jones Act, allotments to states, and appropriations for special research fund projects of the U. S. Department of Agriculture, all facilitated greater teamwork in the solution of problems which transcended borders of individual states and thus had regional significance.[103]

Facilities, Staff, and Support in the Late Thirties

All of these developments in research orientation had their effects upon the program at Stillwater. In 1938 the station had a staff of twenty-nine full-time researchers, fifty doing both research and teaching, and one conducting research, teaching, and performing extension activities. The state appropriation reached $274,317.17, and the grand total of funds for research was $507,243.67.[104] The staff had a barn constructed on the college farm during the year. It measured 156 feet long by 26 feet wide and had a concrete moat completely surrounding it. Cement floors, brick walls, and screened entries and windows made the building insect-proof. With a screened vestibule for use, the barn

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[102] Experiment Station Record, LXXX (1939), p. 724.

[103] Ibid., p. 722.

[104] U.S.D.A., Office of Experiment Stations, Annual Report, 1938 (Washington, 1939), pp. 183-85.

animals could be sprayed and washed before entering the building and thus prevent further insect infestations. This arrangement made possible a continuation of the work with anaplasmosis and its transmission by horseflies.[105] Such a structure and others like it would ultimately contribute to the production of a vaccine twenty-seven years later.

Increased appropriations and facilities as well as cooperative endeavors meanwhile led to an expansion of activities during the 1936-1938 bienniu. The cooperative swine breeding project with the Regional Swine Breeding Laboratory at Ames, Iowa, was a major development at the station. Research in this project centered around the question of the value of inbreeding methods in the improvement of hogs.[106] Cooperative projects were also conducted with the Soil Conservation Service of the U. S. Department of Agriculture. Work in all parts of the state was coordinated in projects which allowed the most efficient use of men and funds from both the Soil Conservation Service and the Oklahoma station.[107] The mapping of the soils of the state proceeded more rapidly, with the increased state appropriation for soil survey and soil fertility work. By 1938 soil mapping was completed in twenty-eight of the seventy-seven counties.[108] The poultry farm had also obtained added facilities and was able more adequately to meet the needs for information concerning the breeding, feeding, and management of turkeys and chickens.[109]

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[105] Experiment Station Record, LXXX (1939), p. 288.

[106] O.A.E.S., Biennial Report, 1936-1938, p. xiii.

[107] Ibid., p. xii.

[108] Ibid., p. xiii.

[109] Ibid.

Other areas profiting from increased state support were cotton, wheat, and alfalfa, as well as the departments of chemistry, entomology, biochemistry, agricultural economics, and rural sociology. Expansion in the program of research with cotton led to the establishment of Southwest Oklahoma Cotton Station at Tipton in 1938. Investigations here were designed to develop strains and varieties of cotton that would be well adapted to the state and to provide foundation seed for cotton improvement throughout Oklahoma. The cotton gin owned by the station was supposedly one of the finest experimental gins in the country at the time.[110] A wheat improvement program was underway with nurseries in twenty-two counties to provide trials of varieties, variety reduction experiments, and locations for field days.[111] Entomology investigations were increased in efforts to control boll weevil and other insects. The staff was also able to conduct a pest survey and materially to aid in the control of several serious outbreaks such as those of grasshoppers. The investigators in this field concluded that the latter work alone more than paid for research costs in entomology.[112]

As a result of agricultural interests and operating conditions in Oklahoma during the latter years of the thirties the staff of the Oklahoma station conducted widely different investigations. In 1938 Oklahoma became the leading producer of alfalfa seed. The station was thus obligated to continue research in adaptability and in diseases of the

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[110]Ibid., p. xii.

[111]Ibid.

[112]Ibid., p. xiii.

plant to insure the maintenance of production.[113] The unusually high tenancy rate for Oklahoma in the late thirties was a serious problem that contributed to a weakened social organization, lessened social participation, absenteeism, economic insolvency, and rising class distinctions. This situation posed an area for research by the agricultural economics and the rural sociology departments.[114] Although tenancy was viewed as the major problem in agricultural economics, research was conducted in the six subfields of farm management, farm finance, land economics, land tenure, farm prices, and agricultural marketing.[115]

In the area of agricultural chemistry contributions of the staff were many. These included the preparation of an egg oil with a high vitamin D content, a routine method for the rapid estimation of carotene in butterfat, determination of carotene content in feeds, the extent of destruction of carotene during curing and storage, the discovery of feed factors which prevent perosis (slipped tendon) in battery-fed chicks, the determination of the tolerance of plants and animals to certain salts found in drinking and irrigation, and studies of plants in relation to the uneven ripening of fruit, firmness of fruit, and resistance of the plant to insect damage. The staff also analyzed phenolic compounds and stream contamination from refineries and industrial wastes. Research here sought to determine usage of contaminated water by livestock and results of such consumption, and the limits which contamination

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[113]Ibid., p. xiv.

[114]Ibid., p. xv.

[115]Ibid., pp. 16-17.

could reach before damage would occur to livestock.[116] Plant biochemistry was a new field of work at the station in the thirties. Projects in this area included determining the best time for cutting and eradicating sand sage and skunk brush by discovering when the mobile reserves of carbohydrates and nitrogen in their roots were at their lowest point. Preliminary determinations here suggested cuttings in late spring and again in early fall. Another project involved the determination of whether the chemical composition of grape juice varied with grapes from different positions on the trellis and thus the possibility that vine training might have something to do with flavor.[117]

A great opportunity came for increased pasture and grazing research during the 1938-1940 biennium with the procurement of the Lake Carl Blackwell area. The A. and M. College obtained this 21,000 acre area, the Lake Carl Blackwell Cooperative Land Use Project, by lease from the U.S. Department of Agriculture on March 27, 1939. Although the lake was designed to have a surface area of 3,300 acres, the remaining land had definite uses as provided for in the lease. This document contained the provision that the land was to be "...a demonstration of readjustment in the former uses of the land to more desirable uses yielding the highest stablized potential well being..."[118] Areas of interest specifically provided in the lease were grazing, recreation, wildlife, and forestry. However, hydraulic testing of soil-saving structures such as

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[116]Ibid., pp. 2-5.

[117]Ibid., p. 5.

[118]O.A.E.S., Biennial Report, 1938-1940, p. 165.

terraces was also already underway.[119] The Oklahoma station acquired approximately 500 angora goats with the land at Lake Carl Blackwell. This herd provided a nucleus for grazing investigation, a few cattle being added, but further work was prevented because of lack of funds for constructing fences, cattle guards, and gates.[120] A quarter section was set aside for reclamation efforts such as testing methods of re-grassing former cultivated areas and of improving rundown pasture land, and for the comparison of various kinds of grasses and methods of seeding. Another quarter section was set aside for research in the development of farm woodlots, with provision for a later study of post production potential and a coniferous forestry plantation.[121] Wildlife studies looked promising, with 17,000 acres of rolling pastures and woodlands surrounding the lake area. Research was contemplated into the relationships between valuable wild animals and plants and other land use.[122]

At Stillwater a number of changes and additions had been made in facilities and in the staff. By 1940 the staff had changed to twenty-four in research, sixty in research and teaching, and one in research, teaching and extension. The state appropriation was only $175,324.88, and total funds were $482,503.44.[123] This was almost $100,000 less than the sum for 1938. The scanty nature of publication at the Oklahoma

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[119]Ibid.

[120]Ibid., p. 166.

[121]Ibid., 168.

[122]Ibid., p. 169.

[123]U.S.D.A., Office of Experiment Stations, Annual Report, 1940 (Washington, 1941), pp. 259-61.

experiment station evidently indicated current practices. One writer stated that researchers in reporting their efforts devoted far more attention to a discussion of how their results were obtained than to stating clearly just what was accomplished.[124] Too little attention was given, in all publications, to narrative descriptions of the progressive development, goals, and accomplishments of research efforts.

During the years 1938 to 1940 the number of publications greatly increased. Some of the topics were shade trees, sheep feeding, finishing beef calves, turkey production, beef cattle feeding, Oklahoma farm price statistics, farm tenancy in Oklahoma, a homemade egg-cooler for farm use, legal aspects of landlord-tenant relationships, the carotene (provitamin A) content of Oklahoma feeds, feeding laying hens, and the brown elm scale.[125] These topics in the regular bulletin series were supplemented by a fairly large number prepared in the _Mimeographed Circular_ and the _Technical Bulletin_ series. A representative list of topics discussed in these latter publications gave an indication of the areas of continuing emphasis as well as of some new research emphases. Topics in animal husbandry were feeds for hogs, feeding of beef calves, lamb feeding, swine breeding. Those in horticulture included fruit tree borers, pruning of fruit trees, rose cankers, and aquatic plants of Oklahoma. Some in agronomy were wheat rust, cotton variety tests, pasture research, corn culture, and seed treatment for cotton. A few in entomology were fly sprays, poultry parasites, termites, the green bug, plant lice, control of house ants and the red harvester ant, and

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[124] Mumford, _The Land Grant College Movement_, Missouri Agricultural Experiment Station Bulletin No. 419 (Columbia, 1940), p. 107.

[125] O.A.E.S., _Bulletin_ Nos. 234-245 (1938-1940).

watermelon wilt. Investigations in agricultural economics included the farm prices situation and land ownership in Oklahoma, and farm business conditions. Topices in rural sociology, for example were social and economic factors of relief families in Ottawa County, and the construction and standardization of a scale for the measurement of socio-economic status of Oklahoma farm families.[126]

Socio-cultural research had greatly expanded and deepened by 1940, especially in the departments of rural sociology and agricultural economics. Research in rural sociology, Project No. 299, Purnell, in regard to tenant farmers suggested that even with a uniform statewide system, school children of tenants had more limited educational opportunities than those of farm owners. The suggestion was made that these tenant farmers should receive either a direct subsidy or, preferably, assistance to help them to become independent and self-sustaining.[127] Farm size and numbers of farmers were also studies during this period. From 1935 to 1940 the average farm size in Oklahoma rose from 165.6 to 193.7 acres. This was the largest increase in any one census period, although the trend for increased size had begun in 1910 while remaining stationary during the twenties.[128] The 179,687 farms in 1940 were the lowest number of any census since 1910, a trend which would continue during the forties, fifties, and sixties. Farm population and the number of active farmers would also dwindle during the same years.[129]

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[126]O.A.E.S., Mimeographed Circular Nos. 8-64 (1938-1940); O.A.E.S., Technical Bulletin Nos. 1-9 (1938-1940).

[127]O.A.E.S., Biennial Report, 1938-1940, p. 164.

[128]Desmond L. W. Anker, "Changes in Oklahoma Agriculture," Oklahoma Current Farm Economics, XIV (1914), p. 105.

[129]Ibid., p. 112.

These and similar research activities at the experiment stations across the country brought forth favorable comments and evaluations throughout the decade. One writer in 1931 suggested: "Single discoveries of experiment stations in different states had been known to add to the wealth of the state year after year more than the entire cost of the institution."[130] Another suggested in 1937 that the state stations, having accomplished considerable results in a relatively short period of years, accordingly had gained the confidence of the farmers whom each station served.[131] The same writer commented in 1940 that the results of station research had more than justified the appropriations provided by the Hatch Act and subsequent legislation. Discoveries, accomplishments, and scientific solutions of problems of the farm, he wrote, "have had profound influence upon agriculture as an industry, the economic and social life of farm people, the commerce in agricultural commodities, and upon education itself."[132] During the fiscal year 1939-1940 the Oklahoma station provided thirty-six distinct contributions to agriculture. This fact, although not explained in detail, was attested to by the Office of Experiment Stations in its July, 1941, report.[133]

The Early Forties

The Oklahoma Experiment Station continued to prosper during the

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[130] W. J. Kerr, et al., The Spirit of the Land Grant Institutions (Chicago, 1931), p. 19.

[131] Mumford, "State Encouragement of Agricultural Experiment Stations," The U. S. Egg and Poultry Magazine, XLIII (1937), p. 732.

[132] Mumford, The Land Grant College Movement, p. 87.

[133] O.A.E.S., Biennial Report, 1940-1942, p. 90.

forties, although World War II would limit basic research. Research efforts and service activities expanded with additional state support and added facilities. In 1942 the service aspect of the work at the Stillwater facility varied from answering routine questions of individual farmers to long-range programs of cooperation with such farm organizations as the Oklahoma Crop Improvement Association, the Oklahoma Poultry Improvement Association, and livestock and diary associations.[134] Service to regional agriculture came through thenine special regional laboratories created by the department of agriculture to coordinate and integrate research problems among various states in the several regions of the United States. Research of regional importance at the state stations was then correlated with these regional laboratories.[135] Other service activities of the Oklahoma station during the 1940-1942 biennium included chemical analysis of soils, feeds, and water; keeping data on farm prices; and continuous surveys of soil conditions, destructive insects, and damaging plant diseases.[136] About 150 projects were underway at the station during the period. Each of these was aimed at finding the answer to some question or a group of questions raised by a problem on Oklahoma farms.[137]

The distribution of research publications increased 120 percent, from 118,565 to 246,159, during the years 1940-1942, despite the policy started early in the biennium which provided that publications would be

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[134]Ibid., p. 7.

[135]R. O. Whyte, "Regional Agricultural Laboratories in the United States," Nature CXLVII (1941), p. 597.

[136]O.A.E.S., Biennial Report, 1940-1942, p. 7.

[137]Ibid.

mailed only on request.[138] At the same time the staff conducted fifty-six short courses at Stillwater with 14,334 in attendance. Various other groups, from 4H youngsters to public officials, held meetings at the campus attended by another 21,539 people.[139]

World War II brought certain adjustments at the station, such as the dropping of some research projects and increasing the efforts on those considered vital to the war effort, extra work for older men, and special wartime activities such as tests of peanut varieties and culture. The greater utilization of earlier research conclusions contributed to increased food production. Among such results utilized were those dealing with soil fertility, higher yielding varieties, more effective insect control, and more efficient feeding of livestock and poultry.[140] The war had stimulated the Oklahoma economy to the point where state support for the station during the four years immediately prior to 1942 had finally reached the national average.[141] Moreover, the implementation of research conclusions and suggestions had a vast financial effect on the state economy. Seed treatment of cotton planted in 1942 added an estimated $1,200,000 to the value of this crop. Through the efforts of research in dairy science dairying had risen from a cash income of practically nothing in 1903 to more than $22,000,000 in 1940. Through assistance in removing prejudice against Oklahoma dairy products and through showing the economy of the use of local feeds, this industry

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[138]Ibid., p. 9.

[139]Ibid.

[140]Ibid.

[141]Ibid., p. 89.

grew. Similar factors were true in the development of livestock and poultry production and processing.[142]

Research in the early forties at Stillwater provided significant contributions. Such achievements were in the area of improved varieties of fruits, vegetables, and field crops; insect and disease control programs aimed at stopping this type of waste in Oklahoma but which also helped arouse a national consciousness of the need for soil conservation. Other accomplishments were soil studies which laid the basis for precise recommendations for maintaining fertility and choosing the most suitable crops; demonstrations showing that a wide variety of Oklahoma feeds such as cottonseed meal, prairie hay, oats, barley, and sorghums could be used satisfactorily for meat animals, dairy cows, and poultry; development of new strains of chickens and turkeys which made faster gains on less feed and had characteristics which brought best market prices; poultry management and feeding programs which gave the greatest profits under Oklahoma conditions; farm management data showing the most profitable methods of operation in different parts of the state; and water analyses showing the state's many different kinds of saline and alkaline waters to be either safe or dangerous for livestock and irrigation.[143]

In 1944 the director reemphasized that the chief task of the Oklahoma experiment station was scientific research aimed at the solution of problems facing Oklahoma's farm people. The station itself was first of

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[142]Ibid., p. 90.

[143]Ibid., p. 90-91.

all a place for the development of new information.[144] The distribution of these new data came through agricultural extension, station publications, vocational agriculture teachers in high schools, articles in newspapers, farm magazines, radio programs, personal letters and public speeches by members of the staff; and through "action agencies" such as the Soil Conservation Service and the Agricultural Adjustment Agency.[145] Farm Research Flashes, a news sheet begun in 1941, announced coming events such as field days, agronomy day, field days at sub-stations, short courses, the development of new machinery, and new publications available from the station. The issued dated September, 1943, included data obtained from laboratory, field, barn, and feed-lot tests as well as notices of new research projects, results for seasonal application, procedural information, specific practices in all aspects of agriculture, and factual information recently compiled but applicable to only one type of farm producer.[146]

Some of the research activities during the 1942-1944 biennium which received the most publicity were soil surveys, pasture research, and projects in animal husbandry and in horticulture. Soil surveys of earlier years were one example of long-term investment of scientific research, and these efforts together with soil conservation work had led to the establishment in 1929 of the first conservation experiment station, the Red Plains Station at Guthrie. This along with woodlot shelter belts was an early example of local research efforts which had

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[144]O.A.E.S., Biennial Report, 1942-1944, p. 7.

[145]Ibid., p. 8.

[146]O.A.E.S., Farm Research Flashes, September, 1943.

gained national prominence as part of the New Deal agricultural programs.[147] Such work would continued at the Lake Carl Blackwell area and at the other sub-stations. Later the work at Guthrie was to be transferred to the Cherokee sub-station. During this period the station developed an expanded program of pasture and range research, which was conducted in coordination with the agronomy department's work on crop rotations and soil fertility. The four thousand acre experimental range at Lake Carl Blackwell was almost ready for use in 1944; it would allow grazing tests comparable to commercial operations and would also permit research in all phases of pasture management from regrassing to efficient utilization of virgin bluestem.[148] Research underway with animal husbandry in 1944 but not finished included studies with urea, a synthetic low-cost source of nitrogen (protein) as a substitute for natural proteins in beef cattle rations; and the effect of the rate of winter gain on rate of gain of beef calves during the following summer.[149]

Research in horticulture in 1944 included efforts at both Stillwater and the Oklahoma Vegetable Research Station at Bixby, in the application of the Oklahoma Pecan Grove Improvement Plan, and in the production of early variety apples for northern markets. These last two areas were suggested for potential increases in income for state agriculture.[150] The 105 acre station at Bixby was procured in August, 1943, and systematic research began in the spring of 1944. The main purpose

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[147]Ibid., p. 27.

[148]Ibid.

[149]Ibid.

[150]Ibid., p. 37.

of this location was to demonstrate a cropping system that would not further deplete overcropped sandy loam soil. The staff divided the farm into ten-acre plots and then experimented with the commonly grown crops in the area -- corn, melons, potatoes, sweet potatoes, onions, carrots, beets, tomatoes, beans, radishes, and spinach.[151] Studies of vegetable rotation and irrigation pointed to increased yield without loss of soil fertility. Variety tests of fruits, nuts, and vegetables continued in efforts to obtain superior types. Vegetable breeding efforts pointed toward future improvements in tomatoes, snap beans, lima beans, and sweet potatoes. Research underway included tests of varieties of pecans for northern Oklahoma, determination of best varieties of vegetables for frozen locker storage, tests of lima bean varieties for commercial freezing, breeding of grape varieties adapted to Oklahoma conditions, the establishment of farm woodlots, and the propagation of the Chinese elm.[152] Other investigations included use of chemicals to maintain tomato production during hot weather, use of starter solutions in setting out cabbage and tomato plants, development of nectarines as an Oklahoma fruit crop, and the determination of the best method for growing plants for transplanting.[153] Major projects underway at Bixby in 1944 included fertilization and rotation studies, the method of maintaining soil nitrogen for fall-crop spinach, variety trials and culture methods with the sweet potato, test of seed samples, control of molds and wilts on spinach, seed treatments for better stands of vegetable

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[151]O.A.E.S., Mimeographed Circular No. 108 (1944), p. 1.

[152]O.A.E.S., Biennial Report, 1942-1944, p. 37.

[153]Ibid., p. 38.

crops, pruning and training tomatoes, and growing tomatoes for the green-wrap market.[154]

Major research areas for the main station during 1942-1944 included pasture and forage crops; home grown feed supplies; hybrid corn testing and breeding; cotton variety improvement; sorghums for sirup and for forage and grain; poultry breeding for egg production and meat quality; and economic aspects of farming-land values and tenancy.[155] Research accomplishments during this same period consisted of a control for the flatheaded apple tree borer; control of apple blotch; production of greenhouse tomatoes; control to stomach worms in sheep; and various other conclusions and methods of operation.[156]

The Middle Forties

Many of the previous areas of consideration continued during the years 1944-1946. Among these were farm housing, farm size, plant breeding, veterinary research, and agricultural commodity pricing. Farm housing in Oklahoma did not compare favorably with that of the nation as a whole, as a result of certain economic, educational, technological, and geographic factors. Those counties which had larger percentages of cropland in wheat tended to have better farm housing, and inversely those counties which had emphasized cotton were found to have had inferior housing. Another correlation with better housing was the larger numbers of cows and chickens per farm family. Farm equipment and

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[154] Ibid., p. 39.

[155] Oklahoma State Regents for Higher Education, Biennial Report, 1942-1944, p. 86.

[156] Ibid., pp. 86-87.

echanization were important for housing as well. Those farms with ore tractors and other equipment tended to have better housing, and he farm tended to be larger and more efficient. Poor housing in Okla-oma followed areas of small farms, poor land, tenancy, migration, large amilies, and the short period of occupation of the land. Many of the riginal dwellings on homesteads had been used until recently, and time ad not been long enough for replacement. The greater risk and specu-ation because of more hazardous climatic factors discouraged more ex-ensive buildings.[157] With the discovery of the pertinent factors con-ributing to such conditions, research would then not only soften the hrust of nature, but would also remove some of the risks and hazards f the occupation of farming.

Optimum Farm Size and Organization

Variations of farm size during the middle forties revealed a need or additional investigation to determine the optimum size in regard to eographic area and type of farming operation as well as to eradicate ome of the economic and social ills of rural life in Oklahoma. From 920 to 1945 the number of farms of 500 acres and over in Oklahoma had ncreased from 6,057 to 11,832, it was discovered, while the land area f these farms increased from twenty-two percent to forty-one percent f the total acreage in farms. Of the 165,000 farms in 1945 25 percent ontained fewer than fifty acres, 68 percent varied from 50 to 499 cres, and seven percent contained 500 acres and over. Farm population eflected nearly the same percentages as the size of farms. The seven

[157] Robert T. McMillan, "Farm Housing in Oklahoma," The Southwester cial Science Quarterly, XXVI (1945), pp. 231-36.

percent of farms 500 acres and over further compounded economic and social problems by containing 41 percent of the total farm acreage, 30 percent of the value of all land and buildings, 26 percent of the value of farm implements and machinery, and 42 percent of wheat acreage.[158]

Mechanization and technology were factors in the increase in the size of Oklahoma farms. Although such changes did not effect the state as quickly as in other parts of the country, the number of tractors increased from fewer than 250,000 to nearly 2,500,000 in the years from 1920 to 1945. Farm output was stepped up by greater use of fertilizers and lime. Consumption of commercial fertilizers in the year 1945 was ninety-five percent above that of the pre-war period, 1935-1959. Application of lime for the period rose to three times the amount in 1935. Both lime and fertilizers contributed fifteen percent to the total increase of agricultural production. The yield expectancy of corn rose twenty percent with the use of hybrid seed. The shift to mechanical power resulted in the addition of 55,000,000 crop acres for marketable commodities that had formerly gone for draft animals. Pasture and crop land for feed for horses and mules was no longer needed.[159]

The advance of technology and the development of new machines for agricultural production were paralleled by the development of plants which produced a superior raw product and which were more efficiently harvested by the new machines. Plant breeders released switch and side-oats, gama grasses which were much more satisfactory than those growing

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[158]O.A.E.S., Bulletin No. 330 (1949), p. 2.

