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III



"Religion, morality, and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged."¹

"The Land-Grant Act is probably the most important specific enactment made in the interest of education. It recognizes the principle that every citizen is entitled to receive educational aid from the Government and that the common affairs of life are proper subjects with which to train men.

"Its provisions are so broad that the educational development of all future time may rest upon it. It expresses the final emancipation formal traditional and aristocratic ideas, and imposes no methods or limitations. "It recognizes the democracy of education, and leaves all the means to be worked out as time goes on."—LIBERTY HYDE BAILEY.

¹ Ordinance of 1787, for the government of the Northwest Territory.

IV



LETTER OF TRANSMITTAL

DEPARTMENT OF THE INTERIOR, BUREAU OF EDUCATION, Washington, D. C., December 5, 1924.

SIR: For nearly 63 years the United States Government has encouraged a program of higher education in agriculture, mechanic arts, home economics, and in basic sciences and arts, through the provisions of the Morrill Act of 1862. The colleges established in the several States as a result of this act are required by law to report annually to the Secretary of the Interior regarding their progress; and under the second Morrill Act of 1890 and the Nelson amendment of 1907, granting to each State certain sums of money now amounting to the sum of \$50,000 annually for the further support of these institutions, the Secretary of the Interior, through the office of the Commissioner of Education, was given administrative authority in cooperation with the States in carrying out the provisions of the aforementioned act relating to these colleges.

In view of this historical relation of the Department of the Interior to these colleges, it is important to have an appraisal of the educational achievements made by these institutions for more than half of a century, and particularly for the decade of 1910 to 1920. In this survey, which has been organized by Dr. Walton C. John, of the Division of Higher Education of this bureau, over 65 specialists and leaders in scientific thought in these and related institutions' have made valuable contributions regarding the programs and progress made in their respective fields.

It is believed that this survey, which includes five of the more important aspects of the land-grant colleges, will be of assistance to students of higher education in general and particularly to those who are interested in the advancement of the work of the land-grant colleges. I therefore recommend the publication of this bulletin.

The SECRETARY OF THE INTERIOR.

JNO. J. TIGERT, -Commissioner.



FOREWORD

For the sake of convenience this survey of land-grant college education is divided into five sections, published separately, as follows:

Part I. History and Educational Objectives of Land-Grant College Education.

Part II. The Liberal Arts and Sciences and Miscellaneous Subjects in Land-Grant Colleges.

Part III. Agricultural Education in-Land-Grant Colleges.

Part IV. Engineering and Mechanic Arts in Land-Grant Colleges. Part V. Home Economics in Land-Grant Colleges.

Such subjects as could not be readily classified under agriculture, engineering, or home economics have been brought together in Part II. They include the liberal arts and sciences, agricultural economics, rural sociology, industrial journalism, military training, physical education, and education in the negro land-grant colleges.

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PART I.-HISTORY AND EDUCATIONAL OBJECTIVES

INTRODUCTION

By WALTON C. JOHN

Assistant Specialist in Higher Education, U. S. Bureau of Education

For more than a quarter of a century the United States has witnessed a period remarkable in the variety and the extent of its scientific achievements. This is all the more apparent if we compare developments in the fields of agriculture, engineering, and their allied sciences and industries with those of the preceding period. Likewise a new and scientific basis for American home life has developed largely on account of the contributions of the relatively new science of home economics.

To a large degree these advances and achievements reflect the influence of the colleges and universities-established under the Morrill Act of 1862 and subsequent acts of Congress. In view of the growing influence of these institutions, which has been especially marked during the past 10 or 15 years, it is especially appropriate that a survey of their educational progress should be made at this time.

The economic, scientific, and social forces working for more than a century in this country have exerted a very great influence on the type of higher education now found at the land-grant colleges. These forces are reflected in the subject matter of the curricula in the several fields of the liberal arts and sciences, of agriculture, of engineering, and of home economics.

THE GROWTH OF AGRICULTURAL "EDUCATION

The theories and practices in agriculture in vogue immediately prior to the Revolutionary War showed little advance over those of medieval times. But with the rapid growth of agricultural activity immediately following the period of territorial expansion into the great Mississippi Valley, social and economic conditions seemed to

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demand a more practical education than that offered by the classical colleges of the day. These colleges for nearly two centuries had trained the leaders of the Colonies and the Nation, and had successfully filled the learned professions, the legislatures, and the pulpits, But meanwhile there had arisen a powerful demand for trained mento attack the national problems of agriculture, transportation, industry, and of commerce in general.

The most important influence in the early movement for agricultural and industrial education came from the farmers, who organized agricultural societies in nearly all the Eastern and Middle Western States. The New York Society for the Promotion of Agriculture, founded in 1791, and the Massachusetts Society for the Promotion of Agriculture, founded in 1796, were typical of this movement. Important agricultural societies existed also in Michigan, Pennsylvania, and Maryland, and in the South. These societies by virtue of their funds developed a new agricultural literature dealing with current problems, and, furthermore, encouraged the establishment of agricultural schools.

In a sense, these State societies culminated in the United States Agricultural Society, established in 1857, which 'urged Congress to grant 500,000 acres of public land to encourage agricultural education.

Another influence favoring agricultural and industrial training was the establishment of a large number of manual-labor schools in the East, South, and Middle West. The principal model for many of these institutions was Fellenburg's Agricultural School at Hofwyl, Switzerland, founded in 1807. Likewise manual labor was introduced into a number of high-grade literary institutions, largely through the work of the Society for the Promotion of Manual Labor in Literary Institutions, founded in 1831 by Theodore Weld.

These influences, coupled with the increasing demands for persons of superior technical training, made it possible for leaders like Jonathan B. Turner, of Illinois, and Senator Justin S. Morrill, of Vermont, to crystallize this growing sentiment into the passage of the Morrill Act, which was signed by President Lincoln July 2, 1862.

Three agricultural colleges now flourishing anticipated the general movement throughout the country, namely, Michigan Agricultural College, founded in 1856; Maryland Agricultural College, in 1856; and Pennsylvania State College, in 1859.

After the establishment of the land-grant colleges the study of foreign agricultural schools was still continued. Among the foreign institutions studied by leaders of this movement was the Agricultural Institute of the University of Jena, in Saxe-Weimar. The institute offered a curriculum in agriculture, but it was possible for students to pursue a thorough course in the principles of any of the sciences

1

which were offered by the university proper. Scientific courses were offered in agronomy, animal husbandry, soils and fertilizers, farm management, and other important subjects. The fundamental studies, such as chemistry, botany, zoology, physics, and meteorology, were also required. Mechanics and the elements of surveying were included in the course of study. Adequate library facilities, in addition to a farm of 1,400 acres, were available for the students' use.

Dr. E. Pugh, the first president of the Agricultural College of Pennsylvania (1859–1864), called attention to three other types of agricultural schools in Europe: First, the agricultural schools which are separate from the university but give instruction in languages and mathematics; second, those offering a scientific course without instruction in languages and mathematics, and whose principal aim is to prepare farm superintendents; third, those which eliminate languages, mathematics, as well as manual labor, the aim being to instruct the ordinary farmer.

Although the study of these foreign institutions was to some extent helpful to those persons who formulated the educational programs in American agricultural colleges, the more important influences were those which came from Darwin's great contribution to biology and to the scientific movement in general, and from Leibig, whose chemical research set the pace for similar scientific activities which finally culminated in the agricultural experiment stations.¹ The modern curricula in agriculture have their foundations firmly laid in the original and comprehensive studies made by these stations.

Furthermore, the bringing together of the engineering school with that of agriculture under one organization was of great value in that it served the agricultural theorists and experimentalists in the development of exact standards and in the more vigorous determination of the educational values to be derived from the newly organized subject matter of the agricultural sciences.

INFLUENCE OF THE ASSOCIATION OF LAND-GRANT COLLEGES

A factor of long-standing importance in developing standards of agricultural and technical training was the Association of American Agricultural Colleges and Experiment Stations, now known as the Association of Land-Grant Colleges. It was organized in 1887 with the object of considering and discussing "all questions pertaining to the successful progress and administration of the colleges and stations included in the association." It has been a leading agency in promoting the success of the land-grant college work. Nationally it is one of our most powerful educational organizations, especially in Federal legislation bearing on education.



Justus von Leibig published in 1840 his epoch-making work, entitled "Organic Chemistry Applied to Agriculture and Physiology."

GROWTH OF ENGINEERING EDUCATION

At the beginning of the nineteenth century the École des Ponts et Chausses and the École des Mines were the outstanding engineering schools of France. These institutions, in connection with the French military schools, gave Napoleon technically trained men who were invaluable in his campaigns. Other technical schools of importance existed in different parts of Europe, but their principal aim was to serve the military interests of their respective countries. However, the need for engineering education as understood to-day did not appear until after the invention in England of the steam engine and the subsequent demand, for all kinds of mechanical devices which were required to serve the new era of industrial expansion.

Among the first of the States to respond to this stimulus was New York, and the same organization and individuals that established the State agricultural societies and promoted agricultural schools in that State were equally active in promoting engineering education.

On recommendation of Gov. De Wibt Clinton, Stephen Van Rensselaer established in 1824 a technical school at Troy, N. Y. The purpose was to instruct "persons who may choose to apply themselves in the applications of science to the common purposes of life—to qualify teachers for instructing sons and daughters of farmers and mechanics by lectures or otherwise on the applications of experimental chemistry, philosophy, and natural history to agriculture, domestic economy, the arts and manufactures." In 1849 Rensselaer Polytechnic Institute raised its educational standards and the study of engineering science became its main objective.

It is apparent that before the Civil War leadership in engineering education was confined largely to a few privately supported institutions, such as Rensselaer Polytechnic Institute, Lawrence Scientific School at Harvard University, founded in 1847, and Sheffield Scientific School at Yale University, founded in 1860.² • Moreover, the excellent engineering training offered at the Military Academy at West Point, and the Naval Academy at Annapolis had its influence during that period.

Following the acceptance of the provisions of the Morrill Act by the several States, a new leadership in engineering education gradually appeared in the State-controlled universities and colleges. Notwithstanding the slow development of the land-grant colleges during the Civil War, the decade following was very productive in engineering science. This advance was well illustrated at the Centennial Exhibition held in Philadelphia in 1876.



^{*} From 1863 to 1892 Sheffield Scientific School received Federal ald under the Morrill Act.

Comparison of the developments of both agricultural and engineering education shows that in many respects their growth has been parallel and in a certain sense complementary. But the programs of engineering education have been modified less than those of agriculture; first, because of their earlier grounding in the well-established mathematical sciences, a fact which has tended to limit engineering studies to the collegiate field from the beginning; second, because engineering for a long time was confined largely to the civil and mechanical branches.

The marked differentiation of courses took place only within the past 35 years and was largely caused by the advances made in the electrical and chemical sciences. As soon as agricultural education laid a thorough foundation on the scientific bases of biology and chemistry through the broad agency of the agricultural experiment stations, the content and method of its subject matter began to show a stability similar to those of the engineering courses of study. Because of the slowly forming standards and the inadequate preparation of the students, much of the earlier agricultural work was secondary in grade.

- But agriculture not only has succeeded in establishing well-organized curricula, but it has enriched systematically the quality of its work and has extended the scope of its field of endeavor through the continual research of the experiment stations. And through the agency of the agricultural extension service the practical application of scientific agricultural knowledge has developed criteria of great value for education.

The effectiveness of these systematic contacts with scientific research and with agricultural life has not been overlooked in other fields. Through the movement to establish throughout the country well-equipped engineering experiment stations, engineering education is enlarging and deepening its sources. Because of the value of the contributions already made by the several State or privately supported stations, this movement has continually gained in strength.³

GROWTH IN HOME ECONOMICS

The education of women on an equal footing with men in the land-grant colleges led gradually to the establishment of technical courses of study or curricula particularly adapted to women's needs. As a result of the keen interest women have taken in opportunities for culture and service, home economics education is now generally considered one of the major educational divisions of these institutions, ranking with agriculture and engineering. Under the provisions of the Morrill-Nelson Acts of 1890 and 1907 home economics has been

Twenty-two stations were reported in 1923.



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considered as one of the economic sciences. Therefore, home economics has benefited correspondingly with agriculture and mechanic arts from the annual Federal appropriation of \$50,000 to each State. Furthermore, home economics has also been recognized by the Smith-Lever Act, which gave financial aid to home economics extension work as well as to agricultural extension through the agricultural colleges.

The college courses in home economics followed the trend of the earlier courses in agriculture; at first, they were to an extent utilitarian and not very scientific. Van Rensselaer, in 1824, included domestic economy in his plan for the institute which bears his name, and following that time a number of academies and colleges required women to work in the culinary departments and to undertake definite responsibilities under educational control.

From the beginning, Iowa State College made domestic science a part of the training for its women students. In 1875 a regular department of cookery and household arts was organized. In their relation to home economics teaching early recognition was given to physiology, chemistry, and other sciences. Later, the course included sewing and laundry work, scientific preparation of meals, comprehensive courses in cookery, and some instruction in the care of the sick.

In 1873 the Kansas State Agricultural College offered courses in sewing, and shortly afterwards added cooking and related branches. In 1874 the University of Illinois offered definite instruction in domestic science, and within a few years a large number of the landgrant colleges were equipped to give sound instruction in this important field, with increasing emphasis on the scientific bases in chemistry and physiology and other related sciences.