[159]Sherman E. Johnson, Changes in American Farming, U. S. Department of Agriculture Miscellaneous Publication No. 707 (Washington, 1949), pp. 3-4.

naturally, and two combine-type kaffirs with yields equal to standard varieties.[160] Investigations of plant breeders included the search for special cottons for southwestern Oklahoma; rust resistant wheats; sirup sorghums with improved flavor and easier rendering; sweet potatoes with higher yields and improved vitamin content for feed, food, and industrial use; and sorghums with desirable characteristics for industry.[161] The Bixby station was also used to promote the vegetable and fruit breeding in progress at Stillwater. At this location the horticulturalists grew seedling vines produced at Stillwater; conducted trials with peaches, grapes, beans, tomatoes, and sweet potatoes; and continued the studies of annual crop rotations in the plots.[162] Research to gain improved quality of raw farm products centered around such crops as cotton with better spinning characteristics, better sorghum sirup through knowledge of varieties and cooking methods, more attractive and better-fleshed chickens and turkeys for meat, a method for holding egg quality until market day, and identification of wheat varieties which would mill into good flour.[163]

To assist in the program of pasture improvement 210 acres were obtained six miles northeast of Coalgate for the Southeast Oklahoma Pasture Fertility Research Station in 1944. This station was located on land typical of approximately two million acres in that part of the state which had been overcropped, was then low in soil fertility, highly

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[160] O.A.E.S., Biennial Report, 1944-1946, p. 11.

[161] Ibid., p. 13.

[162] O.A.E.S., Mimeographed Circular No. 146 (1945), p. 2.

[163] O.A.E.S., Biennial Report, 1944-1946, p. 15.

acid, lacked phosphorus and organic matter, and had been abandoned. The first acres were prepared for planting in 1944, and the first grazing research was conducted in 1946 to measure the pasture performance.[164] Veterinary research centered on the problem of anaplasmosis, a blood disease of cattle which was costing livestock producers $500,000 a year in 1946. This research was expanded with the creation of the Oklahoma Veterinary Research Institute and the establishment in 1946 of the Pawhuska station on a 900-acre range area that also contained an isolation barn and other facilities to continue investigation of anaplasmosis.[165] A major task of members of the department of agricultural economics meanwhile was the maintenance of current statistical data of trends in farm product prices and of factors affecting them.[166]

During the latter years of World War II the staff added special wartime projects, speeded up other work, and dropped a few non-vital research projects.[167] The station obtained fifteen research grants during the biennium; these commercial grants ranged from $1,000 to $20,000 and contained the stipulation that any results would be public property.[168] Regardless of the war, total federal-state expenditures continued to increase, as the figures $33,065,028 in 1946 compared to

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[164]O.A.E.S., Oklahoma's Farm Research Centers [n.d.], p. 5.

[165]O.A.E.S., Biennial Report, 1944-1946, p. 17.

[166]Ibid., p. 74.

[167]Oklahoma State Regents for Higher Education, Biennial Report, 1944-1946, p. 90.

[168]O.A.E.S., Biennial Report, 1944-1946, p. 18.

$22,664,840 in 1942 indicated.[169]

The Agricultural Research and Marketing Act

Postwar indications of surplus production and low prices led to renewed interest in an accelerated research program that would encompass improvements in marketing, new uses for farm products, and the strengthening of educational work in marketing. The Agricultural Research and Marketing Act of 1946 authorized support for such studies, especially marketing. The sixty-one million dollars to be provided by the end of a five year transition period would more than double funds of the state stations.[170] The philosophy behind the act was given in the statement that:

> It is hereby declared to be the policy of the Congress to promote the efficient production and utilization of products of the soil as essential to the health and welfare of our people and to promote sound and prosperous agriculture and rural life as indispensable to the maintenance of maximum employment and national prosperity. It is also the intent of Congress to assure agriculture a position in research equal to that of industry which will aid in maintaining an equitable balance between agriculture and other sections of our economy.[171]

To implement this policy the statute authorized and directed the Secretary of Agriculture to conduct and stimulate research in broad areas that would include:

> Research relating to the improvement of the quality of, and the development of new and improved methods of the

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[169] U.S.D.A., Office of Experiment Stations, Annual Report, 1942 (Washington, 1943), p. 111; U.S.D.A., Office of Experiment Stations, Annual Report, 1946 (Washington, 1947), p. 161.

[170] Benedict, Farm Policies of the United States, p. 496.

[171] U. S. Statutes at Large, Vol. LX (1946), p. 1082.

> production, marketing, distribution, processing, and utilization of plant and animal commodities at all stages from the original producer through to the ultimate consumer...[172]

Some of the special areas emphasized in the act were problems of human nutrition, extended uses and markets for agricultural commodities and by products; more efficienty and satisfactory use of farm buildings, farm homes, and farm machinery, improvement of the rural home and rural life, and the maximum contribution of agriculture to the welfare of the consumer.[173]

In all these suggested areas of research the act encouraged the maximal use of state agricultural experiment stations. Like the Bankhead-Jones Act of 1935, this legislation also incorporated the provision for the matching of funds by the states. However, unlike earlier legislation, the funds provided in this act could be used for the purchase and rental of land, the construction or acquisition of buildings, and the equipment and maintenance of such buildings. Specific appropriations were also included for cooperative research with state agricultural experiment stations. Congress intended that the act provide for continuous research to improve the marketing, handling, processing, transportation, and distribution of agricultural products, and that cooperation be fostered between federal and state agencies, producers and industrial organizations.[174] Research was to be especially directed toward (1) the best methods of processing, preparation for market, packaging, handling, transportation, and storage of agricultural commodities;

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[172]Ibid., pp. 1082-83.

[173]Ibid.

[174]Ibid., pp. 1083-87.

(2) determination of the costs of marketing of agricultural products; (3) development of improved standards of quality as regards condition, quantity, grade, and packaging; (4) the encouragement of free movement of agricultural products through elimination of artificial barriers; (5) finding new markets and new uses of various products; (6) encouraging greater consumer education by conducting and cooperating in such programs to gain more effective utilization and greater consumption of agricultural products.[175] However, the emphasis on marketing research somewhat overbalanced the act, and other problems such as the attention to trivial projects, increased costs of research and personnel, and lack of sufficient numbers of qualified researchers have hindered the development of a more balanced and fundamental research program.[176] Despite these problems the act gave agricultural research agencies an opportunity to achieve a status equal to the research agencies in industry, and it not only provided for expansion in traditional research areas but also authorized new emphases, new types of organizations, and closer ties with the farm and industry. Farming had changed from relative self-sufficiency and local markets to commercial operations and broad national and international markets. Thus research was needed in the areas of market organization, packing, storing, shipping, selling, and competitive relations with other areas.[177]

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[175]Ibid., p. 1088.

[176]Benedict, Farm Policies of the United States, pp. 496-97.

[177]The Agriculture Committee on National Policy of the National Planning Association, The Agricultural Research and Marketing Act of 1946, Special Report No. 19 (Washington, 1948), pp. 1-2.

Events of the Late Forties

A number of interesting and novel events occurred during the years 1947 and 1948. A rather drastic means was used to insure the continuation of wheat research at Stillwater. Field "O", one of the oldest experimental plots west of the Mississippi river, was moved from the campus to the college farm west of town. The six-inch layer of topsoil was moved off, then the lower nine inches were removed and placed in the trench prepared for it in the new location. Then the topsoil was carefully replaced. Care was used to return soil to its approximate location in the field and maintain the separate portions — one receiving fertilizer and the other not.[178] This field had been planted in continuous wheat since the first planting of field crops at the station.

Another phase of research in agronomy at the time was soil and pasture improvement. Certain areas of the state had greater problems along these lines than others, so that special stations were in operation to meet these conditions. The staff had established the Southeastern Soil Improvement Station near Heavener in 1930 on land provided by the Heavener Chamber of Commerce. From 1930 to 1935 research emphasized methods of preventing soil erosion by terracing. After 1935 the farm was used principally for tests of fertility maintenance practices. Although the agronomists conducted annual tests of the adaptation of various crops to the soils of this particular area of Oklahoma, the soil was seriously leached of plant nutrients, and yields were low.

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[178]K. Starr Chester, "Soils men saved Oklahoma's oldest test plot; they just carried it - soil, stubble, worms, and all - to another farm," Farm Journal, LXXI (1947), p. 66.

The soil in the region had lost approximately forty-three percent of its organic matter and thirty-eight percent of the nitrogen, while seventy-five percent was highly acid. The need for lime, phosphorus, phosphate, and potash was so great as to prevent the uilization of legumes in pasture building programs.[179] In 1948 the Coalgate station expanded with the addition of 320 acres, and a cow and calf herd were the means used to test the improved pastures.[180] During this same period three other stations joined the list of on-the-spot facilities. These were the Oklahoma Cotton Research Station at Chickasha, the Kiamichi Field Station for vegetables, fruits, and pasture at Idabel, and the Range Cattle Minerals Station at Wilburton.[181] By 1948 the staff had managed to procure twelve special stations around the state. Each of these held field days one or more times a year to acquaint surrounding farmers with new crops and practices conducive to the respective area or product specialization.[182]

Another cooperative station with the U. S. Department of Agriculture resulted from the closing of the Fort Reno remount depot that had supplied horses and mules for the cavalry and horse-drawn artillery. A great opportunity for beef cattle research developed with the shutdown of this 8,500-acre facility. This large layout was completely equipped for cattle research, since the land, grass, water, network of waterlines

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[179]O.A.E.S., Mimeographed Circular No. 165 (1947), pp. 1-12.

[180]O.A.E.S., Oklahoma Farm Research Centers, [n.d.], p. 5.

[181]Oklahoma State Regents for Higher Education, Biennial Report, 1946-1948, p. 12.

[182]O.A.E.S., Mimeographed Circular No. 174 (1948), p. 10.

and stock tanks, fences, buildings, and other requisites were all in place. Located on U. S. Highway 66 three miles west of El Reno, it had been a military post until July 1, 1948, when Congress transferred all of the reservation to the U. S. Department of Agriculture with a directive that horse breeding continue on a reduced scale. A written agreement between the U. S. Department of Agriculture and the Oklahoma Agricultural Experiment Station was concluded March 18, 1949, to initiate and conduct at Fort Reno a program of research for improved production of beef cattle and swine. One thousand acres of the original reservation was granted to the Justice Department for a federal reformatory, but the remaining 6,800 acres were then made into the agricultural station. Pastures here were representative of large areas in the West and Southwest. The Station included both "short grass" and "tall grass" pastures. Improved breeding methods in cattle and hogs would be applicable universally. Grazing research would be applicable in Missouri, Kansas, Colorado, Nebraska, New Mexico, Oklahoma and Texas. Some of the specific areas of research included (1) improvement of beef cattle by breeding methods (2) improvement of swine through breeding (3) development of improved methods of livestock management with maximum use of grass and forage. Within this field of research efforts would be directed toward (a) determination of age of first calving for best lifelong performance of beef cows; (b) the most effective and economical level of feeding in producing heifers for replacements in the breeding herd; (c) development of the best combination of grass and grain for steers; (d) production of feeder lambs, using a maximum of grass and forage in their feeding; (4) evolving the most effective methods for establishing permanent perennial grass-legume pastures (some pastures had been depleted on the reservation by overstocking with horses); (5) increasing seed stocks of improved strains of grasses and legumes; (6) efficient management of pastures on diversified farms.[183]

Other research during the biennium included efforts in agricultural engineering, forestry, agricultural economics, and rural sociology. Advances in technology created new problems as well as solving old ones. Old skills became obsolete with new machines and new processes. The greater efficiency of some farmers forced the rest to adopt similar methods to stay in operation. Farming as a complicated business required competent well-informed operators.[184] To assist area farmers agricultural engineers concentrated on farm buildings and farm machinery adapted to Oklahoma conditions.[185] The results of studies made by the Oklahoma station involving method and machinery for cotton harvesting was of sufficient importance to be included in the annual report of the Chief of the Office of Experiment Stations. This notation pointed out improvement of average cotton values from $3.65 to $4.80 per bale through use of driers; development of master extractors that improved cotton by another $1.00 per bale; while centralized ginning promised to reduce ginning costs by $2.50 to $5.00 a bale.[186]

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[183] U. S. Department of Agriculture, The Fort Reno Experiment Station, /Unclassified publication, n.d., n.p./.

[184] Charles E. Kellogg, "What is Farm Research?" Yearbook of Agriculture, 1943-1947, pp. 17-32.

[185] Oklahoma State Regents for Higher Education, Biennial Report, 1946-1948, p. 12.

[186] U. S. Department of Agricultural Research Administration, Report of the Administration of Agricultural Research, 1948 (Washington, 1949), p. 387.

Research in forestry during the period 1946-1948 emphasized farm woodlot establishment and utilization of Oklahoma forest products.[187] In agricultural economics investigations included work in marketing of farm products and in the preparation and use of frozen foods. Continuing research was maintained in pasture production and utilization; soil conservation and fertility maintenance; farm business management and land tenure; development of new field and horticultural crops with varieties especially adapted to Oklahoma; production of meat animals; social problems of rural communities and farm farmilies; control of insect pests and plant diseases; milk and dairy product manufacture, and the production and processing of poultry products.[188]

Research in rural sociology was not given much encouragement around the nation or at Stillwater, despite the provision for funds in the Purnell Act. Sociologists were engrossed in the recording of information which in itself was not respected as research, and the practicality of research results could not be readily visible to the public as had been the case with the natural sciences.[189] Although investigations continued with problems of rural living, no publications in this field were produced by the Oklahoma station during the period. In general practice most research units within the experiment stations had a wide latitude to conduct their research.[190] This freedom allowed various individuals

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[187] Oklahoma State Regents for Higher Education, Biennial Report, 1946-1948, p. 12.

[188] Ibid.

[189] Bonney Youngblood, "The Status of Rural Sociological Research in the State Agricultural Experiment Stations," Rural Sociology, XIV (1949), pp. 112-14.

[190] Kellogg, "What is Farm Research?" p. 24.

to devote attention to special projects of their own particular interest. In some cases this allowed research progress not obtainable from general research operations, but in other cases projects were continued beyond the time of usefulness or economy until an individual researcher retired or died.

Investigations in 1949 not only emphasized agricultural economics and quality control, but also expanded effort along former lines at the various substations. Studies of farm size and facilities indicated that as late as 1949 eight-three percent of farm families in Oklahoma did not have running water in the home, seventy-five percent had no telephones, seventy-one percent did not have electricity, thirty-nine percent had no automobiles, and twenty-six percent had no radios.[191] These figures suggested that much of Oklahoma agriculture was either undercapitalized or complacent in view of the need for volume production to maintain an adequate standard of living. These figures further suggested a need for a greatly expanded program of research in rural sociology and agricultural economics.

Special Stations in 1949

The Kiamichi Field Experiment Station located four miles east of Idabel had been purchased October 24, 1946, and by 1949 was actively engaged in horticultural investigations. Activities on this 159-acre farm centered around methods of producing fruits and vegetables, but work also included soil fertility investigations and pasture and grass studies. The land was reterraced, the acreage was divided into plots for

[191]Robert T. McMillan, "A Study of Farms in Oklahoma by Size and Economic Class," Oklahoma Current Farm Economics, XXII (1949), pp. 31-32.

specific investigations, and winter and summer legumes were started.[192] At the Southern Great Plains Field Station, the 1,080-acre complex at Woodward and the 4,315-acre Experimental Range at Ft. Supply were used for searches to discover palatable drought-resistant perennial legumes for use in pasture mixtures. These investigations were applicable to portions of Colorado, Kansas, New Mexico, and Texas as well as to Oklahoma.[193] This cooperative station served as headquarters for grass breeding, regrassing, and range and pasture improvement studies started here in 1936, but in 1949 it also served as a center for research with sorghums, windbreaks, homestead plantings, small grains, rotation and tillage tests, and horticultural crops. Sorghum research and breeding and range improvement had provided outstanding results by 1949. Other investigations included those with grapes and tomatoes, wheat varieties and production, external parasites, and brush and weed control.[194]

In other parts of the state research at the special stations involved different activities. The Pecan Research Station near Changler provided facilities for studies of pecan production problems from insect control to soil management. The state legislature appropriated $25,000 in May, 1949, for the purchase and improvement of the land and for necessary machinery, fencing, and grading. Approximately 58 large native or seedling trees were growing on the farm, and on March 27, 1950, the staff planted 70 Stuart, 100 Desirable, 50 Success, 20 Schley,

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[192] O.A.E.S., Mimeographed Circular No. 185 (1949), pp. 13-14.

[193] U. S. Southern Great Plains Field Station, Thirteenth Annual Range and Crop Improvement Field Day, October 8, 1949, p. 6.

[194] Ibid., pp. 3-5.

116 Western and 124 San Saba improved.[195] This 160-acre farm was not only a testing area but was also a demonstration grove. A second horticulture station in 1949 was that at Bixby. Activities here centered around rotation, fertilization, variety testing, and cover cropping. Objectives at the time were the development of better varieties and fill-in crops between canning and shipping periods. Facilities of this station included packing, storage, and machinery sheds, plant growing structures, pumps, wells, other irrigation equipment, and a modern residence.[196] Efforts at the Irrigation Experiment Station at Blair, established in 1946, were devoted to the best use of water for production of field and horticultural crops.[197] Agronomy projects were conducted at the special stations near Heavener, Lone Grove, Guthrie, Cherokee, Tipton, and Chickasha. At both the Soil Improvement Stations at Heavener and Lone Grove agronomists conducted tests of grass and pasture crops, crop varieties, and soil treatments. The 110 acres near Heavener were also used for pasture and crop rotations, while the 198 acres at Lone Grove were more useful for grass and crop variety tests.[198]

Station staff in agronomy began greater cooperative efforts with the United States Department of Agriculture agronomists and soil experts at the Red Plains Conservation Station. This 360-acre federal facility had been the first station of its kind in the United States. Federal

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[195] O.A.E.S., Mimeographed Circular No. 229 (1951), p. 1.

[196] O.A.E.S., Oklahoma's Farm Research Centers - How to Know and Use Them, /Unclassified publication, n.d., n.p./

[197] Ibid.

[198] Ibid.

employees had been engaged since 1928 in investigations to obtain better methods of revegetation and gully control, crop rotation for erosion control, cropping, and the reclamation of abandoned cultivated land.[199] Cooperative efforts between members of the station and the Soil Conservation Service were also conducted at the Wehatland Conservation Station. This 320-acre farm located near Cherokee was typical of wheat land of Oklahoma and Kansas. Main activities in 1949 were studies on how contour cultivation, terraces, and different methods of tillage affect wheat production, and vegetation to prevent erosion of farm waterways. Variety tests and growing of legumes in relation to control or erosion were other efforts at the time.[200]

The staff concentrated efforts at the Southwest Cotton Station, Tipton, on finding improved strains of cotton and adaptable varieties for that location. Irrigation equipment and procedures were also tested on this eighty acres.[201] Breeding of cotton varieties for Oklahoma conditions, testing existing varieties, and all phases of mechanization including relative costs were the main area of concern at Chickasha. The facilities here included a machine shop adequate for the construction of farm machinery. This last played a part in the development of the cotton stripper.[202] Among the various studies of animals, researchers conducted investigations of beef cattle at Wilburton, Fort Reno, and Pawhuska. The main goals of experiments at the Range Cattle Mineral

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[199]Ibid.

[200]Ibid.

[201]Ibid.

[202]Ibid.

Station located near Wilburton were the discovery of mineral supplement requirements of range beef cattle, pasture improvement methods, control of livestock parasites, and the use of good breeding stock. The facilities of these 640 acres with feed storage houses were coordinated with the 4,500-acre range at Lake Carl Blackwell. One specific investigation at Wilburton in 1949 was that involving the lack of calcium or phosphorus in the diet in relation to weight gain.[203] At Fort Reno cooperative research in 1949 centered on beef cattle nutrition, swine tests, and livestock improvement. The station used 4,200 acres, corrals, and barn facilities of this historic seventy-four-year-old reservation.[204]

Investigations continued at Pawhuska to alleviate the one million dollar annual loss in cattle from anaplasmosis. Facilities here included the 910-acre ranch, a 35-acre central corral area with an isolation barn, and a fully equipped laboratory in downtown Pawhuska.[205] Other special activities outside those at Stillwater included various area tests for one or more years, and county or local tests usually for one year only. Special services performed by the staff in 1949 included the distribution of general agricultural information, soil analyses, various chemical analyses, soil surveys, distribution of farm fitted building plans, pest control surveys, and a variety of economic information.[206] General service to the whole population came in the form of

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[203]Ibid.

[204]Ibid.

[205]Ibid.

[206]Ibid.

more abundant, cheapter, and better products.[207]

In 1949 agricultural research was costing about five dollars per farm and ranch in the state, but for every dollar spent for scientific research $250.00 was added to the incomes of Oklahoma farm people.[208] The influence of research was apparent in many ways. One writer summarized some of the changes that were taking place in rural America. He suggested that the rural life tendancies in 1949 included a shift away from folk beliefs, loss of folk arts and skills, declining self-sufficiency of the farm, increase of part-time farming, greater specialization, decline of the operation of the "agricultural ladder" (rise from agricultural worker to farm owner), decline in the status of the hired laborer, rising levels and standards of living, changing methods of obtaining security (increase in purchase of insurance), and decline in the primary group associations — neighbors, neighboring towns, and various institutions.[209] The extent of these changes in Oklahoma would depend upon which portion was considered, whether close to or distant from the large urban centers.

The great diversity of farming conditions was the major factor in the continued expansion of specialized investigations around the state. Rainfall varied from fifty inches in the southeast to less than twenty inches in the Panhandle. Altitude increased from less than 500 feet in the southeast to almost five thousand feet at the New Mexico line.

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[207]The Agricultural Committee, N.P.A., The Agricultural Research and Marketing Act of 1946, p. 2.

[208]O.A.E.S., Oklahoma's Farm Research Centers, [n.p.].

[209]Carl C. Taylor, et al., Rural Life in the United States (New York, 1949), pp. 525-33.

The growing season, of 240 days along the Red River in the southeast, decreased to only 180 days in the Panhandle. Native vegetation varied from cypress in the bayous of the southeast to the short grass of the High Plains.[210] The two maps below give an indication of the variations in rainfall and types of farming areas. These variations were considered when the various sub-stations were established. The work force at these special stations included a foreman at the stations at Heavener, Lone Grove, Tipton, Bixby, Coalgate, Wilburton; and assistant superintendent at Blair; a superintendent at Idabel; one state and three federal employees at Chickasha; federal employees at Guthrie, Woodward, Cherokee, and Fort Reno; and a laboratory technician and two veterinarians at Pawhuska.[211] The A. & M. Farm established at Oklahoma City and "pilot farms" provided on-the-spot demonstrations. The "pilot farms" consisted of twenty-two selected farms in seventeen counties where farmers cooperated in testing results of research under actual farm conditions, before the practices were generally recommended.[212] Another extremely valuable cooperative venture was the Oklahoma Foundation Seed Stocks, Incorporated, established in 1949 to provide a means of promptly increasing seed of improved varieties developed by station plant breeders and also insuring purity to producers.[213] The costs of these enterprises were met by various appropriations, station sales, and grants and gifts from industrial corporations or their research

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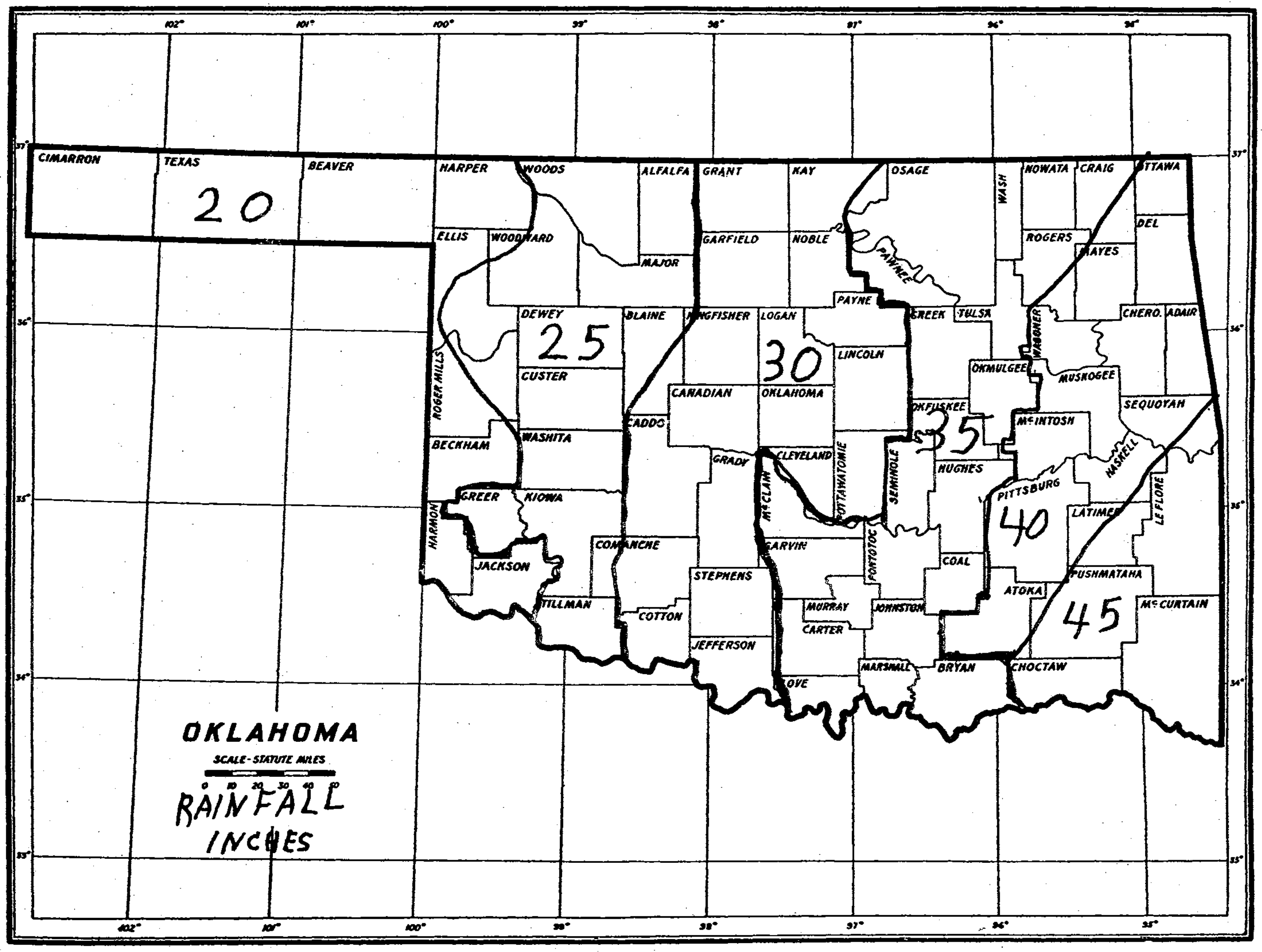
[210]George F. Church, "The Research Program of the Oklahoma Agricultural Experiment Station," Oklahoma Current Farm Economics, XXIII (1950), pp. 93-94.

[211]O.A.E.S., Biennial Report, 1948-1950, p. 4.

[212]Ibid., p. 6.

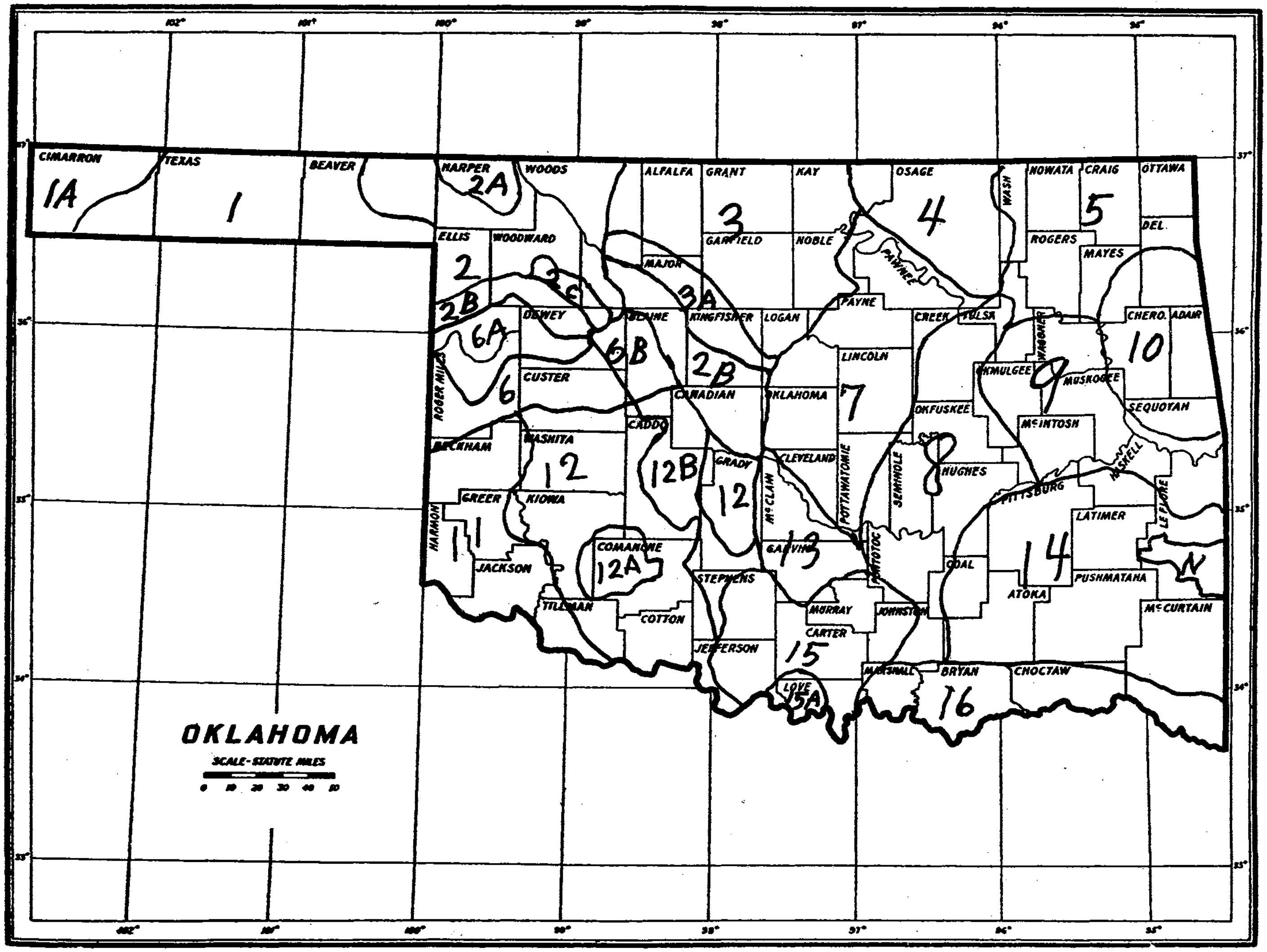
[213]Ibid., p. 7.

AMOUNT OF RAINFALL*



*O.A.E.S., Biennial Report, 1948-1950, p. 61.

TYPES OF FARMING*



*O. A. E. S., Biennial Report, 1948-1950, p. 61

Types of Farming Areas in Oklahoma

Map Listings

1	Cash grain and livestock
1A	Largely range livestock
2	Somewhat broken topography - some small grains, feed crops, livestock
2A	Cash wheat primarily
2B	Cash wheat primarily
2C	Sandy area, general farming
3	Cash grain, general farming
3A	A wooded area of sandy soil - general farming, some cotton produced on this strip
4	Range livestock - some general farming
5	General farming, livestock, dairy, poultry and self-sufficing
6	Cash grain, general farming, cotton, livestock
6A	Rough, sandy area, scarcely any farming, some range livestock
6B	Wooded area, general farming, and cotton
7	General farming, cotton, livestock, dairy, and poultry
8	Cotton, general farming, self-sufficing
9	Cotton, some dairy, potatoes, commercial vegetables, self-sufficing
10	Some fruit, general farming dairy and poultry, self-sufficing (rough wooded land)
11	Cotton supplemented with cash grain, livestock, dairy, and poultry
12	Cotton, cash grain, livestock, some dairy and poultry
12A	Range livestock
12B	Sandy, wooded section, cotton, general farming
13	Cotton, livestock, general farming, broomcorn
14	Cotton, self-sufficing, livestock (rough, mountain and wooded areas)

(Map Listings continued)

15 Range livestock, general farming, self-sufficing

15A Cotton, general farming

16 Cotton, general farming

N National Forest

affiliates. The state appropriation for the main station during the fiscal year 1948-1949 amounted to $488,533.00. The grand total of all funds available to the station was $809,372.64.[214]

Research at the Main Station in 1950

Conditions and facilities of the Oklahoma experiment station continued to change for the better with improved economic conditions in the state's agriculture. The station staff of June 30, 1950, (with some resignations not deleted) included three in administration, six in agricultural chemistry research, fourteen in agricultural economics, eight in agricultural engineering, thirty-eight in agronomy, ten in animal husbandry, three editors, nine entomologists, four in forestry, two in home economics, twelve in horticulture, two in the library, ten in plant pathology, twelve in poultry husbandry, two with short courses, six in sociology and rural life,one at the statistical laboratory, and three at the demonstration farms.[215] The main station consisted of facilities on the campus and farm at Stillwater, the 640-acre Perkins farm, and the 21,000-acre Lake Carl Blackwell Land Use Area. Outfield facilities included eleven special stations, four state-federal cooperative stations, a number of pilot farms, and cooperative tests at from fifty to a hundred locations each year.[216]

During 1950 the station had 243 research projects underway in fourteen departments. These were done at the main station, seventeen

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[214]Ibid.

[215]O.A.E.S., Biennial Report, 1948-1950, pp. 3-4.

[216]Ibid., p. 61.

special stations, and at approximately seventy-five short-time test locations.[217] In agronomy studies were made of weed erosion; loss of soil fertility to weeds; bindweed in wheat; control of brush, ragweed, Johnson grass, and bermuda; deep plowing of sandy surface soils to improve surface ahd holding factors of the soil; and destruction of plow pan for moisture penetration.[218] Research in agricultural engineering centered around projects proposed and initiated by faculty members and projects proposed by industrial or governmental agencies.[219] With efforts to obtain greater farm efficiency many engineering problems arose. From 1910 to 1950 man-hours of labor in farming dropped twenty-nine percent, despite the fact that the amounts of land, buildings, machinery, and other nonhuman resources used in farming increased sharply.[220] Meanwhile at the Oklahoma station a program of farm-fitted building plans began in April, 1949, which provided the nucleus for considerable new type of construction around the state. However, after these plans were published the station staff contributed little additional information. More important to agricultural engineers was the mechanization of cotton.[221] Research in cotton mechanization would involve pickers and strippers, varieties for each machine, and ginning equipment. In horticulture one project came to a successful conclusion with the

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[217]Ibid., p. 6.

[218]Ibid., pp. 7-8, 17.

[219]Oklahoma State Regents for Higher Education, Biennial Report, 1948-1950, p. 13.

[220]Lauren Soth, How Farm People Learn New Methods (Washington, 1952), p. 1.

[221]O.A.E.S., Biennial Report, 1948-1950, p. 19.

release of the "allgold" sweet potato in the spring of 1950. This strain produced double the yield of one of the prevailing varieties, Porto Rico. The "allgold" was equal if not superior in taste and table appearance, and it contained fifty percent more vitamin C and three times as much vitamin A.[222] Research also continued with problems related to the two of the nation's centers of watermelon and watermelon seed production that were located along the old Chisholm trail.[223]

At Perkins horticultural research included studies in the fifty-four-acre orchard which contained 104 varieties of peaches, 69 varieties of apples, 24 varieties of plums, 20 varieties of pears, 9 varieties of cherries, seventy-five varieties of grapes, and 18 varieties of nectarines.[224] Forestry research, as one of the aspects of diversified farming, centered attention on fence post production, preservation treatment of fence posts cut from native trees, selective cutting in eastern Oklahoma forests, and the production of seedlings of forest trees adaptable to the state.[225] Poultry research included studies of the greater use of Oklahoma feedstuffs, and breeding chickens and turkeys for Oklahoma conditions.[226] In dairying efforts centered on better use of Oklahoma feedstuffs in milk production; searches for means to help processors to find new outlets for the state's milk as well as to increase its quality; and studies of bacteriophage organisms which destroy lactic

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[222]Ibid., p. 31

[223]Church, "The Research Program of the Oklahoma Agricultural Experiment Station," p. 94.

[224]O.A.E.S., Biennial Report, 1948-1950, p. 33.

[225]Ibid., p. 34.

[226]Ibid., p. 35.

acid bacteria that are necessary for the production of cheese. Much more was accomplished with the expanded creamery facilities and with the new dairy barn which began full operations during the biennium.[227]

Research efforts in rural sociology were devoted to population movement, farm ownership, rural housing, and the social changes accompanying mechanization. Research underway in 1950 included community services performed by the smaller rural trade centers, levels of living among various rural groups, the extent of the advance of young tenants to ownership, and the effects of farm mechanization.[228] In agricultural chemistry the staff conducted analyses of feeding material and animal tissues, conducted digestion trials, sought the sources of variability in the vitamin and mineral content of vegetables, and continued chemical analyses of grasses for pasture or field grazing use.[229] Attention in agricultural economics was centered on such areas as cotton practices, agricultural land values, and added income from oil leases.[230] Plant pathologists were seeking controls of plant diseases, examining uses of sprays and dusts, cooperating with breeders of disease-resistant crop varieties, conducting studies of cell structure as a basis for possible improvement through breeding, examining soil fumigation practices, and utilizing tracer isotopes to assist in observation of plant structure.[231] In home economics workers were assisting in problems relating to the

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[227]Ibid., p. 37.

[228]Ibid., p. 42.

[229]Ibid., p. 43.

[230]Ibid., pp. 45-47.

[231]Ibid., p. 48.

use of farm products in the homes, the utilization of summer variety apples, and retaining the flavor quality of vegetable crops.[232]

Many of these research efforts failed either to devote attention to some specific area or perhaps gave insufficient emphasis to it, so that special interest groups were not satisfied. As a result various off-campus organizations aside from the U. S. Department of Agriculture contributed grants for special research projects. A list of such grants in 1950 included:

> American Cyanamid Company: Cotton defoliation, control of cotton insects and grasshoppers, DDT as a barn spray.
>
> American Hereford Association: Effect of size of Hereford cattle on economy of beef production.
>
> American Potash Institute: Potassium requirements of Oklahoma soils and crops.
>
> American Seed Trade Association: Effect of time of cutting alfalfa on hay and seed yields.
>
> Armour & Company: Deficiencies of common swine-gattening rations.
>
> Baker Castor Oil Company: Castor bean production.
>
> Battelle Memorial Institute: Effect of cooper-mine tailings on plant growth, control of foliage diseases of forage legumes.
>
> The Boardman Company: Design of all-purpose farm sprayer.
>
> Dow Chemical Company: Pecan casebearer control.
>
> E. I. du Pont de Nemours and Company: Urea in livestock feeding.
>
> The Geigy Company, Incorporated: DDT as a barn spray.
>
> International Minerals and Chemicals Corporation: Effect of fineness of rock phsophate on utilization by crops.

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[232]Ibid., p. 51.

Herron Industries: Improvement of cutting methods in Southeast Oklahoma timberlands.

Hoffman - La Roche, Incorporated: Oxidized flavor in milk.

Mallinckrodt Chemical Corporation: Estrogen feeding of poultry.

Midwest Research Institute: Sorghum breeding for commercial characteristics, and for chinchbug and disease resistance.

Mungbean Research Foundation: Sprouting quality of Oklahoma-grown mungbeans.

National Cottonseed Products Association: Sunflower varieties, culture, and adaptation.

National Institute of Health: Amide nitrogen metabolism in animal tissues.

Oklahoma Cotton Research Foundation: Cotton breeding and mechanized production methods.

Oklahoma Planning and Resources Board, Division of Forestry: Methods of handling seed for tree nurseries.

Oklahoma Poultry Improvement Association: Laying test, and improvement of poultry production.

Oklahoma State Board of Affairs: Pecan research station.

Oklahoma Turf and Golf Associations: Mechanical composition of soils in relation to turf development.

Seed corn companies (various): Oklahoma corn performance tests.

Southwestern Peanut Growers Association: Preparation and publication of a handbook of peanut production in the Southwest.

Spencer Chemical Company: Fertilization and supplemental irrigation of corn.

Standard Oil Company of New Jersey: Control of horse flies (Tabanidae).

Swift and Company: Mineral requirements of range beef cattle.

Texas Research Foundation: Organic matter decomposition in Oklahoma.

Thompson Phosphate Company: Effects of fineness of rock phosphate on utilization by crops.

U. S. Department of Interior, Bureau of Reclamation: Supplemental irrigation of cotton, alfalfa, and vegetables.

United States Golf Association: Turf development and maintenance.

U. S. Naval Ammunition Depot, McAlester: Volume measurements of central Oklahoma hardwood stands.

White Laboratories, Incorporated: Estrogen feeding of turkeys.

Wilson and Company: Sterility, reproduction, and lactation disorders in swine.[233]

Evidently the regular program and these special grants still did not provide all the projects thought necessary. One writer criticized the stations of the Southwest for not providing research information in such areas as the parity concept, industrial-agricultural relationships, the private-public stake in conservation, credit services of the government, surplus disposal, production controls, price supports, or reciprocal trade agreements. It was wished that attention be given to these problems in regard to their effects on the region as well as on the general economy.[234] However, regardless of such criticism the Oklahoma station had contributed a great amount of material gain for the farmers of the state. In one list of contributions the actual realized values totaled around $5,650,000 annually. Improved varieties of kaffirs and

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[233] Ibid., pp. 57-58.

[234] Tyrus R. Timm, "Agricultural Policy: Educational Assistance From the Land Grant Colleges," The Southwestern Social Science Quarterly, XXXI (1950), p. 202.

grain sorghums boosted production significantly. Use of a chemical to control greenbugs in wheat added $4,250,000 to farmer income in 1950. Yet the value of research could not always be determined in money, since improvement in human health as a result of production of vegetables with larger vitamin content have not been evaluated.[235] In other cases the value of research was not clearly evident, since regional production advances as in the case of cotton could not be specifically related to given scientific advances. Research activities with cotton were conducted not only in regard to Oklahoma production, but also they were coordinated with other experiment stations in the southern states.[236]

The Oklahoma station contributed greatly to the progress of agriculture during the three decades from 1920 to 1950. Most of the time the results of research were not spectacular, but merely added to the yields of the various crops through development of improved disease-resistant varieties; research also made farming chores easier by introduction of new methods of efficient operation or new structures; showed how to reclaim abandoned land, and through pasture and forage research encouraged the greater development of the important livestock industry in the state. The general prosperity of the bulk of Oklahoma farmers was attributable in part to the progress made in research at Stillwater and the special stations. Through machines, new varieties, and new methods the impact of adverse climate and soil conditions was greatly softened. As a result of research agriculture in Oklahoma became less

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[235] O.A.E.S., Biennial Report, 1948-1950, p. 5.

[236] Oklahoma State Regents for Higher Education, Biennial Report, 1948-1950, p. 86.

of a gamble. Research in the area of agricultural engineering assisted in greater mechanization, development of more adequate farm buildings and other facilities, and the coordination of machinery for new crop varieties and production techniques.

The better to solve some of the basic problems in the various farming regions of the state, the station had established pilot plots on privately owned farms and special stations, and had extended greater cooperation to the staffs of federal agricultural facilities in the state. Many research fields were greatly expanded through procurement of facilities at Perkins, Lake Carl Blackwell, Lone Grove, Heavener, Bixby, Coalgate, Pawhuska, Cherokee, Ft. Reno, Idabel, Tipton, Chickasha and Wilburton. Research could more adequately meet the needs in certain areas of the state for such productions as vegetables and fruits, grazing, pasture, and dry land and irrigated cotton.

Perhaps the most striking research efforts came as a result of the emphases placed upon the fields of agricultural economics and rural sociology. Through the direction of research and financial support provided by the Purnell Act, the Bankhead-Jones Act and the Agricultural Research and Marketing Act, efforts were turned toward basic economic and social problems of rural living. Emphasis was placed upon finding methods whereby the farmer could achieve an adequate standard of living as well as have a wholesome social and cultural environment. Problems such as tenancy, lack of living facilities, inefficient farming units, and crop and technological maladjustments were examined, while at the same time efforts were made toward a more efficient production through introducing mechanization, improved processing, handling, storage, applying cost accounting procedures, introducing new crops, and discovering new uses for agricultural products and by-products. The whole was capped with a greater concern for the totality of rural society and the responsibility of the whole agricultural industry to the general consumer.