AIMS COMPARED

A distinction may be made concerning the present-day aims of the land-grant colleges compared with those of 1870. The scientific aim of that day was largely subjective; that is to say, the main interest was the organization of systems of scientific knowledge and procedure; to-day the scientific aim has become broadly objective, having in mind the development and the conservation of all our national resources, including a well developed theory and program of rural life, and it must minister not only to the professional needs of more than 30 highly specialized types of engineers, but to 50 or 60 professions in agriculture, home economics, and numerous other professional branches.

This increasing demand for so many types of professionally trained individuals naturally raises the question, To what extent in the future will the land-grant colleges become purely professional schools? On



the other hand, serious attempts have been made to overcome the difficulties arising from this professional trend and particularly in engineering, for as a rule highly specialized curricula are generally developed at the expense of the fundamental subjects and tend to weaken the student in those characteristics making for general strength and power of leadership.

SERVICE TO THE PUBLIC

The decade 1910-1920 was one of remarkable significance. Never before in the history of the world were so many forces—political, scientific, military, and educational—striving for world supremacy. The part played by the land-grant colleges and universities in determining these issues, in company with other higher educational forces, was highly significant and one which it is difficult to overestimate.

Suffice to say that the past decade has brought the public to realize the significance of well-trained leadership in the several fields of technical education. Of particular value also is the work the landgrant colleges and universities performed through the agricultural, home economics, and general extension work.

Indeed, through the extension service of some State institutions as many as 60,000 people, outside of the resident student groups, receive valuable and well-organized information based upon sound investigations and studies made by the resident teachers.

GENERAL SUMMARY

In these studies consideration is given to-- -

(a) The general relations of the land-grant colleges to the country at large;

(b) The general foundations underlying the several curricula and special courses of study offered in the land-grant colleges;

(c) The character of typical curricula in the principal educational divisions;

(d) The development and present status of leading specialties in agricultural, engineering, and home economics education, including the training of teachers;

(e) The growth of research, extension, and other extramural educational activities;

(f) The material growth of the institutions.

In preparing the outline of this study the editor has followed to a considerable extent the divisions and special topics contained in the land-grant college reports which are compiled annually by the Bureau of Education; he has also greatly benefited by the assistance given him by Dr. A. F. Woods, president of the University of Mary-



land, as well as by suggestions made by other contributors to the bulletin.

In order to secure some unity in the treatment of the large number of topics discussed in this study, the several contributors were requested to use the following general outline:

BUGGESTED OUTLINE FOR STUDY ON EDUCATIONAL DEVELOPMENTS IN LAND-GRANT COLLEGES SINCE 1910

1. Status of the educational specialty previous to 1910. A brief historical summary.

2. Development of subject matter for courses of study. Research.

3. Development of curriculum-its present status.

4. Important results.

5. Relation of educational output to present economic situation in the United States.

6. The future.

8

In no instances, however, was the outline allowed to interfere unduly with the best method of treating the particular topic. Indeed, there was a considerable variety of ways in which the outline was followed.

It is confidently believed that educators, as well as the public in general, will welcome the contributions in this survey, not only for their value but also because the work was done gratuitously by those whose time is largely occupied with other duties.

AN APPRECIATION OF SENATOR MORRILL

By J. L. HILLS

Dean of the College of Agriculture, University of Vermont, and Director of the Experiment Station

Justin S. Morrill was Representative and Senator from Vermont from 1854 to 1898. He represented Vermont; and its plain, thrifty folk held him to the task for 44 years.

He was the author of the first modern tariff law, upon which every subsequent protective tariff measure has been patterned. To him more than to any other man of his generation does our Capital City owe its superb architecture. However, his most enduring monument is not the classic edifice which houses the Congressional Library but the 69 land-grant colleges of which in every proper sense he was the father.

A country lad whose schooling ceased at 14, a village merchant with seemingly limited outlook, he came to sit among kings; and about his bier gathered the President and his Cabinet, the Supreme Court, Senators, diplomats, the mighty of this and other lands.





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He was simple in his tastes and modest in demeanor, and without brilliancy in debate. But when dealing with large affairs he showed such grasp of detail, breadth of knowledge, accuracy of information, and clarity of reasoning that leadership came to him naturally.

What other Congressman has been made sponsor for a great tariff measure within 6 years of his advent in Washington—or created a Federal system of higher education along new and untried lines within 7 years—or, indeed, in any direction thus early in his career so unmistakably stamped his imprint upon epoch-making legislation?

Senator Morrill looked the part. A splendid specimen of physical manhood, with finely modeled head and classic features, his was a notable figure on the Senate floor.

Few men in American public life have been more honored or more loved. It was no mere lip-service but just appraisal that led his long-time colleague, the late Senator George F. Hoar, of Massachusetts, to say: "We offer this man as an example of an American Senator . . . than which so far we have none better."

ATEDERAL LEGISLATION AND ADMINISTRATION PERTAINING TO THE LAND GRANT COLLEGES

By L. E. BLAUCH

Former Specialist in Charge of Land-Grant College Statistics, U. S. Bureau of Education

I. THE LEGISLATION

The evolution of the Federal legislation for the land-grant colleges presents an interesting and unique development in American educational history. An important feature in American government is the two sets of political machinery which have been erected covering the same territory yet distinct and more or less independent of each other in action—that is, one National or Federal Government and a number of State governments. In the arrangement which has been made, education has generally been conceded to be a matter to be provided for by the States rather than by the Federal Government. There have, however, been a number of times in the history of the Nation when the Federal Government exhibited an interest in education. Federal land grants have been made to the States to encourage public education of all grades, common school and higher education. Money grants have also been made to the States for the benefit of education.

By the middle of the nineteenth century the need for agricultural education had been brought to the attention of Congress in various 7805°-25†-3



ways. It remained, however, for the Illinois State Legislature to present to Congress a memorial which suggested a practical scheme to provide Federal assistance "for the more liberal and practical education of our industrial classes and their teachers."⁴ The outcome of the movement was the first Morrill Act, which was approved by President Lincoln on July 2, 1862.⁵

The First Morrill Act gave to each State 30,000 acres of public land for each Senator and Representative to which it was entitled in Congress. The States within whose borders there was not enough public land received land scrip⁶ to make up the balance. The money derived from the sale of these grants was to constitute an endowment fund the interest of which was to be used for the support of—

at least, one college, where the leading object shall be, without excluding other scientific and classical studies and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.⁷

The legislative assent of the State to the provisions of the act was necessary before the State could participate in the benefits of the act.⁸ Such are the general provisions of this outstanding law, which marked the beginning of a new era in American higher education. 'The institutions resulting from the Federal aid are now known as "landgrant colleges.'' They may be classified as follows:

State universities *	26
Other land-grant colleges 10	26
Institutions for colored persons	17
	80

The Hatch Act.—One of the most important difficulties which was encountered in the early days of the land-grant colleges was the lack of scientific material of instruction in agriculture and mechanic arts. It was in part to provide such material in agriculture, as well as to promote agricultural development in other ways, that a number of agricultural experiment stations were organized, beginning with provision for a model farm at the Maryland Agricultural College in 1856.