CHAPTER V

RESEARCH ACTIVITIES OF THE FIFTIES AND SIXTIES

The Oklahoma station made significant strides during the period following the Second World War. The period of the Fifties and Sixties saw a tremendous growth at Stillwater and in the whole Oklahoma Agricultural Experiment Station complex. State support increased, but toward the end of the period the spiral of research costs outmatched the dollar increase. Facilities, especially at Stillwater, improved, with numerous additions to the physical plant of the college, which in turn provided the added laboratories, offices, and equipment needed for increased research efforts. The staff became more numerous and better trained. A number of specific achievements resulted during the period, although some areas of research were neglected. In general, the Oklahoma station appeared to ride the tide of prosperity, to follow along in the emphasis on basic research, to absorb and modify advances in technology, and to continue the search for efficiency and quality in agricultural production.

The Early Fifties

The first two years of the mid-century decade saw a number of accomplishments, a continuation of research along the usual lines, and a few new research areas at the Oklahoma Agricultural Station. Some areas were phasing out, while others were merely getting started. The staff size fluctuated in number, and as of June, 1952, those in administrative capacity increased from three to six, and agricultural engineering from eight to thirteen; but meanwhile resignations reduced horticulture from twelve to six, poultry from twelve to six, and rural sociology from six to three.[1] A three-man department of soil conservation was added to the station to expand further and coordinate the work the staff was already doing at the Guthrie and Cherokee sub-stations.[2]

The Red Plains Conservation Experiment Station, a cooperative station established in 1928, was located four miles south and a half mile east of Guthrie. Work on this 350-acre farm had included methods of controlling erosion, conserving moisture, and bringing eroded and unused land into production. After 1940 efforts involved reclaiming land and the use of vegetable cover. Later emphasis integrated erosion control and fertility restoration into a complete farm program, and encompassed pasture development and management on eroded and brush land. This station was closed in 1956 as a result of oil well activities on the land, and the program and personnel were transferred to the station at Cherokee.[3]

The 320-acre station at Cherokee was leased from private individuals and was located one mile south and one mile west of Cherokee. The Wheatland Conservation Experiment Station was in an area with soils typical of the reddish prairies. This was not the best land for wheat production, and as a result it was classified as number two grade of

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[1]O.A.E.S., Biennial Report, 1950-1952, pp. 3-4.

[2]Ibid., p. 5.

[3]O.A.E.S., Mimeographed Circular No. 245 (1953), [n.p.].

wheat ground. The Oklahoma station provided the land and personnel to supervise research and overall operations. The Agricultural Research Service provided a resident engineer, engineering aid, and certain items of equipment necessary for cooperative research.[4]

In June, 1952, twenty-one special stations were in operation in the state. Two, Sandy Land Research at Mangum and the Eastern Oklahoma Field Station at Stilwell, began operations during the biennium, while the Southern Soil Improvement Station at Lone Grove ceased operations in 1952.[5] Tom S. Cunningham became Superintendent of the Sandy Land Research Station January 1, 1952; the station hired a superintendent for the Eastern Oklahoma Field Station, effective July 1, 1952, and a foreman to take over operations of the Oklahoma Peanut Research Station at Stratford, effective June 1, 1951.[6] At the Southeastern Oklahoma Pasture Fertility Station, located six miles northeast of Coalgate, research had been conducted since 1945 on land one half of which was covered with post oak, blackjack oak and hickory, the other half being prairie land which was very low in natural productivity and had been abandoned as cropland. Since this situation was typical of the land of the region, agronomists viewed pasture improvement as the key to a successful livestock enterprise in this area. Attempts were made to foster growth of legumes to facilitate this pasture improvement.[7] Further

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[4]Materials prepared by O. H. Williams, O.A.E.S. Farm Superintendent, November, 1964.

[5]Oklahoma State Regents for Higher Education, Biennial Report, 1950-1952, p. 15.

[6]O.A.E.S., Biennial Report, 1950-1952, p. 5.

[7]O.A.E.S., Mimeographed Circular No. 221 (1951), p. 1.

work in pasture improvement was conducted at other facilities around the state, since it was an important economic resource, with 23,000,000 acres devoted to pasture and grazing land. Grassland farming research included breeding improved grasses and pasture legumes, testing available strains and varieties for use in various parts of the state, developing methods of seed production, managing pasture crops, managing cattle on pastures, managing reclaimed eroded and brush land, and using grasses and legumes for soil improvement.[8]

The agronomic research at the cooperative station at Woodward was especially important, in that most of the leading grain sorghums, broomcorn, and several forage sorghums then grown throughout the Southern Great Plains originated from strains developed or selected at this facility. This achievement amounted to millions of dollars in value annually. Other investigations here included those with Sooner milo and various improved strains of kaffir.[9] At the pecan station near Chandler research expanded with planting of over two hundred additional trees April 20, 1951. These consisted of one-year-old trees from five to six feet in height of the Stuart and Western varieties.[10] The station expanded both area studies and cooperative endeavors by concluding agreement with the Samuel Roberts Noble Foundation to conduct a four-county program. This agreement of June, 1951, was directed toward more

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[8] O.A.E.S., Biennial Report, 1950-1952, pp. 22-23.

[9] D. A. Savage, "Highlights of Thirty-nine Years of Research by the U. S. Southern Great Plains Field Station at Woodward, Oklahoma," Program of the Sixteenth Annual Range Improvement Field Day, October 11, 1952, p. 2.

[10] O.A.E.S., Mimeographed Circular No. 229 (1951), p. 2.

effective land utilization, pasture improvement, and soil fertility. It was to involve land, facilities, and up to $200,000 of annual operating costs provided by the foundation.[11] Further activities of this foundation are examined in the text below.

Aside from these activities and those at the sub-stations, other investigations at Stillwater gained special attention during the 1950-1952 biennium. Poultry breeders at Stillwater developed the Oklabar roosters from four older breeds. By 1952 this new breed had spread to the point of being one-fifth of all broilers produced in the state. The Oklabar rooster had the desirable characteristics of white plumage with few dark pin feathers, rapid feathering that prevented a bare-back condition at broiler age, high hatchability, and a broad, meaty, long breast that would appeal to consumers.[12]

The decreasing production of cotton in Oklahoma posed a second problem for station agronomists and agricultural engineers. During the years 1924 to 1929 Oklahoma had been one of the nation's top cotton producing areas, with over a million bales a year. However, with the Great Depression, overcropping, and the resulting erosion and loss of fertility, acreage decreased from 5,396,000 in 1925 to 1,045,000 by 1953. In the percentage of income from all farm crops, in 1925 cotton led at seventy-five percent, but in 1952 cotton was down to providing only fifteen percent of Oklahoma farm income.[13] To make production

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[11] Oklahoma State Board of Regents for Higher Education, Biennial Report, 1950-1952, p. 15. See footnote No. 39 and material in text below.

[12] O.A.E.S., Biennial Report, 1950-1952, pp. 51-52.

[13] Ladd Haystead and Gilbert C. Fite, Agricultural Regions of the United States (Norman, 1955), pp. 204-5.

easier the agricultural engineering department concentrated efforts on improved harvesting machinery. In 1951 the staff developed an improved stripping roll covered with fibrous brushes for the cotton stripper harvester.[14] This together with other efforts for a larger and better quality of production would allow Oklahoma to regain some of its former production, and to keep in step with a situation which in 1952 found the American farmers producing seventy-five percent more food and fiber than they had produced in 1910.[15]

However, in the current period of agricultural surpluses it was also necessary to consider that if the population was to eat well in a period twenty-five years hence (with a growing population), then much basic research would have to be expanded throughout the country. Break-throughs similar to that of hybrid corn would be needed. The hybrid corn crop of the nation in 1947 was worth one billion dollars, more than thirty times the cost of operating all the state stations.[16] Similar researches should be just as economical to the general public. Oklahoma should play an important part in providing for the growing population, since the state's tillable land could be utilized for primary foods, and the range country could provide more animal protein.[17] Research in the future according to one writer should be oriented "not

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[14]O.A.E.S., Southern Cooperative Series Bulletin No. 100 (1965), p. 44.

[15]Lauren Soth, How Farm People Learn New Methods (Washington, 1952), p. 1.

[16]Russell I. Thackrey, "What Agriculture Can Expect From the Land-Grant Colleges--Future Contributions of Land Grant Colleges," Proceedings The Association of Governing Boards of State Universities and Allied Institutions, Thirtieth Annual Meeting, September-October, 1952, p. 72.

[17]Ibid., p. 73.

only upon an effective production technology, but also upon sound rural institutions and an everlasting soil."[18] Much of the work at this Oklahoma station was oriented in that direction. Research at the Oklahoma complex was contributing significantly both to increased beef production and to soil conservation through its pasture improvement program. A financial gain of $32,890,000 would be possible through widespread pasture improvement obtained through the use of improved plants such as those that produced from 250 to 450 pounds of beef per acre at the Heavener station. This weight gain was a favorable contrast to the average fifty-pound beef yields per acre on the 2,990,000 acres of native pasture in the area. Merely doubling the yield of pasture plants would provide a gain in excess of the fifty-pound figure.[19] Likewise an increase in the yield of cotton through the use of improved varieties developed by the station breeders added at least $1,500,000 to farm income even if only part of the gain could be obtained by farmers. The use of dried sweet potatoes in place of outside-produced corn for feed added $1,500,000 to Oklahoma farm income. Utilization of improved varieties of wheat added $25,000,000 to the 1952 wheat crop.[20] The value of sorghum silage and other Oklahoma-grown feeds developed by the station had been of great importance to the livestock producers of the state. Basic research with cottonseed meal, a high protein feed had alone repaid the cost of research efforts since 1891 many times.[21]

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[18] Wilbur H. Glover, Farm and College The College of Agriculture of the University of Wisconsin A History (Madison, 1952), p. 363.

[19] O.A.E.S., Biennial Report, 1950-1952, p. 5.

[20] Ibid.

[21] Ibid., p. 8.

The Middle Fifties

While many research activities received attention during 1951 and 1952, changes in the staff, expansion of operations, and the creation of new departments and new facilities were the center of attention in the years 1953 and 1954. W. L. Blizzard, B.S., retired as director June 30, 1953, and Louis E. Hawkins, Ph.D., became director March 1, 1954.[22] The station expanded its operations in veterinary medicine by the creation of a department of veterinary research and the appointment of a professor and head of the department September 1, 1953.[23] Likewise a new department of bacteriology developed with the appointment of a new professor and head January 26, 1954. Plant pathology expanding into the department of botany and plant pathology with a staff of twelve during this same period. Another expansion was the creation of the Oklahoma Irrigation Experiment Station three miles south of Altus, to work in conjunction with the station at Blair.[24] Meanwhile pasture studies continued at the Coalgate station, and the special investigations there in 1954 included (1) common bermuda grass-legume pastures on four land types with various soil fertility treatments; (2) weeping lovegrass-legume pastures on one soil type with varying soil fertility treatments, and (3) native grass and improved pastures located on similar land types.[25] While such studies were giving livestock producers much valuable information, one very grave problem in 1954 needed serious

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[22]O.A.E.S., Biennial Report, 1952-1954, p. 2.

[23]Ibid., p. 3.

[24]Ibid., pp. 2-3.

[25]O.A.E.S., Mimeographed Circular No. 263 (1954), p. 2.

attention. This was the large number of low production farms. Of the 1,226,000 farmers in the United States, twenty-six percent had an average gross value output of less than $2,500 per farm. Sixty-one percent of these farmers were in thirteen southern states, including Oklahoma and Texas.[26]

However, despite this and other large time-consuming problems, the station had made a number of significant gains during the period. From 1943 to 1953 the staff made available more than twenty-five varieties of plants for improved local production. These high quality and dependable strains included Midland bermuda grass; Ponca and Concho wheats; Parrott cotton; OK612, OK613, and OK632 hybrid sorghums; Allgold and Redgold sweet potatoes; Nemared tomato; Goldenred peach; Berken mungbeans; Rogers barley; and Cimarron oats.[27] Before these varieties were offered to the public they had passed through a number of controlled procedures after development by station breeders. Preliminary trials were first made by plant breeders, followed by field trials, and pilot tests around the state; then the proposal for the release of the new variety had to be considered by the Variety Naming and Release Committee of the station. When they were accepted by this committee, the seed was given to the Oklahoma Foundation Seed Stock, Incorporated, for distribution.[28]

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[26] James G. Maddox, "A Perspective on the Farm Policy Problem," Agricultural Policy Review, I (1961), p. 17.

[27] O.A.E.S., Miscellaneous Publication No. 32 (1953), p. 1.

[28] Ibid., pp. 2-7.

The Hatch Act of 1955

By 1955 federal agricultural laws had become so involved that new legislation was necessary to simplify and coordinate research efforts in order to attack persisting and newly occurring agricultural problems. The Hatch Act of 1955 was designed to consolidate the act of 1887 and subsequent federal legislation.[29] In addition, it provided for a greater integration of effort on problem areas extending across state boundaries.[30] The legislation stipulated that:

> It shall be the object and duty of the state agricultural experiment stations through the expenditure of the appropriations hereinafter authorized to conduct original and other researches, investigations, and experiments bearing directly on and contributing to the establishment and maintenance of a permanent and effective agricultural industry of the United States, including researches basic to the problems of agriculture in its broadest aspects, and such investigations as have for their purpose the development and improvement of the rural home and rural life and the maximum contribution by agriculture to the welfare of the consumer, as may be deemed advisable, having due regard to the varying conditions and needs of the respective states.[31]

An added provision of the above act encouraged wider support by the respective states and territories. Any federal appropriation in excess of $90,000 to a state station had to be paired with equal amounts from the states individually. If funds were not matched then further funds could be withheld from that station.[32] The provision for the improvement

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[29]U. S. Statutes at Large, Vol. LXIX (1955), p. 671.

[30]State Experiment Stations Division, Agricultural Research Service, Federal Legislation, Rulings and Regulations Affecting the State Agricultural Experiment Stations, U.S. Department of Agriculture Miscellaneous Publication No. 515 (Washington, 1959), p. 3.

[31]U. S. Statutes at Large, Vol. LXIX, p. 671.

[32]Ibid., p. 672.

of the rural home and rural life was soon to be phased out of the Oklahoma program except for indirect economic studies, but in 1955 some sociological studies continued. Nevertheless, the station concentrated primarily on natural science areas and agricultural economics.

One study in rural sociology indicated that farmers in eastern Oklahoma had made the greatest gains of any segment of the society since the start of World War II. Research in the field also suggested an increase in the size of farms (especially in the eastern portion of the state); with slightly larger families, this increase in farm size was especially necessary to raise the standard of living.[33] Those counties in the eastern portion of the state which changed most rapidly to pasture from cropland showed the greatest increase in the level of living. Special research at the station was pointed toward finding the best combination of crops and livestock for the eastern Oklahoma prairie land farms. The level of education was a factor paired to the level of living of these eastern area farmers.[34] However, two problems arose with application of research solutions to low living standards. First, a time lag developed between farm expansion and purchase by the family of added consumer goods; second, many factors such as climate, land fertility, distance to markets, and utilities needed to be considered before an optimal size farm in a given situation would be possible.[35] As seen in 1955 by agricultural sociologists, objectives of the optimum

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[33]Milton E. Morris, "Larger Farms, More Livestock and Greater Mechanization are Needed to Put Us on the Road to a Better Standard of Living," Oklahoma Agriculturalist, II (1955), p. 8.

[34]Ibid., p. 19.

[35]Ibid.

farm should be: (1) the farm should maintain the family in a state of good mental and physical health; (2) it should provide the youth with educational and social equipment equal to the needs of their time; (3) it should produce a surplus above current living expenses to care for parents in old age; and (4) it should pay a sufficient profit to maintain or improve the fertility of the soil.[36] The farm when rented should bring sufficient payments to maintain or improve productivity.[37]

Like rural sociology, agricultural engineering in its broad aspects provided an important service for improving the general welfare of farm life. Although research in this field would continue to expand, support for its broader application would not be available. Agricultural engineering arose as an adaptation from the fields of civil, mechanical, and architectural engineering. Some of its broad objectives were: (1) the reduction of the hazards of farming through control of such factors as availability of water, storms, frost, fires, pests, and accidents around buildings, animals, and equipment; (2) the reduction in protection costs through improved machines, more efficient use of labor, and provision for functionally efficient buildings; (3) improvement and retention of the quality of farm products by better techniques of storage, ventilation, refrigeration, pasteurization, grading, and handling; (4) utilizing greater amounts of farm by-products and surpluses through proper processing, storing, and handling; (5) making farming operations easier and less like drudgery, through mechanical or hydraulic handling

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[36]Ibid.

[37]Otis D. Duncan, "Scoioeconomic Aspects of Farm Population Changes," Paper read before the Oklahoma Academy of Science, Dwight, Oklahoma, May 7, 1955, p. 3.

of manure, and installation of automatic equipment for water, feed, and hay; (6) making life on the farm more enjoyable through provision for the modern conveniences of running water, electricity, sewage disposal, and central heating; (7) and assisting in the conservation and more efficient use of national resources by introduction of improved means of moisture conservation, by regulating subsurface water, by planning efficient farmsteads with good houses and other buildings, by efficient field arrangements, and by good techniques of farm management.[38] According to the evidence set forth in the publication of Oklahoma station only some of the above research emphases were implemented by the agricultural engineers at Stillwater.

One group in southern Oklahoma began a program in 1955 to speed research in all fields in their particular area of the state. This organization, the Samuel Roberts Noble Foundation, Incorporated, established a facility two miles from Ardmore on U. S. Highway 70 to conduct research in cooperation with the Oklahoma station. Research centered around several experimental farms in the area. As a result of these efforts the staff published a number of miscellaneous circulars and other publications.[39] The foundation used three experimental farms in the 1950's to obtain information for local use.[40]

The Stillwater station meanwhile spread its research effort around the state at nineteen other locations. The total acreage as of February,

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[38]H. F. McColly and J. W. Martin, Introduction to Agricultural Engineering (New York, 1955), pp. 4-5.

[39]The Samuel Roberts Noble Foundation, Inc., Circular No. 3 [n.d.], [n.p.].

[40]The Samuel Roberts Noble Foundation, Inc., Miscellaneous Publication No. 2 (1955), p. 1.

1956 amounted to 23,000, a considerable expansion from the original 200 acres.[41] The Coalgate station's 580 acres had been divided into twenty-six pastures of various sizes which were used principally for soil fertility studies to determine the most practical and efficient means to fertilize improved pastures. A herd of 169 yearling steers were used in a number of investigations of pasture size and production.[42] At Stillwater and other locations the staff was engaged in 278 projects representing some twenty-one areas of farming, with the result that farm income had been raised through scientific production and related research.[43] Although no large amounts of information appeared concerning research with wheat, investigations of various sorts continued to be devoted to this major Oklahoma crop. In the nation wheat production in 1956 contributed 7.3 percent of the value of all farm products and amounted to seventy percent of the food grain group.[44] Wheat production was most important to the numerous authorities who were concerned with the "population explosion" and its effect on future food supply. With the increasing United States population in 1956 of 10,000 a day, some suggested that research would be continually needed to maintain the 3,000-calorie diet in the future. Conversion of new land would not keep food supply in balance with the new population indefinitely, and thus

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[41]"Research System in its 65th Year of Science Serving Agriculture," _A. & M. College Magazine_, XXXVII (February, 1956), p. 29.

[42]O.A.E.S., _Mimeographed Circular_ No. 279 (1956), p. 18.

[43]Oklahoma State Regents for Higher Education, _Biennial Report, 1954-1956_, p. 14.

[44]John D. Black and James T. Bonnen, _A Balanced United States Agriculture in 1956_ (Washington, 1956), p. 15.

more information would be needed for increasing crop yields, improving the utilization of feeds, and the more efficient marketing of agricultural products.[45]

The Later Fifties

During the 1956-1958 biennium Oklahoma farmers were more interested in practical solutions to immediate farming problems in the state than concerned for future needs. Support from the state would arise for specific research areas, while the increasing spread of prosperity would create a trend away from support for research dealing with the larger issues of rural life and with coordinated activities for future production in the nation. In a speech in 1957 one researcher suggested some of the problems and their possible solutions; modernization, and transitional problems indirectly related to actual production but directly related to rural welfare were among these projects. The social changes affecting the political position of the farmer were suggested as problems for researchers and for those who made contact with individual farmers. Some of these changes in 1957 were: (1) functional and geographic organization of farm commodity producers; (2) rising importance of the individual farmer as a result of declining numbers of farms and the increase in farm size; (3) farm people's claim to higher educational and cultural attainments than the national average; (4) rising status of women -- in political positions, in the home, in the local economic groups -- which affected the farm situation; (5) improved

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[45]Louis B. Howard, "Universities and Experiment Stations Serve Three Main Purposes," Chemurgic Digest, XV (1956), pp. 16-17.

means of communication and contact with mass media; (6) farm block pressure in government agencies; (7) farmers' closer alliance with an organized market; and (8) population shifts which placed agriculture in a more strategic position.[46]

The breakdown of use of funds further illustrated the general lack of basic research, especially in the area of the social sciences. In 1952 the National Science Foundation estimated that state station expenditures for basic research were distributed among the large fields thus twenty-three percent life sciences, thirty-five percent physical sciences, and sixteen percent social sciences. The average total of station funds for basic research was twenty-three percent, while seventy-seven percent was concentrated on applied research and a small percentage on development.[47] This was not to suggest that the stations had provided insufficient help to agriculture, but that significant breakthroughs requiring several years of basic research had been thus slowed in their materializing. However, not only had agricultural experiment stations provided great assistance to agriculture, but they had also provided scientific service on many fronts and had contributed to the broad advancement of knowledge. Such research achievements as streptomycin and dicumarol were great aids to progress in the science of medicine.[48] The stations were concerned about the effectiveness of

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[46]Otis D. Duncan, "The Political Position of Agriculture," Outline of an address before the Oklahoma Cooperative Council, Enid, Oklahoma, May 3, 1957, p. 3.

[47]H. C. Knoblauch, "Basic Research at State Stations, Twenty-two Percent of Federal-grant Payment to State Agricultural Experiment Stations Support Basic Science," Science, CXXX (1959), p. 1640.

[48]Ibid.

their research, and after 1957 thirty-three stations introduced the procedure of a comprehensive review to help evaluate and improve their research. This operation utilized intensive inquiry by resident staff members and outside consultants into a selected area of the station's work.[49]

Activities at the Oklahoma station in 1957 meanwhile involved two hundred research scientists working with three hundred projects. The station was organized for continuing long-term service regardless of the percentage of effort in "pure" research. New varieties of vegetables, grain crops, and pecans were of immediate economic value to Oklahoma farmers.[50] The new seedbed for cotton that eliminated replanting amounted to $1,312,000 in savings per year for Oklahoma cotton producers. The reduction of feed requirement by five percent added another $125,000 in savings per year. Improved varieties of cotton added $1,850,000 in annual income. The use of a method of applying insecticides by means of a rubbing post provided an annual saving of $360,000. An estimate of the value of increased beef production through use of improved pasture was $23,920,000 per year. Boar selection methods had added $96,000 in increased production of hogs.[51]

Accomplishments continued in 1958 with added staff and expanded operations. The agricultural economics staff had increased from twelve in 1954 to twenty in 1956 and to twenty-six in 1958.[52] A department of

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[49]T. S. Ronningen, "Comprehensive Reviews of State Station Research," Agronomy Journal, LIII (1961), p. 23.

[50]O.A.E.S., Agricultural Research in Oklahoma [c. 1957, not classified], pp. 3-7.

[51]Ibid., pp. 6-7.

[52]O.A.E.S., Biennial Report, 1956-1958, p. 3.

radio isotopes and radiation laboratory with one member enlarged the program. The department of agricultural chemistry research became biochemistry, with a staff of eleven.[53] The agronomy department reached a total of forty-two staff members by June of 1958.[54] Research funds in veterinary medicine were used for a three-fold purpose, first, to develop new factual information in the field; second, to train junior staff members; and, third, to give graduate students experience in research methods.[55] At Fort Supply the Experimental Range area of 4,300 acres had obtained a number of improvements by October 1, 1958. This phase of the cooperative efforts had a crew of six, seventy pastures fenced by sixty-five miles of fence, sixteen windmills, sixteen corral systems, modern living quarters for a full-time range rider, three sets of stock weighing scales, three scale houses, and three barns.[56]

The activities of such special stations and the main state stations across the United States in 1958 were supported by funds from various sources. The percentage distribution of funds in that year for research at all state stations was broken down thus: of the total $122.3 million, twenty-four percent came from the department of agriculture, four percent came from other federal sources, three percent came from other non-federal sources, five percent came from industry, and sixty-four

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[53] Ibid., p. 4.

[54] Ibid., pp. 3-4.

[55] Oklahoma State Regents for Higher Education, Biennial Report, 1956-1958, p. 19.

[56] U.S.D.A., Woodward, Tour Bulletin Second Annual Woodward Field Day, October 1, 1958, p. 5.

percent came from state and local governments.[57]

The general picture of agriculture in Oklahoma in 1959 was quite good, and research continued its emphasis in the areas of major production at Stillwater, the Perkins Farm, Woodward, and various special stations. Since 1940 the number of farms in Oklahoma had declined from 180,000 to 95,000. Acreage remained almost the same, with 34,803,000 acres in 1940 and 35,800,000 in 1959. The resulting increase in average size of farms, from 253 to 378, reflected a healthy progress to obtaining a more efficient operation and an adequate level of living.[58] The largest number of farms in 1959 was in the range of 260 to 499 acres.[59] By the 1959 figures the largest number of farms by value of products sold was in the category of $2,500 to $4,999 of production.[60] The average value of Oklahoma farms rose from $13,016 in 1950 to $31,710 in 1959.[61] The value of cash grain produced in 1959 on commercial farms (a farm where fifty percent of sales was off one product) was $14,817,000; that of cotton was $5,384,000; that of other field crops was $1,418,000; that of dairying was $4,676,000; vegetables $149,000; fruit and nuts $146,000; poultry $779,000; livestock $23,222,000; and general $6,036,000.[62] The total of all farm products sold from all farms was $580,735,000. Of the value of groups of

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[57]National Science Foundation, Reviews of Data on Research and Development, No. 25 (1961), p. 1.

[58]Statistical Abstract of the United States, 1964, p. 611.

[59]Ibid., p. 612.

[60]Ibid., p. 613.

[61]Ibid., p. 614.

[62]Ibid., p. 616.

commodities field crops amounted to $239,858,000; vegetables were worth $2,217,000; fruits and nuts grossed $1,811,000; horticultural specialties and forest products amounted to $6,627,000; dairy products netted $43,032,000; poultry and poultry products amounted to $14,851,000; and livestock surpassed all with $272,237,000.[63] Production acreage figures of various crops were also changing in 1959. The 660,000 acres of cotton was a reduction from the one million acres of 1953. The five million acres of wheat was a one million acre reduction from 1954. Grain sorghums and small grains had increased over their acreage of the 1945-1954 period. Pasture acreage had increased nearly one million acres over the average annual acreages of the 1945-1954 years.[64] These figures reflected in part the results of research and also indicated direction and emphasis in future research activities of the station.

One activity of great importance to wheat production had been the continuous cultivation research on the Magruder plots at Stillwater. The plot of 1.25 acres had first been planted in the fall of 1892. In 1896 the plot was divided in half; from 1892 to 1898 no fertilizer was used, while in 1896 the north and south plots were examined to determine the soil variability by yield. From 1899 through 1929 the south half was fertilized with barnyard manure, the north plot being left unfertilized. Just before the planting of the 1926-1927 wheat crop, each half was divided into five plots, and then individual yields were taken on each of the ten plots during 1927, 1928, and 1929 to determine the soil variability. In 1930 the ten plots received varying amounts of

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[63]Ibid., p. 617.

[64]W. B. Back, "Recent Trends in Oklahoma's Agriculture," Oklahoma Current Farm Economics, XXXLV (1961), p. 9.

fertilization. Unfortunately, in 1933 a hundred-foot strip along the east end of the plots went in the construction site for Murray Hall.[65] Construction of Stout Hall led to the removal of the remaining portion. During the summer of 1947 the surface and sub-surface soils from plots 3,6,7,8,9, and 10 were moved to the agronomy farm approximately one mile to the west, as previously discussed. Bulldozers were used to remove the top eight inches of soil from an area one hundred feet long near the center of each plot. The sub-surface soil, eight to sixteen inches, was then removed and placed in prepared trenches in an east-west direction. These hundred-foot trenches were seventeen and a half feet wide and sixteen inches deep, with a four foot strip of undisturbed soil as a border. The sub-surface soil was then placed in the trench and leveled, and surface soil was placed on top. The earth under the sub-soil was very much like that of the reddish clay of the original plot.[66] The research information gained from the continuous culture, variety trials, fertilization studies, and soil analyses was of significant value for general wheat culture, but also as consummate research information to aid in soil improvement and soil conservation on wheat land types of farms. This was one example of the utilization of information from a continuous research project. The data collected in earlier years could be applied in experiments with new varieties under new circumstances and varying conditions.

Research at the various special stations in 1959 followed patterns similar to those at Stillwater. The research at Woodward included

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[65]O.A.E.S., Bulletin No. 53 (1959), pp. 5-6.

[66]Ibid., pp. 10-11.

studies of soil fertility, soil moisture, cultural practices with wheat and sorghums, growing of trees and shrubs for homestead beautification and windbreak development, breeding and improvement of forage and grain sorghums, grass breeding and grass-seed production, and the improvement of native rangelands being grazed by beef cattle.[67] This research was an attempt to solve some of the Woodward area's major problems, including drought, high winds, low and variable crop production, severe wind and water erosion, low fertility, inefficient size of farms and ranches, and unprotected abandoned land which had formerly been cultivated. The ultimate objectives in addition to the solution of the above problems were lowered production costs, increased efficiency of production, and increased use of agricultural products and its by-products.[68]

Research in horticulture at Stillwater and at the special stations had made a number of important accomplishments during the 1950's. As reported in 1959, the three varieties of sweet potatoes developed by the horticulturalists had gained wide acceptance in the state. The Allgold, which in 1950 was planted on nine percent of the acreage, by 1952 had increased to thirty-eight percent. With the addition of the Redgold and Nemagold, introduced in 1954, these varieties reached 91 percent of the sweet potato acreage by 1958.[69] At Bixby in 1959 investigations in addition to the problems of vegetable and small fruit production included studies of rotation and fertilization in regard to tomatoes, sweet corn, cabbage, and green beans; and variety tests and cover crop

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[67]Southern Great Plains Field Station, Woodward, Summaries of Talks First Biennial Technicians Field Day, November 5-6, 1959, p. 1.

[68]Ibid.

[69]O.A.E.S., Farm Research Flashes, March, 1959, p. 1.

trials on other areas of the station.[70] Efforts at the Kiamichi Field Station were devoted to studying production problems of fruits and vegetables in southeast Oklahoma. One objective was to gain increased quality and yields by use of a good soil fertility program. Some work was proceeding with grafting improved pecans on native stock and with a modest pasture improvement study. All research had to take into consideration the forty-four inches annual rainfall and the gently sloping well-drained soils at the station.[71]

In agronomy the hub of all activities was the coordinated operation of the agronomy farm at Stillwater and the farm at Perkins. The two hundred-acre agronomy farm contained a number of permanent plots of approximately five acres each, which were used for investigations with major field crops and pasture grasses.[72] Of the 640 acres at the Perkins Farm 295 acres were used for agronomic research. Here investigations involved variety testing, rotation studies, and yield response to fertilizer applied at different rates and dates. The 295 acres were divided into a number of long narrow plots of about four acres each going east and west.[73] The 140 acres in the southeast corner contained the poultry research area, and a small oak woodlot separated the agronomy and poultry areas. Horticultural activities absorbed 205 acres in the northeastern corner of the farm. Research in horticulture revolved around efforts with apples, peaches, grapes, pecans, and walnuts, and

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[70] O.A.E.S., Processed Series No. 332 (1959), p. 1.

[71] O.A.E.S., Processed Series No. 325 (1959), p. 1.

[72] O.A.E.S., Processed Series No. 315 (1959), p. 1.

[73] O.A.E.S., Processed Series No. 315A (1959), p. 1.

the selection of the most promising varieties. Poultry research at this location involved breeding and feeding of turkeys, and the development of summer ranges such as those with bermuda grass mixtures and sown crops. Facilities in addition to various sheds and roosting buildings included several permanently fenced ranges of approximately three acres each.[74] Meanwhile research efforts at two special stations added to the total program. Activities in 1959 at the Southwest Cotton Substation near Tipton involved alfalfa in rotation with cotton, variety tests, and experiments with improved strains of cotton, with irrigation of cotton the chief project for the year.[75] At the 110-acre South Eastern Soil Improvement Station the emphasis remained on soil improvement for the production of pasture crops and the testing of pasture crop varieties.[76]

In 1960 the most publicized research activity at a special station was that at the Oklahoma Peanut Research Station, located two and a half miles north of Stratford. Investigations on these seventy acres concentrated on problems with peanuts, such as varieties, fertilizers, cropping systems, rotations, tillage, diseases, and the like. Some investigations were also conducted with other crops, such as soybeans, grain sorghums, cowpeas, mungbeans, wheat, oats, corn, castor beans, and alfalfa. To facilitate these activities thirty-seven large plots provided the necessary divisions.[77]

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[74]Ibid.

[75]O.A.E.S., Processed Series No. 335 (1959), p. 1.

[76]O.A.E.S., Processed Series No. 323 (1959), pp. 1-2.

[77]O.A.E.S., Processed Series No. 352 (1960), p. 1.

Two other areas of research that achieved recognition in 1960 were wheat and poultry. The general areas of research with wheat around the state included the breeding of improved varieties, improved milling and qualities, improving production and management methods, and marketing. However, the "principal aim of the research program" was declared to be "to make the jobs of producing, handling, and marketing wheat more efficient and less costly."[78] In poultry research efforts were centered on management practices which best conserved high quality in eggs.[79] The poultry husbandry department became poultry science during the 1958-1960 biennium, and the editorial department changed to that of public information, with nine members on the staff.[80]

1960 — Year for Evaluation

Reports of specific research activities were very much in the background in 1960, since evaluations of changes of agriculture in general and research efforts during the past decade or two, or even the last fifty years, received the largest amount of national publicity. One such assessment indicated the interest of 1960, pointing out that the total agricultural output since 1940 had increased by more than a half. Meanwhile the number of farm laborers had declined by one-third, and the output per man-hour had doubled. These factors were significant for the change to total rural research, since surplus labor and

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[78]O.A.E.S., Wheat Research and Education in Oklahoma [Unclassified publication, n.d. 1960?], p. 3.

[79]O.A.E.S., Farm Research Oklahoma's Road to Progress [Unclassified publication, n.d.], p. 4.

[80]O.A.E.S., Biennial Report, 1958-1960, p. 3.

inefficiency were two important economic and sociological aspects involved. Advances in technology since 1920 together with agricultural research were the keys to continued progress in agriculture.[81] Although farmers preferred research in higher yields, consumers benefited more through lower food costs.[82] On the farm and in the farm home the work load was lightened through the technological advances in agriculture.[83]

However, despite these improvements farm children failed to gain an advance in educational opportunities. In 1960 the estimated proportion of five-year-olds attending kindergarten was sixty-six percent for urban areas and only twenty-four percent for the farm children.[84] "It is a tragic fact that the training programs available to rural youths in school continue to be generally unrealistic," one observer wrote. This problem was further emphasized by the fact that, although only 8.1 percent of the nation's labor force was engaged in farming and only 3.0 percent of all personal income was derived from farming, 36 percent of the nation's vocational funds were spent on vocational agriculture.[86]

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[81]Byron T. Shaw, "Research Planning and Control in the United States Department of Agriculture: The Experience of an Old and Well-Established Research Agency," Annals of the American Academy of Political and Social Science, CCCXXVII (January, 1960), p. 96.

[82]Carroll P. Streeter, "Eight Myths about the Farm Situation," The Reader's Digest, LXXVII (August, 1960), p. 142.

[83]Committee on Research Evaluation, Agricultural Research Service, An Evaluation of Agricultural Research - U. S. Department of Agriculture Miscellaneous Publication No. 816 (Washington, 1960), p. 7.

[84]Annabelle Desmond, "The American Farmer," Population Bulletin, XIX (1963), pp. 70-71.

[85]Ibid., p. 77.

[86]Ibid.

The maintenance of a relatively large number of small high schools, each with a vocational agriculture program and the necessary equipment, was declared to be a great waste in view of the nature of industrial society. Improvement in education was further limited by inertia and the lower level of educational attainment by rural people, especially in Oklahoma. The median years of education for people of 25 years and older in 1960 was 8.8 years for farm individuals, 9.5 years for rural non-farm adults, and 11.1 years for urban adults. In the 1950's, the median for urban people rose by 0.9 years, but for farm people it rose only 0.4.[87] Problems of education were complicated by the high fertility range of farm women who had an average of 3.33 children compared to the national average of 2.46 children.[88]

Another economic problem that needed further investigation was the rural home. With increasing specialization, the amount of individual farm-produced products for home consumption declined. This fact further aggravated the family income situation and the greater imbalance between urban and farm living. The average income for urban families was $6,166 in 1960, as compared to $3,228 for farm families.[89] To yield an annual income of $3,500 from farming, an average current investment of $73,000 was required. For a $5,500 income, an investment of $111,000 was required. $10,000 worth of products had to be sold to net a $2,500 income.[90] The ever-expanding problem of surpluses further reduced the

[87]Ibid., p. 69.

[88]Ibid., p. 67.

[89]Ibid., p. 71.

[90]Ibid., p. 62.

income of the small farmer, despite the fact that 12.5 million acres of cropland acres had been diverted to other uses (suburbs, highways, and airports) since 1945, while the "soil bank" program removed an added 25 million acres from cultivation.[91]

The large increase of the general population, from 132 million in 1940 to 180 million in 1960, and the decrease of the farm population from 30.5 million to 15.6 during the same years, failed to alleviate the situation for farmers. In fact, the farmer's share of the national income declined from seven percent to three percent between 1940 and 1960, while the net national income increased about five times, $82 billion to $416 billion.[92] The incredible efficiency of United States agriculture was creating problems for agriculture itself despite the rapid decline in farm population. In 1961 each farm worker supported 27.4 consumers. This achievement was more than three times the 7.0 people supported in 1900.[93]

The efficiency and productivity of American agriculture can be largely attributed to the century-old public-supported agricultural research program.[94] In more than half of the research programs the Department of Agriculture and the state experiment stations cooperated formally, but in others they cooperated informally. The 8,400 researchers at state agricultural experiment stations conducted about three-fifths of the research undertaken in the state and national programs,

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[91]Ibid., p. 63.

[92]Ibid., p. 53.

[93]Ibid.

[94]Shaw, "Research Planning and Control," p. 96.

and seventy-eight percent of research was paid for by state funds.[95] Thus the federally-originated program had become a predominantly state-supported program for the general benefit of agriculture in the individual states.

As changes occurred in agriculture and in the national economy, so changes came in the objectives of agricultural research. The fields of research beame more involved and more inclusive of all aspects of rural society. In addition, research also spread into raw products and processing industries, distribution techniques, and even the merchandising quality of farm-originated products. On the other hand, agricultural research had been of increasing interest to industry, both with the increased use by farmers of machinery, fertilizers, and pesticides and with the new uses to which industry had put agricultural crops and by-products.[96]

Accordingly a good agricultural research program would have to include the needs for new and more efficient technology, and would have to anticipate these changes before they emerged.[97] A specific list of procedures which would illustrate the thinking that would influence research in agricultural economics at Stillwater included: to obtain information on consumer needs, wants, and preferences; to overcome obstacles to profitable adjustments of supply and demand by providing technical and economic guides; to improve product quality by creating standards through improved production, processing, grading, marketing, and

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[95]Ibid., p. 97.

[96]Committee on Research Evaluation, An Evaluation of Agricultural Research, p. 13.

[97]Ibid., p. 8.

household practices; and to determine effects of broad agricultural policies and programs.[98] These objectives were in line with the philosophy of the Agricultural Research and Marketing Act of 1946. The expansion of the staff in agricultural economics was an indication of support for most of thses objectives, while at the same time the lack of support for programs suggested by the Purnell Act and the Bankhead-Jones Act in the area of rural sociology and home economics led to the phasing out of much research activity in these fields. The problems of the farm home were examined in relation to which economic changes would bring about solutions. The decline in real income of farmers was investigated, in relationship to such problems as improved quality of farm products, improved efficiency of farm production, and wider uses for farm products, especially in industry.[99]

The work and achievements of the agricultural experiment stations were slow to affect farming operations because of the five step process leading to the use of a new method, variety, or implement. First came awareness, information of the existence of a new idea, product or practice, a step which came to some farmers before others. Interest came second, a desire to seek extensive and detailed information about a concept and then to determine its possible usefulness and applicability. Third came evaluation, relating the acquired information to existing conditions which the practice would have to fit. Trial came fourth, an attempted use of the practice or idea, with acquiring of information

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[98]Ibid., pp. 3-4.

[99]Shaw, "Research Planning and Control," pp. 96-97.

on how to implement it. Fifth came adoption, the full acceptance and inclusion of the practice into the normal procedures of operations.[100]

In Oklahoma these steps came even slower due to the diversity of farming types, adverse climatic factors, reduced utilization of news media and communication, the lack of participation in farming organizations, and the lower level of education. Since 1891 agriculture in Oklahoma had progressed from single one-horse plows to deep-plowing heavy caterpillar-drawn plows and multiple cutivators; from wheat production of ten bushels an acre to twnety bushels; and from the two-year production steers to "finish" calves in from six to eight months. The various sub-stations represented the sixteen major types of farming in Oklahoma.[101] The varied farming opportunities in Oklahoma provided the basis for the farm research program of the station. The Oklahoma station had the responsibility to recognize and study the needs of agricultural producers, marketing agencies, and consumers throughout the state. In most cases the station was assuming this responsibility with a considerable perseverance.

In normal practice research at Stillwater usually extended beyond one department to combined research with staff members from various departments. The investigator's objective determined the size and scope of any research undertaking. A project might begin in a laboratory and then progress through field trials which simulate farm conditions, but in other cases both steps might be done simultaneously. Research

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[100] Herbert D. Lionberger, Adoption of New Ideas and Practices (Ames, Iowa, c. 1960), pp. 3-4.

[101] O.A.E.S., Farm Research Oklahoma's Road to Progress in Agriculture /Unclassified publication, n.d./, pp. 1-3.

on a given project might be undertaken in several parts of the state, as in the case of crop variety trials, where a dozen or more locations might be selected to test the performance of a new prospective variety. The same was true in animal husbandry, where research looked for answers to the question of why animals performed differently in different parts of the state. Cooperative research projects in conjunction with the U. S. Department of Agriculture, those with other states, and those conducted as regional projects, not only speeded up research processes and added to the usefulness of the results achieved, but also allowed the Oklahoma personnel to exchange ideas and information, and thus added to the total information available to Oklahoma farmers. Research projects varied in elapsed time, with some extending over years, other proceeding month by month or week by week.

Farm research has been best evaluated by comparing current farming operations with those of the past. Practically all farmers in 1960 were using new crops, new equipment, and new farming practices developed out of research. In one five-year period alone the Oklahoma station released sixteen new crop varieties and four grass varieties.[102] The outstanding contributions of the Oklahoma station, as listed in the Tenth Biennial Report of the Oklahoma State Regents for Higher Education, were plant and animal breeding, animal nutrition, insect and disease control, fertilizers, farm engineering, and range and pasture management.[103] The Goldenred peach was released by the station in 1958 and by 1960 had a good acceptance by producers in the state. One

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[102]Ibid., p. 5.

[103]Oklahoma State Regents for Higher Education, Biennial Report, 1958-1960, p. 19.

commercial orchard operator had planted more than 5,000 of these trees. This variety had the advantages of not requiring fruit trimming and had fewer bud losses in early spring. Other prime characteristics were good yield, excellent consumer appeal, superior flavor, ripening at mid-season, resistance to bacterial spot, and greater winter hardiness than the Elberta.[104] Breeding trials with new lines of tomatoes illustrated that improved yields were possible. Trials in 1958 showed that adapted breeding lines exceeded production of the best commercial varieties by thirty percent at Bixby, forty-six percent at Idabel and sixty-five percent at Blair.[105] However, in many cases results of such research were not passed on in published form, but were given directly to college students, to farmers attending field days, to extension specialists who worked directly with researchers, and to farm organizations and individual farm leaders.

The Early Sixties

Perhaps direct distribution of research results was a factor in the small amount of published literature giving a narration of activities during 1961 and 1962. What accounts did appear mostly emphasized methods used to achieve a given project goal. Research publications in agronomy were the most numerous of any field during both the 1950's and 1960's, with their publication numbers almost tripling those of agricultural economics, the department with the next highest number of station publications. Horticultural publications were next in numbers.

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[104]O.A.E.S., Oklahoma Farm Research Flashes, July, 1960, p. 1.

[105]Ibid., p. 2.

Horticultural research in 1961 continued efforts with flowers, fruits, nursery plants, nuts, and vegetables. Other activities involved problems of growing, grading, packing, storing, shipping, and selling.[106] Horticulutral study was becoming more sophisticated, with a number of specialized fields, each with a technical name. Fruit production became pomology; vegetable growing appeared as clericulture; flower growing arose as floriculture; and the use of trees, shrubs, and flowers became landscape gardening. Horticultural production became divided between fruit crops and truck crops or vegetable crops.

Meanwhile general economic problems hindered progress in the state. Despite the advance in technology, the returns from agricultural labor, as suggested by agricultural economists in 1961, were significantly less than from other forms of labor, yet the national average capital investment per agricultural worker ($21,300) exceeded the capital investment per worker in industry ($15,900) by thirty-four percent.[107] The elimination of waste in the capital investment of agricultural production was one of the special areas of research in agricultural engineering. The staff in this field were especially active with the mechanical problems of cotton production. Special areas of attention were mechanical methods of seedbed preparation, techniques of planting with the newly perfected plateau profile planter, further development of the cotton

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[106]O.A.E.S., _A Program for Research in Horticulture at the Oklahoma Agricultural Experiment Station_ /Unclassified publication, June, 1961/, p. 2.