With the development thus begun came an agitation to strengthen the movement and to put it on a secure basis through Federal aid.

⁴ Quoted by I. L. Kandel in "Federal Ald for Vocational Education." Carnegie Foundation for the Advancement of Teaching, Bul. No. 10. p. 78.

Statutes at Large, vol. 12, p. 503.

[&]quot;"A negotiable certificate issued by the Government and entitling the holder to become owner of a certain amount of public land."-New Standard Dictionary, article "Land."

Statutes at Large, vol. 12, p. 504.

In 1866 the grant was extended to new States. Ibid., vol. 14, p. 208.

Including Cornell University in New York and Rutgers College in New Jersey.

¹⁰ Known by various names, as colleges of agriculture and mechanic arts, agricultural colleges, State colleges, polytèchnic institutes, etc.

As a result Congress passed the Hatch Act in 1887.¹¹ This act provided for an annual appropriation of \$15,000 to each State from the funds accruing from the sale of public lands, for use in continuing research and in verifying experiments in an agricultural experiment station which was to be established in connection with the State's land-grant college.¹²

Extensions of the first Morrill and the Hatch Acts.—Ten years after the enactment of the first Morrill Act a campaign was launched to secure additional Federal funds for the land-grant colleges. Following 18 years of effort the second Morrill Act was passed, under which the Federal Government annually appropriated, out of money accruing from the sale of public land, \$15,000 to each State and Territory for the further endowment and maintenance of its landgrant college or colleges, this amount to be increased annually by \$1,000 for 10 years, after which time the annual appropriation for each State and Territory was to continue at \$25,000.¹³

The annual appropriations for land-grant colleges were increased under what is known as the Nelson amendment to the agricultural appropriation bill for the fiscal year of 1908.¹⁴ Each State at present receives \$50,000 annually under the Morrill-Nelson appropriations.

Under the Adams Act, passed in 1906, the Federal subsidies for agricultural research were greatly increased.¹⁵ It gave to each State's for its agricultural experiment station for the year ended June 30, 1906, an additional appropriation of \$5,000 and increased this amount annually by \$2,000 for five years, after which time the annual appropriation to each State under the act was to continue at \$15,000. Under the Hatch and Adams Acts each State now receives \$30,000 a year.

Agricultural and home economics extension.—At the beginning of the twentieth century the land-grant colleges were differentiating and " extending their functions in a third direction—that of extension service, which was a part of a larger movement then developing to popularize education for adults along numerous lines. It required no great stretch of the imagination to appreciate that such a service, was clearly in keeping with the purpose of the first Morrill Act—

[&]quot; Statutes at Large, vol. 24, p. 440. Approved Mar. 2, 1887.

⁴ In all of the States the agricultural experiment station is under the management of the land-grant college, except as follows: (1) In Ohio the experiment station is entirely separate from the land-grant college; (2) in New York the Federal funds are divided between two stations, both of which are under one director and under the land-grant college board of trustees; (3) in New Jersey and Connecticut, each, there is a estate station and an agricultural college station, both under the same director. There are numerous branch stations in many States, but these do not receive Federal aid.

¹¹ Statutes at Large, vol. 26, p. 417. Approved Aug. 30, 1890. The reclamation act provides that, if the sales of public lands do not furnish a sufficient amount for the appropriations under the second Morrill Act, the deficiency shall be provided from any moneys in the Treasury not otherwise appropriated. (*Ibid.*, vol. 32, Part I, p. 388: Approved June 17, 1902.)

¹⁴ Ibid., vol. 34, pp. 1256, 1281.

¹⁴ Ibid., vol. 34, Part I, p. 63. Approved Mar. 16, 1906.

"to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."

The progress of the movement is indicated by the fact that in 1905 the Association of American Agricultural Colleges and Experiment Stations included among its standing committees one on extension work. The committee the next year recommended that each college of the association take steps to organize and develop a department of extension teaching or to promote such activity. In 1909 the association urged Federal aid for this work. Such aid was granted through the Smith-Lever Act, which appropriated money to each State to be used in conducting agricultural and home economies extension work from its land-grant college. Under it each State receives annually \$10,000, plus a share of an additional and annually increasing amount, apportioned to the several States on the basis of the rural population.

The Federal Government thus subsidizes the three forms of activity in which the land-grant colleges engage—that is, resident teaching, research, and extension work.

H. GENERAL PRINCIPLES

Several general features may be noted in the land-grant college legislation. One of these is the form of contractual relationship which was established between the States and the Federal Government. The first Morrill Act specified the use which was to be made of the fund to be derived from the land grant, and it laid down directions for the management of the grant. Before a State could become a beneficiary of the grant its legislature was required to accept the conditions and provisions of the act.

The contractual relationship was again implied in the Hatch Act in the requirement of State legislative assent to the purposes of the grants. Furthermore, in the same act Congress reserved the right to amend, suspend, or repeal any or all the provisions of the act. In this way the Federal Government is enabled to alter or repeal the act without committing a breach of contract. This latter provision was carried in all the later acts.

The acts clearly implied a duty on the part of the States to support the colleges and the experiment stations. It was not intended that the Federal grants should cover all the cost of the institutions. The first Morrill Act included a statement that a part of the fund not exceeding 10 per cent might be used to purchase land for sites or for experimental farms if such expenditure was authorized by the State legislature. A State was, however, expressly prohibited from using any portion of the fund or the interest thereon in any way for buildings.



The Hatch Act was "to aid" the States in their promotion of research in agricultural experiment stations. The act also implied that the States should supply facilities for research, and consequently it provided that of the first annual appropriation not more than \$3,000 might be used by a State for buildings to carry on the work of the station and that in subsequent years only \$750 of the annual appropriations could be so used. These small amounts were obviously not sufficient to provide the necessary quarters and facilities for a station.

The principle of the Federal grant in aid was carried further in the Smith-Lever Act by expanding the earlier relation into cooperation between the States and the Federal Government: Under it the several.States are required annually to match the Federal funds which, they receive in excess of \$10,000 a year, and the projects and plans are carried on with the specific approval of the Secretary of Agriculture or of his representative. Clearly the expressed interest of the Federal Government is thus more than that of merely donating funds; it emphasizes the partnership feature of a service to be rendered. The national as well as the local interest is thus provided for.

A second feature of the land-grant college legislation which may be mentioned is the method of making the appropriations. The first Federal appropriations for the land-grant colleges were made under the provisions of the Hatch Act. These appropriations were to be made from funds in the Treasury arising from the sales of public lands. It was provided, however, that the appropriations were "to be specially provided for by Congress in the appropriations from year to year." (Sec. 5.) The part of the annual fund for a State which remains unexpended at the end of the year is deducted from the appropriation to that State for the succeeding year. The Federal moneys for the agricultural experiment stations are carried in the annual agricultural appropriation bill.

Unlike the grants for agricultural research, those under the second Morrill Act and the Nelson amendment are continuing; that is, they continue without any further annual legislation. A similar statement applies to the Smith-Lever appropriations. There are, however, other Federal appropriations for agricultural extension, as will be explained later, which are not permanently appropriated.

A third feature of the land-grant college fegislation is the Federal administration. The first Morrill Act carried no provision for Federal supervision or administration. Each land-grant college was to make to each other land-grant college and to the Secretary of the Interior an annual report on its progress and work and the governor of each State was to report annually to Congress the state of the fund. There was no provision for a Federal agency to see to it that the States carried out the law properly. As a result there was great disappoint-



ment over the management of the fund in some of the States. Even the very records of the funds in several States were so confused that it became next to impossible to know what was the condition of the fund:

When the Hatch Act was passed, 25 years later, it gave to the Department of Agriculture advisory power, as follows:

That in order to secure, as far as practicable, uniformity of methods and results in the work of said stations, it shall be the duty of the United States Commissioner (now Secretary) of Agriculture to furnish forms, as far as practicable, for the tabulation of results of investigation or experiment; to indicate from time to time such lines of inquiry as to him shall seem most important, and, in general, to furnish such advice and assistance as will best promote the purpose of this act. (Sec. 3.)

Each station was to make a detailed annual report of its work to the governor of the State or Territory in which it was located, and a copy of this report was to be sent to each station endowed under the act to the Commissioner (now Secretary of Agriculture) and to the Secretary of the Treasury. Payment to the States was to be on the basis of the report submitted to the Secretary of the Treasury. Here is, therefore, a beginning of Federal supervision and administration in a very general way. No penalties were expressly provided for violation of the act, though it was probably possible for the Secretary of the Treasury to withhold payment.

The second Morrill Act was the first of the land-grant college laws to contain provision for Federal administration. It charged the Secretary of the Interior with the proper administration of the law, and payment by the Secretary of the Treasury to the States was to be made on a certificate by the Secretary of the Interior. In case the Secretary of the Inviror should refuse to certify a State or Territory he was to report the lacts and the reasons therefor to the President. The State or Territory could then, if it desired, appeal to Congress from the determination of the Secretary of the Interior. Under the act the treasurers of the respective colleges are required to report to the Secretary of the Interior and to the Secretary of Agriculture on or before the first day of September of each year, a detailed statement of the amount so received and of its disbursement. The president of each institution is also required to make an annual report to the Secretary of the Interior and to the Secretary of Agriculture on the condition and progress of the college. There is here shown an evident desire on the part of Congress for a closer restriction and supervision of the Federal funds than appears in the earlier acts. It indicates a greater consciousness of the national aspect of the institutions than do the previous laws. It was a step in the direction of a more businesslike handling of Federal funds for educational purposes.

Because the Hatch fund was not always applied strictly in accordance with the original intent of the act and because of the loose



Federal supervision which was set up under the act, Congress in 1895 inserted in the agricultural appropriation bill a statement that the Secretary of Agriculture should prescribe the form of the annual financial statement required by the Hatch Act and that he should ascertain whether the expenditures under the appropriation are in accordance with the provisions of the law and make a report thereon to Congress.¹⁶

Under the Adams Act the authority of the Department of Agriculture was enlarged and more specifically provided for, the Secretary being charged with the proper administration of the act.

The administration of the Smith-Lever appropriations was placed in the Department of Agriculture. Under it the additional sums above the first \$10,000 for each State are allotted annually by the Secretary of Agriculture to the several States on the basis of the rural population.

As has already been stated the administration of the 1862 andgrant and the Morrill-Nelson funds is under the Secretary of the Interior. Under the organization of the department this function has been delegated to the Bureau of Education. The act making the annual appropriation to the Bureau of Education of the Department of the Interior in 1895 provided an appropriation to secure the necessary information regarding "the operations and work of the colleges of agriculture and mechanic arts" which would enable the secretary to discharge his duties properly under the second Morrill Act.¹⁷ In 1902 the position of specialist in charge of land-grant college statistics was created.

The treasurer of each land-grant college makes to the Secretary of the Interior and to the Secretary of Agriculture an annual certified report on the Morrill-Nelson appropriation and on the land-grant funds, in case his institution has an income from the latter.¹⁸ The president of each college also makes an annual detailed report on the faculty, students enrolled, finance, etc., on blanks furnished by the Bureau of Education. On the basis of these reports the Secretary of the Interior certifies annually to the Secretary of the Treasury authorizing him to pay to the several States the funds provided by law, and on or before December 1, he reports to both Houses of Congress as to whether the several States have fulfilled the requirements of the law and as to whether he has certified the several States to



¹⁸ Statutes at Large, vol. 38, p. 271. Approved Aug. 8, 1895. The Adams Act of 1906 contained a similar clause.

¹⁷ Statutes at Large, vol. 28, p. 798.

¹⁰ Until 1912 the supervisory function of the Bureau of Education did not extend to the expenditures of the principal and interest of the 1862 land-grant fund. For 50 years each State administered the grant as it chose. On June 21, 1912, however, the Acting Secretary of the Interior ruled that the act of 1890 was supplementary to the act of 1862 and that consequently a State could be penalized for a violation of the latter by withholding its share of the annual appropriation under the later acts. The Commissioner of Education has since that date (1912) been requiring reports on the principal and interest of the 1862 landgrant fund.

the Secretary of the Treasury. In this way Congress is informed on the appropriation for the colleges.

The reports made to the Department of the Interior are carefully examined and edited and constitute the principal source of information for the annual report on land-grant colleges issued by the Bureau of Education.

In addition to examining, editing, and publishing the reports mentioned, the Bureau of Education, through the Commissioner of Education, makes all rulings regarding the interpretation of the acts. and the expenditures which may be allowed. It has consistently . taken the position that the State should determine the most appropriate distribution of the Morrill-Nelson funds to meet their respective needs, provided the requirements of the acts are met. For example, the Bureau of Education has never held that a definite por-So long as a satistion of the funds must be spent for agriculture. factory department of agriculture is maintained by the college and does not violate the requirements of the acts no objections are raised. On the other hand, the bureau has not hesitated to disallow from the Morrill-Nelson funds expenditures for salaries of persons teaching subjects not mentioned in the law or for salaries of persons found incompetent to do their work.