[107]James S. Plaxico and John W. Goodwin, "Minimum Land and Capital Required for Farmers to Earn an Average Factory Wage," _Agricultural Policy Review_, I (April - June, 1961), p. 16.

stripper and evaluation of ginning methods and equipment.[108]

It was apparent that in the above areas of investigations as well as in the total program, the Oklahoma Agricultural Experiment Station was performing satisfactorily in 1961. A visitation committee sponsored by the Agricultural Board of the National Research Council of the National Academy of Sciences made an examination of the Experiment Station and Extension Service in 1961. This group stated: "It is apparent that Oklahoma State University has assembled and maintained a competent staff in both [the Experiment Station and the Extension Service]."[109] Of the research program the committee suggested:

> Much research under way is practical and directed to the solution of major problems, yet there is an awareness of the need for fundamental research, of which considerable is being conducted. With limited present resources, the Experiment Station is unable to appreciably enhance its store of fundamental knowledge. This is unfortunate in view of the fact that among its faculty are people emiently qualified for basic research.[110]

To remove these various inadequacies the committee recommended certain changes in the research program. The station should make a substantial shift toward animal agriculture, especially a move that would place greater emphasis on programs to utilize surplus Oklahoma feed grain crops within the state in the finishing of livestock. It further suggested that a stronger emphasis be placed on quality, particularly in wheat and cotton research; greater interest in the use of wheat as a

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[108]Oklahoma State University, Division of Agriculture, Cotton Newsletter, No. 21 (February, 1961), pp. 5-6.

[109]O.A.E.S., Report of the Visitation Committee on Appraisal of the Agricultural Experiment Station and Agricultural Extension Service Oklahoma State University (Unclassified publication, December, 1961), p. 5.

[110]Ibid.

forage crop; and more attention toward marketing problems.[111]

Regardless of the suggestion that research operations should emphasize animal production to a larger extent, investigation in the broad field of agronomy predominated in 1962. While agricultural economists clearly outlined research objectives for the solution of many of the broad economic problems in agriculture in 1960, an agronomist examined the problems and techniques of field plot experiments and gave an indication of the trends in agronomic research. Field experiments normally involved tests of crop varieties, cultural practices, use of fertilizers and pesticides, crop rotations, pasture development, and perennial crop experiments. Some of the other interests included methods of plowing, time of plowing, seedbed preparation, yield responses, dates of planting, and treated and non-treated seeds.[112] Such procedures were typical of those conducted at Stillwater and at the special stations. Every strain or variety of plant would necessitate experiments with all of these factors to discover adaptability for local use as well as the most effective cultural factors.

In agronomy as well as in other fields, one of the most pressing problems has been the attempt to maintain an effective balance between applied and basic research. Many times a very simple problem required a considerable amount of initial basic investigation.[113] To attain valid results, a definite scientific procedure needed to be followed.[114]

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[111]Ibid., p. 7.

[112]Edwin L. Le Clerg, <u>Field Plot Technique</u> (Minneapolis, 1962), p. 17.

[113]Ibid., p. 111.

[114]Ibid., p. 4.

An outline of effective methods of research included:

(A) A clear statement of the problem to be solved.

(B) The formation of a trial hypothesis.

(C) A careful and logical analysis of the hypothesis, i.e., elaboration of its implications. These frequently take the form of predictions.

(D) Provision for the observations necessary to complete the test of the hypothesis. This involves a detailed outline of the experiment; equipment, costs, and methods. It also involves the design of the experiment. The factors should be expressed in precise quantitative terms when possible.

(E) Reduction of the personal equation to the minimum.

(F) Rigorous and exact experimental procedure with the collection of data pertinent to the subject.

(G) Statistical analysis of the data.

(H) Sound and logical reasoning as to how the observations bear on the trial hypothesis and in the formulation of generalizations. Statement of the exact conclusions warranted from the cases examined should be made as precise as possible.

(I) A complete and careful report of data and methods of analysis so that other investigators can verify them.[115]

In the past such clear steps were not always taken in research, and a number of defects frequently appeared. These included broad, indefinite proposals; disregarding of previous investigations; failure to utilize scientific methods essential for good experimental procedures; and use of inadequate initial procedures.[116] However, when planning and procedures followed scientific practices, great accomplishments were made through the project method. Therein, when an able leader for a

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[115]Ibid., p. 16.

[116]Ibid., p. 3.

given project was available, the ultimate realization would be coordination, continuity, and results.[117] It appeared that the most important contributions from agricultural research in the future would come from well planned, coordinated projects rather than from isolated unrelated projects.[118] Further attention at the respective state stations should be given to the problem of individual differences among researchers, especially in areas of subjective evaluation.[119] The trends in agronomic research included changes in the design of experiments, long-time projects, regional cooperation, and more basic research.[120]

Activities in agronomy seemed to have been the most popular topic for discussion in the publications reporting activities of the station in 1962. Research in the various aspects of cotton produced the most interest, which was warranted by the $51,156,000 value for the nation's 1962 cotton and cottonseed production.[121] Some of the objectives of cotton mechanization research at the Oklahoma station included methods to reduce the cost and to improve the effectiveness of machines in procedures for seedbed preparation, to improve effectiveness of machines, to provide better methods of seed grading, and to produce means for controlling the movement of moisture, heat, and gas in the seedbed as an aid to stand establishment. Other problems with cotton involved weed control after "layby", reduced costs of the planter components, improved

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[117]Ibid., p. 4.

[118]Ibid., p. 3.

[119]Ibid., p. 15.

[120]Ibid., p. 4.

[121]Statistical Abstract, 1964, p. 663.

effectiveness of harvester cleaning-conveying systems, cost and effectiveness of stripper rolls used in harvesting irrigated cotton, and improved efficiency and effectiveness of ginning equipment for processing machine-harvested cotton.[122]

Agronomists at Stillwater suggested that further research with cotton was needed to increase yield and at the same time to cut costs per given yield; to improve quality in an effort to compete more effectively with artificial fibers and foreign production; and to gain more information concerning the best methods for producing irrigated cotton.[123] This latter was an example of the general purpose of the station staff to develop technology required to achieve the maximum potential of new wealth from Oklahoma's farms and ranches.[124]

The main research efforts of the Oklahoma Experiment Station meanwhile were summarized in the Agricultural Handbook for 1962 as investigation of sorghum and broomcorn production, breeding, and genetic studies; wheat and barley production and breeding; wheat genetic studies; wheat diseases; cotton breeding and genetic studies; cotton physiology; weed control; grass improvement; forage seed; peanut and guar; and castor bean production and breeding.[125]

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[122]Oklahoma State University, Division of Agriculture, Cotton Newsletter No. 22, February, 1962, pp. 6-7.

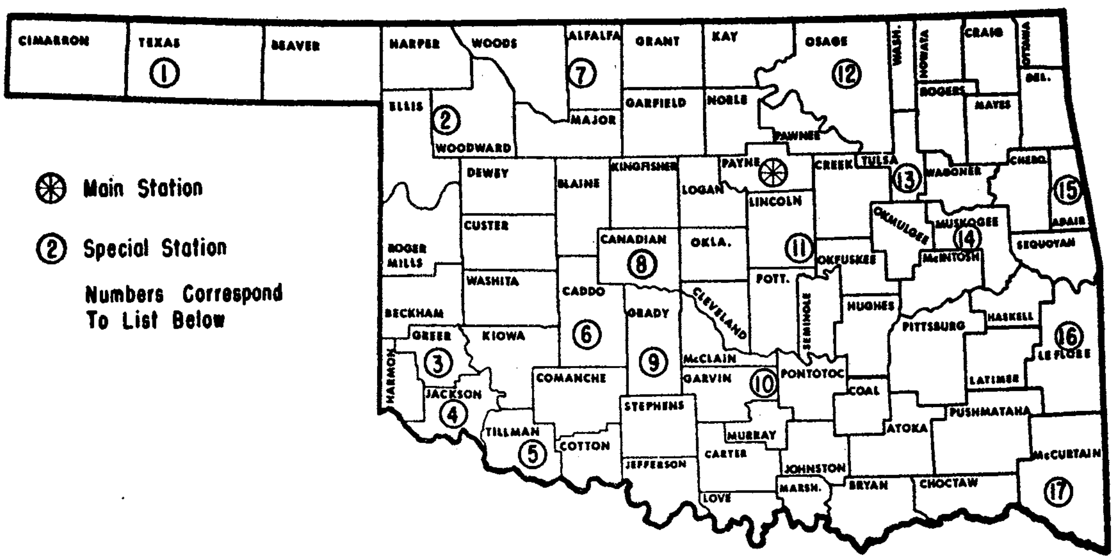
[123]Ibid., pp. 13-16.

[124]Oklahoma State Regents for Higher Education, Biennial Report, 1960-1962, p. 31.

[125]U. S. Department of Agriculture, Directory of Organization and Field Activities of the Department of Agriculture, 1962, Agriculture Handbook No. 76 (Washington, 1962), p. 227.

Oklahoma Agricultural Experiment Station System

Main Station, OKLAHOMA STATE UNIVERSITY, Stillwater



1. Panhandle Experiment Station, Goodwell (Coop. Panhandle A&M)
2. Southern Great Plains Field Station, Woodward (Coop. USDA) 280(o)
3. Sandy Land Research Station, Mangum 320(o)
4. Oklahoma Irrigation Experiment Station, Altus 240(o) and Blair 59(1)
5. Southwest Oklahoma Cotton Station, Tipton 80(1)
6. Caddo Peanut Research Station, Ft. Cobb
7. Wheatland Conservation Experiment Station, Cherokee (Coop. USDA) 320(1)
8. Ft. Reno Experiment Station, El Reno (Coop. USDA) 7,000 partner
9. Oklahoma Cotton Research Station, Chickasha (Coop. USDA) 410(o)
10. Oklahoma Peanut Research Station, Stratford 50(o) 20(1)
11. Oklahoma Pecan Research Station, Sparks 160 permit
12. Veterinary Research Station, Pawhuska 910(o)
13. Oklahoma Vegetable Research Station, Bixby 105(o)
14. Eastern Oklahoma Pasture Station, Muskogee 320(1)
15. Eastern Oklahoma Field Station, Stilwell 140(o)
16. Southeast Oklahoma Soil Improvement Station, Heavener 20(o) 110 permit
17. Kiamichi Field Station, Idabel 160(o)

(o) = owned
(1) = leased

The Concluding Years, 1963-1965

In 1965 research by the station staff was in progress at sixteen special stations, the Perkins Farm, the Agronomy Farm at Stillwater, and at Lake Carl Blackwell. With the progress in technology, plant breeding, and methods of control of insects and diseases, new problems arose with separate implications for agricultural production in each of the farming areas of the state. Activities at each of the stations included those of special importance to the local area and also investigations that were of interest to all areas of the state. Pasture and soil improvement and the culture of alfalfa were examples of this latter research.

The Southern Great Plains Field Station at Woodward provided opportunities for cooperative research in dry land farming. Although dry land cropping was begun here in 1940, other efforts were begun and were then phased out. Horticultural investigations were an area for study for a number of years, but those with fruit trees terminated in 1948, while those with trees and shrubs and with soil and water ended in 1964. Dry land studies have continued with sorghums and cereals, grass breeding, and arid range and pasture maintenance.[126]

At the Sandy Land Research Station at Mangum, meanwhile, efforts centered around dry land farming techniques in the production of cowpeas, wheat, guar, cotton, peanuts, and grain sorghums. During 1964 the staff of four, working at thirteen sites around the state, handled the wheat fertility tests for which the John Deere Company had provided

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[126]Interview with Mr. M. C. Shoop, Range Management Specialist, Southern Great Plains Field Station, Woodward, Oklahoma, January 7, 1965.

the funds. Facilities included two houses, a hay barn, an implement shed and office, and a small granary. Farm implements were leased on a two-year basis, as was the case at practically all the special stations. The 320-acre farm was divided into twenty-acre plots on which experiments were moved around from year to year.[127] Efforts at Mangum were coordinated with those at Altus and Fort Cobb, especially in the use of equipment for preparation of the soil for planting.

At the Oklahoma Irrigation Experiment Station at Altus and Blair the prime duties involved irrigation problems, crop varieties, proper fertilization procedures, variety testing, and cropping systems.[128] The 240 acres at Altus served primarily for tests of agronomic crops, while the fifty-nine acres at the station north of Blair provided a location for investigations of horticultural crops under irrigation conditions.

In a farming area producing cotton, wheat, alfalfa, grain sorghum, and forage sorghum, the current research emphases at Altus have included cropping systems, cotton fertility, sorghum varieties, cotton herbicides, control of the bollworm, methods of harvesting irrigated cotton, automatic irrigation, cotton soil erosion, sugar beet varieties, castor bean varieties, soybean varieties, rate and intervals of the irrigation of cotton, irrigation of wheat, small grain trials, and the maintenace of a cotton breeding nursery.[129] Facilities included a recently erected modern house and implement sheds. The 240 acres were farmed in three

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[127]Interview with staff and tour of facilities of the Sandy Land Research Station, Mangum, Oklahoma, January 12, 1965.

[128]Materials prepared by O. H. Williams, November, 1964.

[129]Ibid.

blocks of land. One sixty-acre portion remained under dry land cultivation while the rest was irrigated.

Two of the smaller stations in the general area were those at Blair and at Tipton. The Blair station, located approximately one mile southeast of Quartz Mountain State Park, contained a house, three small sheds, hot beds, and various irrigation equipment. A small herd of beef cattle was grazing on the property in January of 1965.[130] Meanwhile further to the south but in the same general area, research continued at the Southwest Oklahoma Cotton Station near Tipton. This small eighty-acre farm contained a house and hay bran, and was operated by a single foreman with some assistance from the staff at Altus and Mangum. Thirty of the eighty acres had been irrigated, and research has continued primarily with cotton varieties, cotton breeding, and rotations.[131]

Toward the central portion of the state came the special stations at Fort Cobb, Cherokee, Fort Reno, Chickasha, Stratford, and Sparks. The Caddo County Peanut Research Station near Fort Cobb was the newest addition to the list of special stations. It came as a result of requests of growers who wanted more research on irrigated peanut cultivation. The Caddo County Peanut Growers Association arranged in 1963 for the U. S. Bureau of Reclamation to provide sixty acres rent free near the west end of the Fort Cobb dam. The agronomy department of the station then agreed to develop a comprehensive research program on this

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[130]Brief visit at the Horticultural Irrigation Station at Blair, Oklahoma, January 12, 1965.

[131]Brief visit at the Southwest Oklahoma Cotton Station, Tipton, Oklahoma, January 12, 1965.

site, which was two miles west and one mile north of Fort Cobb. Of the sixty acres of sandy loam soils, forty-six acres had been planted in peanuts in 1964; six acres had been planted in peas; and fifty-two acres had been irrigated. Workmen were clearing additional land, and the staff were planning to erect a central building for implements, storage, and office space.[132] Current research with peanuts included seed treatment studies, leafspot control studies, the influence of water stress on yields and quality of peanuts, irrigated plant population study, dryland plant population study, wild peanut species nursery, weed control, insect control, and plant nutrition and fertilization requirements.[133]

The current research at Wheatland Conservation Experiment Station near Cherokee has centered around soil and water investigations; soil fertility; rotation studies; water holding techniques with grass, alfalfa, and wheat; fertilizer studies; and methods of plowing and cultivation.[134] Other specific investigations included variety tests of grain and forage sorghums; nitrogen topdressing study on wheat; rates of phsophate experiment on wheat; rates of nitrogen; clean tilled and stubble mulch tillage practice; grass versus alfalfa; stubble mulch techniques in control of runoff; soil loss from ends of level terraces and erosion between terraces; and weed control.[135]

In January of 1965, 200 acres of the 320-acre station were planted

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[132]Brief visit at the Caddo County Peanut Research Station at Fort Cobb, Oklahoma, January 12, 1965.

[133]Materials prepared by O. H. Williams, November, 1964.

[134]Wheatland Conservation Experiment Station, Annual Report, 1963, p. 2.

[135]Materials prepared by O. H. Williams, November, 1964.

in wheat. Of the 96 plots, one-half were used for runoff measurement. The terrain has provided both A and B classes of slopes. Of the A classification, two-thirds of the plots were on land slopes with some in coninuous wheat cultivation and some in rotation of alfalfa and wheat, and stubble mulch studies had begun in 1955, along with deep plowing experiments. On the more steeply inclined B slopes rotation studies were made with three years in grass and three years in wheat. In this area clean tillage was practiced and no stubble mulch was employed.

A new project underway was a plot spacing 200 feet long with 100 foot horizontal spacings; it was being used to test for soil loss in addition to runoff. Studies were made contrasting stubble mulch versus clean tillage and the use of a concrete gutter with an earth channel. Erosion between the terraces was also being studied in four small plots (eighteen feet wide on 166-foot slope lengths), which were to be used to determine where soil loss started. Other activities at the station in 1965 involved a small grain nursery, a nursery for sorghums and forage crops, trials of bermuda grass, tests of herbicides to control cheat in wheat, rates of residue, rates of nitrogen, rates of fertilization, and placement of phosphates.

Facilities included an office building, an implement storage building, and various other sheds. While all of the sub-stations maintained some meteorological instruments, this station had ninety continuous recording instruments. Rain gauges were found in numerous locations around the 320 acres. The fields contained many terraces and numerous concrete sluices. One state employee and four federal workers provided by the Agricultural Research Service made up the staff for the station.[136]

Moving south to Canadian County, an observer in 1965 found activities at the Fort Reno Experiment Station primarily involved with investigation in animal science. Approximately 1,000 head of cattle provided the basis for research activities that involved breeding and nutritional experiments with cattle and such specialized studies as the cancer of eyes. Of the 6,800 acres, some were in cultivation, some served as experimental plots for native and commercial grasses, and some were large pastures. The station produced its own hay and silage, with hay totaling approximately 40,000 bales a year. The alfalfa hay was produced through methods of flood irrigation. The livestock were consuming sixty tons of feed a week, which was supplied from a five-year-old feed mill with a capacity of 700,000 bushels.

To maintain this operation thirty-three full-time employees were required. Although much of the corral system from the previous remount operation could be utilized, a considerable amount of World War II surplus materials such as aircraft landing mats had been adapted to meet special stock pen requirements.

Three cows remained from the "650 Herd" which at one time had consisted of 120 cows used in tests of feeding and production of calves. Certain characteristics were found in one cow that were superior to others in size, weight, and gain of calves produced over a period of eighteen years. Investigations with sheep and hogs had been other secondary activities at the station. Attempts had been made to encourage

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[136]Tour and interview with Eldon Greer, Station Superintendent, Wheatland Conservation Experiment Station, Cherokee, Oklahoma, January 7, 1965.

the greater production of sheep through providing more efficient handling methods and doubling the yearly crop of lambs.[137] The station had provided a fully equipped facility readily adaptable for research with cattle on a large scale and at a relatively small cost.

At the Oklahoma Cotton Research Station near Chickasha, research activities recently have centered around the efforts of the cotton specialist in agronomy and agricultural engineering. This sub-station has been one of the largest in Oklahoma and one of the leading cotton research stations in the entire cotton belt. The 427 acres in 1965 were composed of 88 acres located in the Washita river overflow bottom and 339 acres on the terrace border of this river. While the terrace soils have been used for experimental work, the bottom land has been used for bermuda grass and small grain pasture. With the construction of the H. E. Bailey Turnpike the fields were rearranged, and a 140-acre tract was added in 1962 to the original purchase of 1948.[138]

During the 1964 season 220 acres were in cotton, 75 acres of which were irrigated; 100 acres were planted in wheat; and the remaining acreage was in pasture for a herd of twenty cows and calves. Specialized areas of research included plant breeding, fertility studies, weed control by herbicides and flame cultivation, plant diseases (blights and wilts), and various problems in the mechanization of cotton production. Studies of this latter have involved the development of special machinery for the preparation of the seedbed, for cultivation and weed control,

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[137]Tour and interview with Dusty Rich, Herdsman, Fort Reno Experiment Station, El Reno, Oklahoma, November 24, 1964.

[138]Materials prepared by O. H. Williams, November, 1964.

for irrigation, for picking and stripping, for unloading collector wagons, for burr extraction and lint cleaning, and for market preparation.[139]

In former years the area surrounding Chickasha was predominantly a cotton producing region, but in recent years production has switched to a wide variety of crops. Thus current investigations have necessitated the inclusion of experiments with soybean varieties, alfalfa, and bermuda grass. Facilities at the station included five residence buildings and eleven permanent buildings for storage, processing, office space, laboratories, and a machine shop. A thirty-five-by-ninety foot greenhouse provided the facilities for cotton breeding efforts during the winter months. Aside from the actual research scientists who periodically examined research in progress, a staff of seven operated the program of the station.[140]

Research activities at Stratford and Sparks were not as extensive as those at some of the other special stations. At the Oklahoma Peanut Research Station near Stratford the seventy acres provided opportunity for investigations of peanut production varying from varieties, fertilizers, and cropping systems to tillage practices in dryland production. Other research was conducted with soybeans, sorghum, mungbeans, cowpeas, castor beans, alfalfa, and guar. Current research included weed control, herbicide screening test on peanuts, variety tests of grain and forage sorghums and hybrids, peanut strains, control of

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[139]Tour and interview with Jerry Baker, Assistant Superintendent, Oklahoma Cotton Research Station, Chickasha, Oklahoma, November 24, 1964.

[140]Materials prepared by O. H. Williams, November, 1964.

insects attacking peanuts, peanut breeders seed production, special crop studies, and erosion control studies.[141]

Meanwhile at the Oklahoma Pecan Research Station near Sparks, the 157 acres of native and commercial varieties of pecan trees were used to aid research in thinning and crown spacing relative to production.[142] Hay was the only field crop produced, and surplus pecans were sold to the highest bidders. No permanent structures or residences were established on the station except for a small implement and storage shed. Work included variety trials, pruning, spacing and management propagation, irrigation, soil fertility, flowering and fruiting, harvesting, and market economics. Routine activities were performed by a foreman and helper.[143] Research with thinning here had a great effect on production in the state, for thinning was shown to increase production tremendously.

Research applicable to the eastern part of the state was conducted at the six sub-stations located at Pawhuska, Bixby, Muskogee, Stilwell, Heavener, and Idabel. From its beginning, the Veterinary Research Station near Pawhuska concentrated activities on the blood disease of cattle, anaplasmosis, and as a result of these efforts and the coordinated laboratory investigations at Stillwater, a vaccine was developed to prevent further spread of the disease. Facilities at this 910-acre

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[141]Ibid.

[142]O.A.E.S., Processed Series No. P-451, April, 1963, p. 1.