In a general way the Bureau of Education has worked with the land-grant colleges mostly at long range and through written reports. It has taken the position that according to the law the States should determine their own educational policies. It has exercised only rarely the right of visit and search. Undoubtedly this is an important field in which the bureau could more effectively assist and serve the land-grant colleges if adequate funds were available for such work.

The administration of the Federal funds for agricultural research and for the agricultural extension service is under the Department of Agriculture. For a number of years the experiment station work was conducted under the Office of Experiment Stations, which was established soon after the passage of the Hatch Act. This office promoted in a very effective way the agricultural experiment stations of the country. It originated the Farmers' Bulletins and developed the Experiment Station Record. The latter of these publications gives summaries of studies in the stations and in similar institutions throughout the world and it includes editorial articles and news • regarding agricultural research.

After the enactment of the Smith-Lever Law the States Relations Service was organized in the Department of Agriculture. Among other services, the new division included the Office of Experiment Stations and two Offices of Extension Work, one for the 15 Southern States and another for the 33 States of the North and the West.

The Department of Agriculture has recently been reorganized, and the supervision of its activities is grouped under three directors charged respectively with scientific work, extension, and regulatory service. The States Relations Service has been discontinued. The Office of Experiment Stations and the Office of Extension Work are continued under the respective directors.

The Federal Government now supports agricultural extension work through three funds. The forerunner of the service under the Smith-Lever Act was the Farmers' Cooperative Demonstration Work which was organized in the Southern States to combat the Mexican cottonboll weevil. The Smith-Lever Act contained a clause which stated that the act was not to be construed to discontinue the Farmers' Cooperative Demonstration Work, and accordingly there is now a Federal appropriation for such service.

During the World War an emergency appropriation was added to the Smith-Lever appropriations. Congress consequently in 1919 made a supplementary appropriation of \$1,300,000 to be expended on the same terms and conditions as the regular Smith-Lever appropriations.¹⁹ Thus three funds for agricultural extension are administered by the Department of Agriculture. For the fiscal year ending June 30, 1924, the following amounts have been appropriated:

For Farmers' Cooperative Demonstration	Work	\$1, 284, 350
Supplementary to Smith I		4, 580, 000
supprementary to Smith-Lever funds		1, 300, 000

The several States have entered into an agreement with the Department of Agriculture whereby all the work of the department relating to agricultural extension in the States is conducted through the Division of Extension.

A number of years ago the experiment stations began to organize their work into definitely planned projects. At present the Adams fund is administered by the Department of Agriculture entirely by projects, and the Hatch fund is also in large part managed on the same basis. The Office of Experiment Stations now compiles annually a classified list of -projects which are being carried on by the stations.²⁰

This method has helped to bring order and system into agricultural research, and it has made possible the coordination of the work of the several stations by the department. The method, together with the publication of the Experiment Station Record, has gone far to establish a well-coordinated system of agricultural experimentation from a national point of view.

The extension funds are likewise administered on the project basis. Under the scheme of cooperation between the States and the Federal



[&]quot; Statutes at Large, vol. 41, Part I, p. 261.

[&]quot; In 1921 a total of 4,770 separate projects was listed, an average of about 95 per station.

Government, which the Smith-Lever Act provided, each State submits to the Secretary of Agriculture plans of work for the ensuing year. After these plans are approved by the Secretary, the State is certified for its share of the Federal appropriations for the next 6 months.

Under the various acts mentioned above the several States submit detailed annual reports to the Department of Agriculture on their activities. The land-grant colleges are also systematically visited by members of the Department of Agriculture and the work is carefully gone over. All vouchers for Federal funds involved in the projects are examined. The Department of Agriculture thus exercises close supervision over the agricultural research and the agricultural extension work which is conducted by the States aided by the Federal Government.

THE LAND-GRANT COLLEGES IN RELATION TO NATIONAL DEVEL-OPMENT

By E. D. BALL

Director of Scientific Work, U. S. Department of Agriculture

A critical study of the development of the Nation during the last century will show that the most rapid increase in population did not begin until about 1870, when the policy of distributing the public domain to the veturning soldier, the homesteader, and even through the agency of the timber claim and the railroad grant, was inaugurated, This led to the rapid development of an exceedingly rich and fertile area in the upper Mississippi Valley. At the same time there was a rapid improvement in the method of harvesting and threshing of the grain crops, which was found applicable to and adopted by the producers on these broad and fertile acres. This increase in the possibility of food production by a given individual reacted immediately in the form of a stimulation of commerce and industry. This was the era of railroad building, of town and city development, of the increase in manufacture of steel and iron, in the consumption of lumber, and of general industrial progress, which in turn developed markets for the continually increasing production.

About 1900 a second stage in this era of development was reached. The large areas of rich and fertile land available for settlement were practically exhausted. Small areas of less desirable land scattered throughout the region were gradually taken up. Agriculture was pushed into regions of greater frost and drought hazard; irrigation and drainage projects contributed other areas; but the sum total of new land coming into cultivation only a little more than balanced the areas that were constantly being given up through soil exhaustion, erosion, or to the needs of the growing population. Most of our cities

were established in the rich and fertile river valleys, and their growth' steadily eliminated highly productive areas. The development of highways, railways, and electric lines, of parks and pleasure grounds, of golf courses and cemeteries, all contributed to the reduction in the productive area. This became such an important factor that in the last decade 20 of the older States actually decreased in agricultural area, while the greater gains were practically all made on the border zones of profitable production, where either the drought or the frost hazard, or the cost of clearing or otherwise reclaiming the land, made the undertaking expensive or hazardous.

The land-grant colleges were largely founded in the period following 1870, practically coincident with the period of most rapid national development. They were, however, small and struggling at this time, and with a few notable exceptions their influence on this development was not marked.

By 1890 the concentration of production and the increased transportation facilities had combined to produce the inevitable complication of the agricultural problem. New weeds, pests, and diseases had been introduced and widely disseminated; continuous cropping had brought on soil problems, and troublesome marketing factors were beginning to develop. Overproduction was reducing prices, and the problems of decreasing the overhead and lowering the cost of production were attracting attention.

The colleges by this time had become firmly established and were finding their field. The establishment of the agricultural experiment stations a few years previously had already resulted in the accumulation of a small amount of tested knowledge and had opened up wide fields for investigation. This strengthened the college teaching, which again reacted favorably on the quality of the research, so that by the approach of the critical period following 1900, when acreage increases were not keeping pace with population, the land-grant colleges were in position to make their major contribution to the problems of production. It has been largely as a result of their efforts that an adequate food supply has been maintained up to the present time.

We are, however, rapidly approaching a third period in our national history when the acreage readily available for production purposes will have been utilized and the increases will scarcely more than offset the losses. At the present rate of progress that period will arrive within 15 or 25 years, and the United States will become a foodimporting instead of a food-exporting nation unless extraordinary efforts are made to increase production upon the present acreage.

A study of the rate of development of the European nations that have reached the food-importing stage indicates that we may expect at that time a material slowing up in our national progress. Whether



this will happen or not will be largely determined by the national attitude toward the development of those agencies which contribute largely to agricultural and industrial development, chief among which are the land-grant institutions.

During the last half century the major effort of all such agencies has been to increase the production per man. In agriculture the acres were for the time being unlimited. The amount of production was only limited by the man power. In the industries the raw material was abundant, and production was again limited only by the efficiency of the individual. As the result of the national concentration on this phase of the problem, one individual in America will produce four times as much food as would be produced by a worker in any of the European countries; and a fairly similar situation exists with reference to the products of industry. On the other hand, the average production per acre in this country is less than one-half that of England, France, or Germany. In the industries ... n approximately similar situation exists. If America is to continue to grow and develop with anything like the rapidity of the past century, it will be necessary for all agencies to concentrate their efforts on the development of an increased supply of food and raw materials from the acres under cultivation, and this without decreasing the production per individual. In the same way in the industries it will be necessary to increase the effectiveness and utilization of the raw materials without decreasing the efficiency of the individual worker.

If we study the history of Germany for the last 50 years, we will note that Bismarck at the beginning recognized the problem confronting that nation and turned every facility of government to its solution. Germany spent five dollars to any other nation's one in the development of education and research in agriculture and industry. She was able to interest the most brilliant minds of her own nation in the solution of these problems and even to attract the outstanding men of other nations. She built up the dye industry, the steel industry, and the fertilizer industry. She increased agricultural and industrial production and entered into a career of development of wealth and power far beyond that of any other of the adjoining nations. While she never succeeded in becoming a self-sustaining nation, she approached so near it as to make herself practically independent of the other powers.

The land-grant colleges as at present organized contain all of the essential elements necessary for the solution of similar problems for this Nation. That they will contribute much is unquestioned. Just how much will depend to a large extent on how clearly they vision the problems and organize themselves for their solution. It is entirely possible to increase the production on the present acreage to a point where it will furnish the food supply for a normal increase

in population of the Nation for at least a century to come and at the same time furnish the raw materials for a proportionately expanding industry, so that the Nation as a whole may continue to grow and prosper as it has in the past:

If, however, this goal is to be accomplished, all of the sciences related to agriculture must contribute their maximum service to its future development. There must be better plants and animals, still better cultural methods, better tools and machinery, better organization, and better transportation. Those sciences contributing to an industrial and engineering development must devise better utilization of our raw materials, reduce the power cost, the fuel cost, and They must in many ways increase the efficonstruction costs. ciency of our utilization of the forces of nature. Those sciences which contribute directly to the development of the home and social life must develop a more highly efficient home organization. This in turn will result in the possibility of a better social organization that will in the end result in a more efficient functioning of every component of our increasing population. Those sciences that contribute to the solution of the economic problems must in the same way develop more efficient forms of organization and distribution, more sources of information and prediction.

The land-grant colleges must become State leaders in fact as well . as in name. They must organize for cooperation of all the forces within the State necessary for the solution of the problems of the local industry, however large or small. They must also represent the State in providing for interstate and national cooperation of all the forces necessary to the carrying out of great national or international programs. They must continue their leadership and even increase their efforts to develop the proper educational facilities for the solution of agricultural and industrial problems. They must recognize that the educational leadership carries with it other responsibilities; that by virtue of this educational and research leadership they are in most cases the only agency in the State competent to render the service necessary to the organization of new lines of agricultural and industrial effort or to the redirection and development of old lines, and that if they fail in this latter function they have to a large extent failed in their responsibility for the State and National development. It is true they may plead that that, function has not been specifically assigned to them, but it has not been specificially assigned to anyone else because no one else is in position to assume it. It is not so much their duty as it is their opportunity.

The land-grant colleges as a whole are rendering a splendid service to the State and Nation. This service is at the present time, however, very largely local and individual—that is, one department or



division will be assisting in the development of a certain phase of an This may be either as a result of its own investigation in industry. which it discovered the need for assistance or may be in answer to the direct appeal from the industry concerned. In the aggregate these fragmentary contributions have resulted in a tremendous development of State and National resources. If, however, we are to meet the problem of continuing the present rate of development of our Nation, there must be a much more highly organized effort along They must not only help industries that are established this line. and in position to call for help but they must look over the field of opportunity and assist in creating industries. They must not only render assistance on a particular phase, as requested, but be in position to recognize where assistance is needed and what divisions of the institution should cooperate in the service.

If we are to maintain and even increase our present high standard of living and at the same time meet the competition of other countries, we must not only meet the superficial and local problem but we must so organize as to be able to carry out projects that can only be accomplished in a national way. The eradication of animal and plant diseases, of insect pests, are national and sometimes international problems in which there must be whole-hearted cooperation of the different States or the project is impossible. Many of our most serious pests and diseases can, with the expenditure of relatively insignificant sums of money, be entirely eliminated, and the consequent increase in efficiency be counted as a contribution to the possibility of our national development. The constant menace of yellow fever to the human race, of the foot-and-mouth disease to our cattle, and of canker to our citrus industry has been eliminated. Other eradication programs are under way, and have already progressed sufficiently to give every encouragement of final success. There are, however, many more pests and diseases that should ultimately be attacked in the same way that are at the present time serious handicaps to maximum production.

In the same way there are great national problems for the consideration of the engineers. Shall we forever continue like China to allow the flood waters of our largest river to continue to be an instrument of death and destruction in the lower levels, when if they were retarded at the source they might instead become tremendous elements of increased efficiency in agriculture, commerce, and industry? We are even now attempting to work out a plan for utilization of the waters of the Colorado, a beneficial and important step, but only one of a large number of similar problems that the engineering forces should have under consideration. We are using up our natural resources in coal and oil at a tremendous rate and allowing the major portion of the potential water power of the Nation to remain un-



harnessed. Our economic organization should consider the possibility of reorganization of commerce and industry so as to eliminate wasteful and useless transportation costs. Our national supply of hides comes largely from the Mississippi Valley and the great West; from there they are shipped to New England to be made into shoes, to be shipped back to the western region again. In the same way the great wool-producing regions of the West ship their products to Pennsylvania to be made into yarn, to New England to be woven into cloth, to be returned to the western wearer. Hotels in the heart of the western range advertise that they use only meats from the packing houses of Chicago and Omaha. New York and Michigan fruits are shipped westward, and the western fruits are shipped to the, Atlantic seaboard. The ultimate consumer pays the freight, but the Nation as a whole loses in its economic efficiency thereby-loses not only in the cost of the additional service but still more in the impossibility of the railroads to furnish adequate service to take care of the perishable crops which must be moved or lost. We have in the past left very largely to private initiative the development and utilization of our natural resources. These have in many cases been exploited by exceedingly wasteful and destructive methods that allowed more immediate return to the individual but gave no heed to the future requirements of the Nation. We are already bitterly realizing this in the case of our forests. The same wasteful methods are, however, being employed in the coal mines as well as in the oil, gas, and other industries founded on natural products.