[143]Brief visit with the foreman, Oklahoma Pecan Research Station, Sparks, Oklahoma, January 8, 1965. Thirty square feet of cross-sectional trunk area uniformly spaced was the formula arrived at for providing the highest yields per acre -- O.A.E.S., Pecans - A Program of Research and Education for Oklahoma [Unclassified publication, December, 1964], p. 5.

station were composed of a laboratory building, barns, and three residences. Barns contained double-screened pens for isolation from insects and metabolism stalls left from earlier investigations. Some of the other facilities included a feeding building, animal scales, six collecting pens, and thirteen pastures. All hay used was cut on the station, soybean meal was the only feed used, and each pasture had its own pond. The staff was composed of a veterinarian, a full time researcher, two laboratory technicians, and two farm workers. Cattle used in investigations have been predominantly Herefords, and a herd of prize Anxiety, a breed line of Hereford, has been started with a gift of ten animals.[144]

The development of a vaccine for prevention of anaplasmosis was a significant accomplishment for the station and of direct financial benefit to area cattlemen. Ten percent of the cattle in the eastern half of Oklahoma had been infected with anaplasmosis. Approximately 6.9 million dollars was lost annually by Oklahoma cattlemen as a result of the disease. Although from thirty to fifty percent of those cattle infected lived, they lost weight, aborted calves, and recovered slowly over a period of two to three months. However, not only did this disease affect cattle in Oklahoma, but thirty-nine of the fifty states reported cases, and anaplasmosis was a problem in a number of other nations as well.[145] Thus the development of the vaccine would have

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[144]Tour and interview with Ira P. Kliewer, Assistant Professor and full time researcher, Veterinary Research Station, Pawhuska, Oklahoma, January 7, 1965.

[145]O.A.E.S., Agricultural Information, "Facts About Plasmosis," /Unclassified publication, n.d., two page multilith/.

far-reaching effect.

The actual beginning of research with this disease at the Oklahoma Station began formally November 5, 1928. In 1946 efforts were increased, and the Veterinary Research Station was established at Pawhuska. During the period 1952 to 1956 antibiotics, aureomycin and terramycin, acted as a cure for the carrier state and as a treatment for acute cases.[146] Vaccine preparation began in 1953, with intensive efforts starting in 1961.[147] During 1962-1964 an agreement was reached with the Fort Dodge Laboratories in Fort Dodge, Iowa, to supply money for the final testing of the vaccine.[148]

The vaccine was developed by a team of researchers headed by Dr. W. E. Brock, with Dr. C. C. Pearson and Ira O. Kliewer as associates. The actual development of the vaccine was accomplished in laboratories at Stillwater.[149] The staff tested the vaccine first on forty cows at the Pawhuska station, and then conducted large scale field testing with 200 cattle at the Joe Soderstrom ranch near Pawhuska. The Fort Dodge Laboratories prepared the vaccine for the field trials and assisted in the testing.[150] After successful testing a federal license was obtained by the Fort Dodge Laboratory May 18, 1965, for the manufacture and

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[146]O.A.E.S., Agricultural Information, "Chronological History of Anaplasmosis Research at Oklahoma State University," [Unclassified publication, Summer, 1965], pp. 1-5.

[147]"Facts About Plasmosis."

[148]"Chronological History of Anaplasmosis Research," pp. 1-5.

[149]Ray Burley, [News release - Pawhuska], O.A.E.S., Agricultural Information, n.d. [Four typed pages].

[150]Ibid.

distribution of the vaccine.[151] Commercial distribution was planned for the fall of 1965. News of the successful vaccine was first released at a special meeting held at the Pawhuska station.[152]

In addition to the development of the vaccine the researcher had made a number of other contributions in relation to the disease. First of all, the staff isolated the anaplasma marginal that created a condition characterized by anemia.[153] Other accomplishments saw the station develop an improved complement-fixation test as a method for detecting "carrier" animals; be the first to use this method to isolate carriers and thus control the spread of the disease; pioneer in the use of antibiotics for treatment and prevention; be the first to break the "carrier" state by use of antibiotics; join with the U.S. Department of Agriculture and other states in holding periodic conferences for the control of the disease; be first to demonstrate the transmission by horseflies and mosquitoes; and greatly increase the knowledge of transmission by ticks and stable flies.[154] With this added knowledge and the wide use of the vaccine, this cause of loss in cattle -- fourth most costly in the United States -- could be eliminated. The vaccine has been shown capable of protecting uninfected cattle for one year, and in other cases it has greatly reduced death losses, weight loss, and other damaging conditions. The potential for saving the industry from $35,000,000 national annual loss seemed to be a great accomplishment in

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[151] "Chronological History of Anaplasmosis Research," p. 5.

[152] Burley, News Release.

[153] O.A.E.S., Technical Bulletin No. T-116, 1965, pp. 5-8.

[154] O.A.E.S., Agricultural Information, "Oklahoma State Has Been Leader," [Unclassified single sheet news release, n.d., n.p.].

view of the 37-year investment of $750,000. This sum should be returned several times in Oklahoma alone during the first year.[155] This new vaccine ranks as one of the major research contributions in the history of the Oklahoma Experiment Station.[156] However, despite the solution to the problem for which the Pawhuska station was established, this facility will not be phased out, but will embark upon a study of the influence of the spleen on disease susceptibility. The National Institutes of Health provided a two-year grant of $60,889 with which to facilitate these efforts.[157]

No such vigorous activity was present at the Oklahoma Vegetable Research Station at Bixby. In January of 1965 the 105 acres at Bixby was deserted, but facilities included an implement shed with what appeared to be an office and a seed storage room, heated seedling plots, a paved road through the farm, and power lines stretched to the well pumps used in irrigation. Only traces remained of the house mentioned in earlier years.[158]

Likewise, little research activity was being performed at the Eastern Oklahoma Pasture Station, located five miles west and two miles south oi Summit, and fourteen miles southwest of Muskogee near Oktaha. The half-section of land was leased in 1962 from Harry L. Whitaker, who remained on the farm as superintendent. Most of the station was

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[155] Thayne Cozart, "The Anaplasmosis Vaccine," [A two page unclassified news release], O.A.E.S., Agricultural Information [n.d., n.p.].

[156] Thayne Cozart, "Anaplasmosis News Release," [Unclassified news release], O.A.E.S., Agricultural Information [n.d.], p. 1.

[157] Burley, News Release.

[158] Brief visit to the Oklahoma Vegetable Research Station, Bixby, Oklahoma, January 13, 1965.

suitable only for pasture, and research centered on small-plot experiments on cultivated crops and pasture. The station site had a 210-day growing season and received forty-two inches of annual rainfall. In April, 1962, an additional forty acres was leased from the Warner, Borum, and Warner Company, which added to the station certain land in more adverse circumstances. Thus research would be more representative of the region. The heavy clay soils, poorly drained and acid, together with the relatively heavy rainfall compounded farming problems and research efforts to obtain improved pastures. Land in the area needed to be well terraced and contoured.

At the main location the clay hardpan soil typical of the region was well terraced, including the pasture plots and herding pens.[159] These latter were constructed of aircraft landing mat materials to facilitate the handling of a herd of 100 to 200 steers used to test small grain pastures with various rates of fertilizer and hay-pasture combinations. Stock ponds and several pumping houses provided the water for this livestock.[160] Current tests included phosphate placement on wheat; oat and barley fertility tests; sorghum variety tests; fertility tests of soybeans, bermuda grass, fescue, alfalfa, serecia; pasture studies of grazing and fertility rates; native grass pasture; and variety tests of oats, wheat, barley, bermuda grass, alfalfa, switch grass, fescue, and lespedeza.[161] Facilities included a residence, hay barn, storage barn, shop and office, and additional fences for the experimental

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[159]Materials prepared by O. H. Williams, November, 1964.

[160]Brief visit and interview with Harry L. Whitaker, Superintendent, Eastern Oklahoma Pasture Station, Muskogee, Oklahoma, January 13, 1965.

[161]Materials prepared by O. H. Williams, November, 1964.

pastures.[162] This appeared to present a good opportunity for research that would be in line with the suggestion by agricultural economists that more Oklahoma land be utilized for animal production.

Similar climatic factors would affect agricultural conditions and research efforts at the three other eastern Oklahoma sub-stations at Stilwell, Heavener, and Idabel. The Eastern Oklahoma Field Station was located nine miles north of Stilwell and six mils south of Westville in Adair county. Although seventy percent of the people in the county were on welfare or receive commodities, a good potential existed for developing a truck gardening industry. Several canning and freezing plants were located in the area, and the county had 1,200 acres of apple orchards. Research at the station has been geared to the development of locally adapted varieties of fruits and vegetables that would be best for the canning and freezing industries. Specific research projects have been variety trials with snap-beans, strawberries, and watermelons; trials with sweet potatoes and tomatoes; apple variety trials and breeding; peach variety trials; grape variety trials and breeding investigations; tests of Lawton and Raven blackberries; trials with the new blackberry harvester; and the wider use of asparagus in the region.[163]

The work of the station was conducted by two full-time employees and seasonal harvesters. The 140-acre station contained some woodland and creek area, and an orchard had been started. The vegetable plots were in five-year rotation with alfalfa. Facilities included a residence; a building containing an office, a storage room, and implement

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[162]Brief visit Eastern Oklahoma Pasture Station.

[163]Tour and interview with Carroll Germany, Superintendent, Eastern Oklahoma Field Station, Stilwell, Oklahoma, January 13, 1965.

shed; and a few other small buildings.[164] It was quite unfortunate that research in home economics and rural sociology could not have been continued and set to work on the social, psychological, and economic problems, solution for which would have given the vegetable research program a greater acceptance in the area.

The research efforts seemed to be on a small scale, and available facilities for such research appeared to be lacking at the Southeast Oklahoma Soil Improvement Station at Heavener. Current research activities included wintering level of twenty cows on dead bermuda grass and various other grazing experiments in addition to efforts to raise soil fertility and improve stands of pasture growth. The station was a one-man operation on approximately 130 acres of land. Facilities included a residence, a hay barn, and various sheds. Its general appearance was not very impressive, but the economy of the operation and the not easily discernible research efforts may have been part of the reason therefor.[165] Conducting operations on a leased site of course discouraged more permanent construction and the creation of special plots to demonstrate techniques and results of various efforts related to the area's farming conditions.

A more adequate plant was present at the Kiamichi Field Station at Idabel. Facilities here included a residence, two equipment sheds, a special heated storage building for potatoes and other vegetables, a farm pond usable for irrigation of vegetable plots and in extreme cases of the orchards, and hot-water-heated seed beds where all plants for the

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[164]Ibid.

[165]Brief visit with C. M. Bohannon, Foreman, Southeast Oklahoma Soil Improvement Station, Heavener, Oklahoma, January 13, 1965.

plots were grown. Current investigations included growth of various fruit trees, sweet potato breeding, watermelon breeding for commercial production, and a small-size watermelon for use in supermarkets. While laboratory work was mainly conducted at Stillwater, the results from laboratories and greenhouses were tested on a larger scale by field trial at locations such as Idabel.[166]

While not used as sub-stations, the Agronomy Farm, the Paradise Farm, and the Perkins Farm have been facilities away from the main station on the campus and as such come into a separate category. The Paradise Agronomy Farm was operated in conjunction with the Perkins Farm until discontinued in 1964. It was located seven miles west of Perkins Farm on state highway 33, in the tension zone between the cross timbers and reddish prairies of Oklahoma. Of the two hundred acres of this farm sixty were still under oak forest vegetation, and the remaining acreage was devoted to agronomic research — variety testing and yield responses to fertilizers, with some plots in pasture research.[167]

The 640-acre Perkins Farm meanwhile continued its division of research activities, horticulture having one quarter, poultry science one quarter, and agronomy having the other half of the section. The agronomy staff continued investigations with cotton grain sorghums, wheat, and pastures. Forty acres of this last half-section was irrigated from a well by the sprinkler method.[168] Meanwhile at the Agronomy Farm west of the campus seven men were at work on the two hundred acres with such

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[166]Tour and interview with G. H. Hedger, Superintendent, Kiamichi Field Station, Idabel, Oklahoma, January 8, 1965.

[167]O.A.E.S., Processed Series No. P-455 (1963), p. 1.

[168]Brief visit at Perkins Farm, January 14, 1964.

projects as winter small grains pasture, forage grass nursery, grass nursery, turf grass nursery, a rust study, wheat breeding nurseries, oat performance nurseries, Johnson grass control study, and a sorghum breeding test.[169]

Research Activities Given Special Attention

in Publications, 1963-1965

Investigations in the area of agronomy received the most publicity during the years 1963-1965, although certain other areas had occasional mention, and the well publicized research in veterinary medicine has been discussed in connection with the special station at Pawhuska. Publications of the station were also most numerous in agronomy, with next in order of numbers coming agricultural economics, horticulture, agricultural engineering, animal science, entomology, and poultry science. The types of research reported in agronomy covered such subjects as grain sorghums, guar, mungbeans, oats varieties, alfalfa, cotton varieties, barley, fertilizer usage, castor bean trials, legumes and bermuda grass, pasture management, disease-resistant varieties of broomcorn, and the processing of grass seed.

The publications of the station in the field of agricultural economics included such topics as minimum land requirements for specified incomes, insurance, the export demand for U.S. cotton, the effect of product prices on farm organization and income, economic evaluation of cropping systems, inter-regional competition in fed beef, resource requirements for alternate livestock and cropping operations, credit and

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[169]Materials prepared by O. H. Williams, November, 1964.

capital growth in southeastern Oklahoma, the use of computers in feedlot management, and factors affecting pecan prices.

Some of the subjects examined in the field of horticulture were cultural studies with spinach, the keeping quality of cut flowers, origin and development of the Nemared tomato, and a survey of certain aspects of the retail florist business. The Nemared tomato had been developed and tested by the horticulture department with the cooperation of the Hawaii Agricultural Experiment Station and the United States Regional Vegetable Breeding Laboratory, Charleston, South Carolina.[170]

Publicity surrounding research activities was more pronounced with agronomy than with the other areas, although some types of information in other fields of research were emphasized. Of course much basic and specialized research information was published in the scientific journals, but this information was not within the scope of the present study. Narrative explanatory materials concerning agronomy gave a considerable amount of attention to cotton and a few other crops. Research effort by the staff of the Oklahoma station were compounded by the presence of seven major diseases of the plant plus adverse climatic conditions -- wind-driven rains, hail, and blowing sand. These factors in themselves contributed problems that invited research. From research into these problems came disease control methods, disease resistant varieties, climatic resistant varieties, and plot maintenance methods.[171] Plant

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[170] O.A.E.S., Bulletin Nos. 603-639; Miscellaneous Publication Nos. 68-76; Processed Series Nos. 436-511; Technical Bulletin Nos. 98-116; Bulletin No. 635 (1965), p. 5.

[171] Oklahoma State University, Division of Agriculture, Cotton Newsletter No. 24 (1964), p. 5.

breeding in cotton was directed toward the development of varieties resistant to fusarium wilt and nematodes, which have been spreading in Oklahoma and Texas. Thousands of acres of sandy and loam soils have been affected.[172] A blight-resistant cotton, Parrott (BR), was developed by station breeders and pathologists, thus promising better yields and grades.[173]

Other research in cotton production involved such areas as the control of early season weeds and insects; the study of the economics of mechanical stripping, mechanical picking, and hand harvesting using the recommended varieties for each method; determination of combinations of gin machinery to obtain the highest net return from rough-harvested irrigated cotton.[174] Research with the control of weeds was not only important in cotton, but it was also a very important problem in all crop productions in Oklahoma. Meanwhile in 1963 the loss in agricultural production from weeds and the cost of weed control throughout the United States were estimated at four billion dollars. Losses by weeds included effects on productivity, quality, efficiency of water management, human efficiency, and the harboring of insects.[175] During 1963 the staff of the Oklahoma station used thirty-five different chemicals in efforts to discover the best means to control weeds in cotton.[176]

172Oklahoma State University, Division of Agriculture, Cotton Newsletter No. 25 (1965), p. 11.

173Ibid., p. 12.

174O.A.E.S., Cotton Committee, A Ten Year Cotton Program in Oklahoma, 1958-1967 /Unclassified publication, n.d./, p. 2.

175W. C. Shaw and A. J. Loustalot, "Revolution in Weed Science," Agricultural Science Review, I (Fall, 1963), p. 39.

176Cotton Newsletter No. 24, p. 1.

In studies of harvesting methods efforts centered on the study of the cotton stripper components, since the cotton stripper was harvesting more cotton than any other machine in Oklahoma.[177] Stripper roll construction, spray equipment, and gin equipment were three areas where agronomy and agricultural engineering cooperated quite closely. Efforts to control insects in cotton included investigations into types of spray equipment and evaluation of various insecticides.[178]

Certain factors and activities in Oklahoma agriculture have affected the direction and emphasis of research in agronomy during recent years. One such factor has been the increasing amount of irrigated land. In 1944 only 2,237 acres on 74 farms were under irrigation, but by 1959 this amount had increased to 197,632 acres on 2,481 farms, and the increase has continued.[179] With improved production of alfalfa and increased use of overcropped farm land for forage crops and pastures, the value of the hay produced in Oklahoma in 1962 reached $47,009,000.[180] As a result of improved conditions in wheat production the value of this crop reached $145,001,000 in 1962.[181] In the sandy soil region of northwestern Oklahoma wheat and sorghum acreage constituted ninety percent of the cropped land.[182] The program of research with sorghums has produced twenty-three varieties and hybrids, with two additional

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177O.A.E.S., Technical Bulletin No. T-111 (1964), p. 5.

178A Ten Year Cotton Program in Oklahoma, p. 8.

179Statistical Abstract, 1964, p. 623.

180Ibid., p. 660.

181Ibid., p. 655.

182O.A.E.S., Bulletin No. B-627 (1964), p. 5.

pollinators for use in developing other hybrids of grain, forage, broomcorn, and sirup types. These results have come through the efforts of John Sieglinger. He not only developed most of the varieties, but he did so rather quickly in order to meet the needs of harvest machinery, disease resistance, and insect resistance.[183] Tests of small grains during 1964 involved twenty-three varieties -- fourteen of hard red winter wheat, five of winter oats, and four of winter barley.[184]

Various Evaluations, 1962-1965

A number of evaluations were obtained from a few departments and individuals by means of a exploratory questionnaire. Unfortunately, only a few individuals were willing to examine research activities from a general historical perspective, and as a result only those evaluations given below were collected. Other evaluations have given consideration to more general matters. First in alphabetical order by departments came that of agricultural economics. Some of the major contributions of this field of research, as enumerated by one member of the staff, included guides to farmers and agricultural business for decision-making at all levels, suggested optimum resource combinations for farming, and procedures for rapid and optimum coversion of dairy farming to bulk milk handling.[185]

However, the most important aspect of agricultural economics was

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183Ray Burley, "Sieglinger Helped Make Sorghum a Fantastic Crop," The Oklahoma Farmer-Stockman (December, 1964), pp. 6-7.

184O.A.E.S., Processed Series No. P-t04 (1964), p. 1.

185Questionnaire, G. P. Collins, Department of Agricultural Economics, March 9, 1965.

that of farm management. Over half the staff have devoted their main attention to this problem. Of the thirty-two on the university staff in 1964 fifteen were in research, and sixty-five percent of the facilities of the department were used for research. However, as in other departments, research information has often been given out in the classroom even before the results are published.[186] Current broad problems under investigation have been production economics and farm management; resource economics (more particularly land economics); marketing; agricultural business firm management; and agricultural policy, area development, and world agriculture. Some of the more specific problems in the field were economic efficiency in livestock and forage enterprises; changes in the dairy industry market structure; production capacity and adjustments in agriculture; recreation in Wildhorse Creek Watershed; production efficiency of field crops in Oklahoma; land market trends and factors; appraisal of farming adjustment opportunities; and regional feeder animal marketing.[187]

Some of the more important accomplishments of the department's research program have been the development of basic input-output budgets and optimum farm and ranch plans for various parts of the state, as well as the appraisal of market expansion possibilities for major commodities, particularly beef cattle.[188] Some of the problems solved were the determination of the most profitable land use and market outlets for

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[186]Interview with James S. Plaxico, Head, Department of Agricultural Economics, November 30, 1964.

[187]Questionnaire, Collins.

[188]Questionnaire, James S. Plaxico, Department of Agricultural Economics, January 29, 1965.

various areas of the state, economic advantage of bulk milk handling, adapting computer facilities to determine optimum farm organization, and economically sound insurance protection for all types of insurable risks. In the area of cooperative and regional research some thirty-five projects were underway in the area of farm and ranch management, marketing, agricultural policy, farm finance, resource economics, and land appraisal. Six specific studies were area supply response, livestock marketing, grain marketing, risk and uncertainty in the Great Plains, optimal adjustments of wheat farms in the Great Plains, and evaluation of crop insurance in the Great Plains.[189]

Other regional projects involved multiple pricing plans, economic appraisal of farming adjustment opportunities, livestock marketing in the southern plains, and the impact of present and proposed agricultural price and income programs.[190] The results from such efforts in the field of agricultural economics had led to specialization, changes in land and livestock use, introduction of new and improved capital items, and greater managerial skills, and these in turn were the direct contributing factors to increased productivity. All of these benefits resulted principally from research and education.[191]

In answer to the request for some of the major research accomplishment of other departments, the following were suggested: grain sorghum improvement and other plant breeding in such crops as wheat and cotton; forage grass; economical control of the greenbug ($1.25 to $2.00 per

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[189] Ibid.

[190] Questionnaire, Collins.

[191] Luther G. Tweeten and Fred H. Tyner, "Toward an Optimum Rate of Technological Change," Journal of Farm Economics, XLVI (1964), p. 1075.

acre), which has added to the production of wheat where in the past as high as forty percent of the crop was lost; development of the cotton planter by agricultural engineering, which has been used on fifty to sixty percent of Oklahoma cotton farms and has provided savings estimated at one million dollars a year; development of the cotton stripper; cattle grub control that has been estimated to have saved from eight to ten million dollars a year; and a new weaning technique for dairy calves that was estimated to save $500,000 in milk previously fed to calves.[192]

Of considerably less extent than these observations were those from the fields of agricultural engineering, biochemistry, agricultural information, sociology, and veterinary medicine. In the area of agricultural engineering a few of the accomplishments were automatic irrigation, planter development, harvester for cotton, castor bean harvester, castor bean huller, and harvest aid machines. Cooperative efforts were those projects with cotton mechanization and weed control. One of the major goals which was achieved in several areas was the reduction of manhours of labor by the introduction of machines.[193]

In the field of biochemistry investigations were not so closely concerned with practical production problems, but were more involved with basic long-range investigations. The more important research achievements in biochemistry encompassed such topics as water evaluation, gossypol and cottonseed meal, vitamin A, mineral nutrition, wheat proteins, and a variety of investigations concerned with intermediate metabolism and metabolic control. Some of the problems related to

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[192]Questionnaire, Collins.

[193]Questionnaire, Jay G. Porterfield, Department of Agricultural Engineering, Oklahoma State University, January, 1965.

water, gossypol, vitamin A and mineral metabolism had been solved by this department.

Research absorbed eighty percent of the staff effort in biochemistry, while the remaining twenty percent were engaged in the transmission of this research information and techniques in the classroom. Current research in biochemistry became more basic and included a less direct commodity relationship. This recent fundamental research was oriented away from applied areas and incorporated such projects as the investigation of the properties of wheat protein, studies in hormone action, studies of factors responsible for the flavor of peanut butter, methods of sampling and measuring intake of grazing forages, and control of undesirable woody species in the Southern Great Plains.[194]

Although officially phased out by 1964, research in the field of agricultural sociology and rural life has continued with direct subsidies to individual researchers by the U. S. Department of Agriculture. Formal connection with the experiment station terminated as of January 1, 1964. Some of the areas of continuing interest were the changing age structures of Oklahoma population centers, population trends in Oklahoma towns and cities, ecological patterns of Oklahoma, and farm population and agricultural land utilization. In the past important investigations in the department included studies of population, migration, and health and living in rural areas. The major breakthrough in the field but not attributable to the station was Sewell - Farm level

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[194]Questionnaire, Roger E. Koeppe, Professor and Head, Department of Biochemistry, Oklahoma State University, March 1, 1965.

of living scale.[195]

Meanwhile the important accomplishments in veterinary research included the method for the prevention of anaplasmosis, the cure for the carrier state of anaplasmosis, seriologic test for the carrier state, and the etiology (demonstration of the causes) of pinkeye.[196] These departmental evaluations of course gave only a small insight into the complex research program of the station. Results of research were cumulative and unobtrusive, and many times a considerable progress was achieved without a great awareness on the part of large numbers of people. Through an evaluation of the total research program an indication of the importance of results became apparent.

Observations from the point of view of the agricultural information department suggested that some of the major breakthroughs of the station staff were the cotton stripper, the cotton planter, performance studies of beef cattle, lifetime studies of beef cattle, the development of automatic irrigation system, stubble mulch tillage, and the development of new crops — especially those resistant to greenbugs and nematodes.[197] While this department has not been involved in agricultural investigation, it has furthered research efforts tremendously by distributing materials to ninety key libraries, 410 vocational agricultural teachers, 180 county agents and a large number of individual farmers and

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[195]Questionnaire, J. D. Tarver, Department of Sociology, Oklahoma State University, January 22, 1965.

[196]Questionnaire, W. E. Brock, Department of Pathology, College of Veterinary Medicine, Oklahoma State University, February 2, 1965.

[197]Questionnaire, Charles N. Voyles, Department of Information, Oklahoma State University, January 23, 1965.

interested persons.[198]

General Evaluation - Last Years

The significance of the Oklahoma Agricultural Experiment Station appeared when the size and extent of progress in Oklahoma agriculture became fully exhibited. The ranking industry in Oklahoma has been agriculture. More capital and more people were involved in this than in any other industry. Investments included three billion dollars for land, one half billion dollars for machinery, and one and a half billion dollars for livestock. This four billion dollar investment and agricultural production provided a farm income of $700,000,000 annually and an added $130,000,000 annually from the manufacture of farm products.[199] Of the state's 95,000 farms in 1962 sixty percent were commercial, with an average farm size of 394 acres. Oklahoma contained thirty-seven million farm land acres or eighty-one percent of the state's total land area. The average value of farm land and buildings was $39,327.[200]

In 1963 in order of value the most important crops in the state were wheat, hay, cotton lint, sorghum grain.[201] The dollar values of wheat and cotton in 1962 were respectively $177,000,000 and $55,000,000, and the total valuation of all crops was $269,000,000. Meanwhile livestock production the same year reached $377,000,000.[202] This large

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[198] O.A.E.S., Agricultural Information, Distribution Sheet.

[199] O.A.E.S., Bulletin No. B-630 (1964), p. 36.

[200] U. S. Department of Agriculture, Office of Information, Fact Book of U. S. Agriculture (Washington, 1963), p. 139.

[201] Statistical Abstract, 1964, p. 653.

[202] Fact Book of U. S. Agriculture, 1963, p. 139.

capital investment and the resulting production was extremely important to the Oklahoma economy. Many believed that it needed protection from foreign and domestic competition.

In the face of such competition continual research was needed to insure that the state's agricultural production continued to improve in quality and also in efficiency. It was also an important fact that research was largely responsible for both the capital investment and production. Both could reach greater heights through increased research programs, and a number of very serious problems still remained unsolved. Despite the fact that sixty percent of the farms had increased toward economically efficient size, the average gross income per farm in 1962 was only $7,911, while the net income per farm was only $2,253.[203] In a time of specialized production and inflation the farmer's real income decreased all the more.

According to Forrest W. Beall, Chairman of Governor Henry Bellmon's council on agricultural development, Oklahoma agriculture has advanced at a much slower pace than agriculture nationally. He compared the average per capita farm income in the state, estimated in 1963 as $2,216, with the $9,000 figure for California. He also illustrated that Oklahoma's figure was from $1,000 to $1,500 under the farm income in neighboring states.[204] Regardless of what political padding may have been done to these figures, the general impression gave support to the need for more research to facilitate removal of inefficient farming operations.

A second problem appeared in the failure to share more adequately

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[203] Ibid.

[204] Stillwater News Press, March 22, 1963, p. 12.

in world markets. For example, the extent of the world market for Oklahoma products was indicated by those products going to Japan in 1963. Sorghum, cotton, petroleum, and chemicals were some of the products sold to Japan, but the surrounding states sold larger amounts of the same products. Kansas sold $48,500,000 worth of products compared to $9,200,000 for Oklahoma.[205]

A third problem that has needed study was that of the changing work force and the training needed by Oklahoma youth. Agricultural-related employment encompassed three areas in 1964. These included 175,000 who managed or operated the nearly 100,000 farms and ranches; 14,000 workers who supplied farmers with production items; and 300,000 engaged in marketing and processing of agricultural products.[206] With further mechanization and application of various forms of technology to all three areas of employment, larger numbers of workers have been forced into other occupations. Research has been needed to provide the necessary training to equip farm or rural youth for work either in the more complex agricultural industry or in some field outside agriculture.

Although these and other new problems arose in recent years and needed attention, the actual support for the existing research programs has not kept pace with the times. The state support in the fiscal year 1962 was more than double the dollar figure of 1950, but actually this amount produced only a seven and a half percent increase in buying power. This again was not sufficient to meet increasing research costs

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[205]United States-Japan Trade Council, Japan Buys American in all Fifty States (Washington, 1965), pp. 5-11.

[206]O.A.E.S., Bulletin No. 630, p. 36.

or the competition from other areas.[207] Yet research programs have been needed all the more in view of the increasing amounts of capital invested as well as the cash risks.

In order to improve the quality of Oklahoma products, an improved and continually expanding research staff would be needed. Definite progress was made between 1960 and 1964 not only in increasing the size of the staff, but also in increasing the proportion of staff members holding a doctor's degree.[208] However, despite these advances, the rank of the staff in the nation by salary was 20th for professor, 23rd for associate professor, 34th for assistant professor, and 43rd for instructor.[209] The funds for the Oklahoma station for the 1962-1964 biennium amounted to $1,659,621.72 from the state, $616,951.00 from Hatch funds, and $147,574.92 from regional research grants.[210] On the average the states in 1963 provided $3.70 for every dollar appropriated by the federal government.[211] According to this ratio, the Oklahoma legislature should have appropriated approximately $2,828,746 to remain with the national average.

Although conditions were not ideal, the Oklahoma station continued its growth during the fifties and sixties with expansion in staff,

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[207]O.A.E.S., Agricultural Research and Oklahoma's Economy /Unclassified publication, n.d., n.p./

[208]O.A.E.S., Biennial Report, 1962-1964, pp. 2-4.

[209]Oklahoma State University, The Needs of Agriculture at Oklahoma State University, 1965-67 Biennium /Unclassified publication, April, 1964/, p. 7.

[210]O.A.E.S., Biennial Report, 1962-1964, p. 6.

[211]U.S.D.A., Agricultural Research Service, Questions and Answers on Agricultural Research Agriculture Information Bulletin No. 224 (Washington, 1963), p. 4.

facilities, and financial support from both the state and federal governments. The Hatch Act of 1955 was of considerable influence upon both the direction and nature of research efforts and the areas of greatest increase in numbers of staff. Research investigations followed the trends of the nation that encompassed, for example, efficiency studies of crop production from planting to use by the manufacturer; tests to discover new uses for agricultural crops, for by-products from these crops, and for new crops such as those recently developed having possibilities as a chemical base for a plastic used in coating electrical wires; and efforts to give the consumer better quality of product more efficiently.

It appeared that major research efforts were following fairly closely the more natural agricultural pursuits of the state. Efforts were quite successful in providing improved breeds, techniques of operation and management, and improved pasture techniques for greatly expanded livestock operations within the state. Investigation at Fort Reno, Fort Supply, Lake Carl Blackwell, and the special stations around the state contributed largely to this area of agricultural production.

The station staff developed a number of varieties of trees and plants that provided greater production, were less susceptible to disease and were less affected by climate, and had greater consumer appeal. Such improved products were sweet potatoes, tomatoes, watermelons, pecans, peanuts, peaches, cotton, wheat, guar, and alfalfa.

Some of the highlights of the station work in the fifties and sixties had centered around the development of the vaccine for anaplasmosis, pecan tree spacing, sorghum varieties for dry land farming, technique for winter leveling of feed for livestock, the development of techniques for stubble mulch to prevent erosion, development of the disease-resistant Redgold and Nemagold sweet potatoes, and investigations with the plant from India, guar. The new building for veterinary medicine, the two new agricultural halls, and the Fort Cobb peanut substation were examples of the more recent additions to facilities.

Although the Oklahoma Agricultural Experiment Station had contributed much to the prosperity of the state, state funds again lagged behind the national average, and great concern was expressed by the station personnel over the lower salaries for researchers than those paid in other areas of the nation.

Despite the fact that agricultural research was viewed by the general public as important, much effort was needed to explain the need for additional funds and the value of the new research orientations. Most of the farm operators have been receptive to the new results from the station, but some of the small operators and the general public were not aware of direct effects of research on the consumer's standard of living.

CHAPTER VI

CONCLUSION

The Oklahoma Agricultural Experiment Station was established several years after the experiment station movement had achieved federal support to create stations in every state and territory. The Oklahoma station profited from the combined experience of both the European stations and the stations established before and after the Hatch Act of 1887.

Personalities were of considerable importance in the development of the Oklahoma station during the years prior to 1900. Both dedicated service and personal interest were reflected in research emphases and the type of research facilities developed. Great emphasis was placed upon horticulture and upon field crops such as wheat. Individuals had importance not only in obtaining Stillwater as the site for the college and station, but also in preventing its being moved to El Reno after alleged corruption. Several lasting benefits for the research program were established during the formative years.

Many significant events and several research areas were important in determining the research results furing the two decades from 1901 to 1920. National enactments such as the Adams Act, the Smith-Hughes Act, and the Smith-Lever Act had tremendous influence on facilities, research orientation, and accomplishments. A number of additional laboratories, barns, and other buildings were constructed and were of great encouragement to the staff. On the other hand, the loss of facilities and records in the Morrill Hall fire, the failure to obtain state funds in any large amount, and the interference of the state board of agriculture in the internal affairs of the research program were all detrimental to smooth operation and continued progress of the station.

The development of the Oklahoma facility during the twenties, thirties, and forties was directly related to the additional national legislation in each of those decades and to the amounts of direct appropriations from the state legislature. The Purnell Act, the Bankhead-Jones Act, and the Agricultural Research and Marketing Act each provided research orientation, allowed for expansion of the staff, contributed to the procurement of added facilities, and were responsible for a number of important research accomplishments. Research interests and research facilities were greatly expanded. Investigations included all of Oklahoma, except the Panhandle with its own experiment station, through the use of pilot farms and special stations located in the special farming regions of the state.

Research activities in the fifties and sixties continued to expand, with increasing efforts at the main station at Stillwater and at the special stations. The second Hatch Act provided greater coordination and added funds for this expansion. Investigation continued to broaden in scope with increasing interest concerning the whole of rural society, benefits to the consumer, and the fostering of new industrial uses of agricultural products or by-products. Research efforts have had important direct consequences upon Oklahoma agriculture. Pasture research and livestock management procedures have been widely adopted, and as a result the livestock industry has grown in the state with many individual producers now enabled to obtain a better living from the land. The development of a vaccine for anaplasmosis has suggested an even larger income for livestock producers. The development of new and improved varieties of field and horticultural crops has had an important influence on the quality and quantity of such crops available to the consumer.

The significance of the operation of the Oklahoma Agricultural Experiment Station can be understood only in relation to its contributions to Oklahoma agriculture, to regional agriculture, to national agriculture; and to consumers in Oklahoma and in the nation. To an analysis of these contributions and certain reflections thereon, we now turn.

The Oklahoma Agricultural Experiment Station has been an important division of the college and university. Its field of usefulness has centered in the advancement of knowledge through systematic experimentation and investigation. The station has acted as an agency for discovering and verifying the practical application of scientific facts and principles to the broad field of agriculture. The Stillwater station followed the general pattern of the other state stations in most aspects of the program, but certain distinct periods of significant growth developed as indicated by added staff, increase in acreage, increase in facilities, addition of special stations, and in amounts of state and national support. It was extremely unfortunate that the Oklahoma station was plagued by inadequate state support throughout most of its operation. In many cases Oklahoma farmers, consumers, and especially political leaders have not understood the great opportunities the state might receive through greater state support. Even today farm surpluses and dwindling numbers of actual farmers have been mistakenly viewed as indicating that research should be curtailed. It has been rather remarkable that the Oklahoma Agricultural Experiment Station has been able to accomplish what it has in view of inadequate state support and of political manipulations. Certain periods of more adequate support have been reflected in greater research accomplishments and better organized programs. When greater amount of funds were made available research efforts were earlier successes, for example the accelerated program for a vaccine against anaplasmosis.

Likewise, the Oklahoma station has had an almost continual history of a diversity of agricultural conditions, certain adverse climatic factors, and a relatively new and a less-than-affluent population in general. A historical development of the Oklahoma station has reflected these persisting problems. Only through the dedicated efforts of the station personnel has the station been able to make progress. However, even now state funds are inadequate to meet the needs for salaries that would be competitive with the other states. It would be hoped that an enlightened general public and legislators dedicated to the public interest will become more conscious of both the need for more funds and direct effect of research at the station on the consumer's standard of living.

Larger and larger appropriations from the state would be only one suggestion for an expanded and far more effective research facility. A brief summary of the emphases at the station during its years of operation indicates further steps for improvement. The early years of the Oklahoma station appeared to have been a time of collecting information and pursuing researches without any great thought to the unique farming conditions of the specific farming areas of the state. Unfortunately, general farming and self-sufficiency were greatly stressed during the first decades. Later research would follow programs for specialized farming and for the benefit of the total rural community. Research activities of recent years have been of a nature to serve the general public as well as the farming community. Although many areas need applied research to provide solutions to immediate problems, basic research has expanded, as it should, to meet the need of long-range problems and the better to implement more practical research.

While long-range investigations have been conducted in regard to basic problems, there is still a need to examine agriculture and the Oklahoma situation from enlarged perspective. This aim would entail a more numerous staff and one oriented toward a broad composite goal. Such a staff would need the leadership and direction of a person of large character and insight. This person would ideally need to be well grounded in the fields of economics, political science, sociology, psychology, and the humanities, as well as having a general knowledge of the various fields of agricultural science. He should have an aesthetic, artistic, historical appreciation and be able to include some aspects of each in the program of the station. As an administrator he should be a chief of staff with specialized personnel to supervise special efforts of the station. A number of new fields of investigation would doubtless need to be added to provide research data that would allow the greater utilization of the information gained from investigation of specific agricultural products.

Perhaps one of the easiest ways of achieving this goal would be to include the whole of Oklahoma State University in the three areas of research, extension, and instruction, with each department having a portion of its staff engaged in each of the three -- research, extension, instruction. Many of the problems insurmountable by agricultural science alone could be thus eradicated.

The goal of research in agriculture is to find the information necessary for the individual farm family to use in obtaining a wholesome life from agricultural production. Many problems not directly related to agricultural production prevent the use of this information. Ignorance, poverty, complacency, and lack of communication could be eliminated with the assistance of departments in colleges other than that of agriculture. Thus a society already interwoven could achieve change through multilateral action of interdependent staff members.

Examples of such research activities of other departments could include the following. The problem of complacency could be attacked through investigations by staff in social psychology, sociology, and political science. What are the most efficient and equitable units of local government? The staff from political science could determine the best units according to climate, terrain, and population density. They could then find ways to eliminate inefficiency by removing too small units, duplication, wasteful methods, nepotism, unequal tax assessments, and favored political and economic position for a certain few within the political unit. In the studies by the staff from social psychology and sociology, cultural and motivational factors could be investigated to determine methods of bringing about a change in attitudes. The staff from the history department could provide information concerning past events and practices that directly or indirectly influence the behavior patterns of citizens in given localities in the state. Such researches would cast reflection on the problem of poverty as well as on complacency.

Likewise many departments could attack the problem of ignorance and low cultural attainments. The departments of economics, sociology, and geography could, together with the education department, work out the most feasible public school system. An urgent need has existed for consolidation, curriculum revision, and enlarged educational experiences, but problems of economics, complacency, and lack of communication have prevented the development of an educational program to meet the needs of today and the future. Commonly accepted goals hold that every child should have an opportunity to attend a school fitted to his needs, from kindergarten through high school or perhaps junior college regardless of his racial, ethnic, social, or economic background. According to geography and population density, public school units should vary from the local village elementary schools to the large multiple-county boarding-type high school-junior college. Research could determine means of financing, location, curriculum needs, and ways to gain support for such a program. Perhaps in many cases farm families could live in small residential areas close to main highways, which could save expense not only in bus transportation but also in road maintenance. With increasing specialization, many farmers could commute to the production unit instead of the family commuting to town and school.

Over the years the station staff has accumulated a great amount of information about the soil, climate, terrain, adaptation of plants and animals to the climate and terrain, and techniques with various plants or animals in different localities within the state, but at the same time much less information has been gathered about the people involved in agriculture. For good communication and to obtain the acceptance of change individuals of varying backgrounds the individual needs to be understood in that background. Studies by staff members from such departments as sociology, psychology, economics, and history could isolate certain cultural factors transferred from other farming situations, and certain lingering folklore customs could be set aside and the research information from departments of the college of agriculture could thus gain acceptance.

Another complicated area that could readily engage the whole research force of the university is that of rural living. Research into efficient farmsteads and farm or rural housing could involve university architects in projects to design functional yet aesthetically acceptable buildings for the various subdivisions of the state. In contrast to the early philosophy of the station staff that special stations not be model farms, it appears that the erection and maintenance of model buildings by university extension architects would be one of the quickest ways to break down complacency. If local materials could be fabricated into economical buildings on the special stations, then new construction could be encouraged throughout the region. As it is, the relatively poor housing conditions at the various special stations appear as a support for sub-standard housing in the respective regions. With an aggressive program in research and extension, many holdover ideas from the years of the depression thirties could be forgotten. As mentioned above, many farm houses could be removed from the producing unit, and regional living areas could be established with all the modern conveniences, including recreational facilities. Such arrangements could cut costs with daily food needs provided by delivery trucks or "rolling stores" at much less expense than the small crossroads store. Other needs could be met more economically with larger purchases from supermarkets or cooperative stores for freezers and immediate use.

It has seemed strange to some observers that research efforts have centered on increasing production when a large portion of the Oklahoma population are underconsuming the state's own products. Ways should be discovered to provide every individual with sufficient income with which to purchase a nutritional amount of foodstuffs. This goal suggests again the need for research by many departments. Especially useful would be political science research in the area of laws for fair property assessments and for ad valorem taxation.

Adequate income for those individuals less gifted in ability might be arranged by a system establishing a two-family farm, with the less skilled hired man achieving a better place under close supervision than as a tenant or a subsistence-type farm operator. After research has established the guidelines, the county agent and home demonstration worker could work with the owner to insure wholesome living to fit the needs of the hired worker.

In the area of machinery much could be done to insure greater efficiency in its sale, use, and storage. A large amount of machinery has been left standing around the countryside as eyesores, while formerly prosperous retailing centers now have a large portion of their buildings vacant and deteriorating. Many of these buildings should be destroyed, and many pieces of machinery scattered across the landscape should be removed. Research by historians could determine which buildings in the rural communities should be saved as historic sites; investigations by sociologists and economists could suggest which towns might be retained as distribution centers. Many abandoned buildings might be restored for use by agricultural implement dealers. A small museum containing examples of older implements might be created.

Two other means could be used to provide economy in the use of machinery if the research techniques could be worked out; these would be a used implement exchange, and a leasing system. Implement dealers could avoid a large inventory of used implements by participating in a statewide central exchange. With a great amount of machinery staying idle a large part of the year, a system of leasing might be more economical for farmers. Implement manufacturers could make arrangements for seasonal transfer of equipment from region to region similar to the way combine operators now move from south to north. Research could determine the feasibility of these suggestions.

Within the station operation a few additional activities would be of benefit to greater coordination. Some type of formal inter-departmental memorandum would make each staff member aware of activities in other departments. This non-technical information sheet could list each individual accomplishment, new projects undertaken, and the people involved in the investigations.

Despite inadequate financial support, political manipulation, and occasional misplaced research emphasis, the Oklahoma Agricultural Experiment Station has done an admirable service for agriculture in the state and region. With further expansion and larger perspective the station can provide even greater service.

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This book was somewhat dated, but it pointed to the serious problem of gaining a position of influence with farmers.

VITA

Francis Richard Gilmore

Candidate for the Degree of

Doctor of Education

Title: A HISTORICAL STUDY OF THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION

Major Field: Higher Education

Biographical:

Personal Data: Born in Cincinnati, Ohio, November 2, 1928, the son of Harold and Harriet Gilmore.

Education: Attended elementary school at Morrow, Ohio; graduated from Morrow High School, Morrow, Ohio, in 1947; received the Bachelor of Arts degree and the Bachelor of Science in Education degree from Wilmington College, Wilmington, Ohio, in June and August, 1951, with degrees in history and education; received the Master of Arts degree from Miami University, Oxford, Ohio, in June, 1952, with a major in history. Attended University of Cincinnati, Cincinnati, Ohio, during summers of 1954 and 1955; attended University of Wisconsin, Madison, Wisconsin, during 1954-1955, summers of 1956, 1957, 1958 and fall of 1958.

Professional Experience: Began service in U. S. Army in 1952 with rank of Private, released from U. S. Army in 1954 with the rank of Corporal after a year and ten months as administrative clerk and watch repair instructor at Aberdeen Proving Ground, Maryland; appointed teacher of American and World History at Anderson Township High School near Cincinnati, Ohio, 1955; appointed Head, Department of History and Political Science at Dakota Wesleyan University, Mitchell, South Dakota in 1956; appointed Assistant Professor of History at Phillips University, Enid, Oklahoma in 1959; appointed Instructor at Oklahoma State University for the summer of 1962; appointed graduate assistant at Oklahoma State University in 1962; appointed Assistant Professor of History at Salem College, Salem, West Virginia in 1965.