The national program should not only concern itself with the encouragement of more economic processes of development of these natural resources but should be so organized as to be constantly seeking the possibility of development of new industries and more economical utilization of raw materials and waste products in old industries. We are now studying the possibilities of new plants and animals and improved varieties of old ones for agricultural purposes. We should in the same way study the problem of the wild fowl, of; our fur farming, of the possibilities of the production and utilization of fish, frogs, crayfish, clams, and the diverse things on which these animals feed, with an idea of a more complete and efficient utilization of our forest, desert, bog, and water resources. More attention should be paid to the utilization of wild-plant life of our desert, swamp, and other nonagricultural areas. Many of these plants have been studied for their ultimate chemical constituents, but no effort has been made to obtain these products in sufficient quantities so that their possible uses might be studied and developed. When it was found that furfural could be made from corncobs, it reduced the price of that article to one-seventieth of its former cost, but even then the market demand was limited. The reduction in



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the cost of this substance, however, stimulated investigation into the possibilities and opportunities of extension of its uses. This has resulted in many noteworthy discoveries, increasing its field of usefulness until it bids fair to be a standard product of large commercial importance. Who knows but what equally valuable results might be obtained from a similar investigation of the milkweed, the ragweed, the cactus, the sagebrush, and the mesquite, or any one of a hundred other of our common weeds or shrubs? We have recently developed a tea from the yaupon said to be equal to the best quality of the South American yerba maté. We are also again investigating the rubber possibilities of our native vegetation.

In the same way we should investigate the possibilities of utilization of deposits of peat, clay, stone, cement, and other similar materials. There are other great chemical and engineering problems that have baffled the ages, such as the direct utilization of the nitrogen of the air, the heat of the sun, and the energy of the tides. The discoveries of each decade open up tremendous possibilities that are fruitful in the development of industries in the decades to follow.

The land-grant colleges, distributed as they are throughout the length and breadth of the Nation, with an organization capable of service in the agricultural, industrial, and commercial development of their various regions, are in position to render a tremendous service in national development. If they recognize their responsibility in the matter, make every effort to secure and retain men and women of outstanding vision and leadership in the different lines of activity, and so organize as to bring this tremendous force to the solution of the major problems as they arise, a continuing and satisfactory national development is assured.

THE LAND-GRANT COLLEGES AND EDUCATIONAL VALUES

By A. A. POTTER

Dean of the Schools of Engineering, Purdue University

The land-graft colleges have developed on the part of the States a sense of responsibility for technical education and a realization that education is a developmental function in which the State and the Nation may take an active part. They have perfected a type of technical training upon which is dependent the permanent welfare of the people. Agriculture, industry, and home making form the basis of national prosperity; these have been greatly benefited by the educational, research, and extension activities which have been carried on by the land-grant colleges. The majority of the leaders in agriculture and in home economics have been and are being trained at these institutions. Notwithstanding the fact that formal



instruction in engineering was given in 1824 at the Rensselaer Polytechnic Institute, and that several of the oldest and best schools are privately endowed, by far the largest number of the engineers in the United States have been trained in the land-grant institutions, including those which are also State universities.

Comparisons have been made between the "old classical type" of education and that which prevails at land-grant colleges. Those favoring the classical type of education usually claim that technically trained men and women lack general information and are less cultured than the graduates of classical colleges. Prof. George Filmore Swain, of Harvard University, in discussing both types of education, states that he has not found that graduates from colleges of arts, as a rule, are able to speak or write the English language more correctly, or have any better disciplined minds, or are any better informed on general topics than the graduates of engineering schools. He says:

If I may define culture, I may admit that it should be the aim, but if the work means only an external smoothness and roundness of outline without regard to intrinsic qualities, it is a sham * * If I may define culture as a system of training which brings into intelligent activity all the best powers of mind and of the body, which teaches him to study, and which develops in the student the power of attacking a new subject or a new-problem, I would admit this sort of culture to be the aim of education; but this is discipline and not what is usually termed culture.

Much depends, no doubt, upon the individual student and upon his teachers. Either type of education may result in promoting intellectual growth and in developing the inherent powers of the student.

In the land-grant colleges and other institutions similar in scope the students may choose schools or divisions, such as the school of agriculture, the school of engineering, the school of home economics, or the school of science. This makes for coherent work, as the curricula of the several schools are generally prescribed and rigid. However, in some institutions electives in any school are permitted, but such electives are carefully restricted so that the student is bound to occupy himself with subjects of fundamental importance and which are of permanent value to him in his chosen career.

One of the most important aims of education is to train men and women who can think clearly and correctly. The land-grant colleges during the earlier years of their existence trained men to do things and stressed the value of practical education. The tendency has been to place too much emphasis upon studies which lead to the greatest usefulness immediately after graduation. During the past decade or so the utilitarian place has been giving way to the idealistic. Those directing the policies of land-grant institutions have been stressing



the training in the fundamentals, have been reducing the number of informational courses, have been discouraging the development of the memory or of the skill of a student at the expense of reasoning power, have been trying to awaken the creative instinct of the undergraduate, have been stimulating in him independence of thought and self-reliance, and in the furtherance of these ends have placed a high valuation upon good teaching. It is being realized that the greatest asset of an institution of learning is its teachers, and increasing attention is being given to the technic of teaching.

The land-grant institutions, including a number of State universities, have not been satisfied with teaching or with the conservation of knowledge as their only function. They realized that efficient technical instruction must find expression in the application of scientific research and have encouraged their teachers to become interested in extending the boundaries of scientific knowledge. The agricultural experiment stations of these institutions created definite agricultural knowledge, which has greatly improved agricultural instruction and has contributed to efficient agriculture.

The land-grant colleges, which rest upon the foundations of State and National beneficence, realize that the stability of a democracy depends upon the prowess and qualities of the people. The type of education which is represented by the land-grant colleges has strength-* ened the character of thousands of men and women by developing in them the power of scientific analysis, so that they are able to approach every problem with an open mind, without prejudice and without preconceived ideas. All the curricula of the land-grant institutions have a disciplinary value in teaching the student industry, seriousness of purpose, and the necessity of useful service to humanity. Some of the curricula have developed in students accuracy, system, and thoroughness; other courses have instilled a love for nature and an appreciation of the responsibility of the individual to his community; the home economics curricula have resulted in improving the homes of the Nation by bringing about a greater realization on the part of the young women of the nobility of home making as a career and a keener interest in home economics education.

Prof. Arthur James Todd, in the preface to his Theories of Social Progress, makes the following comment: "If humanity is to hold the threads of its own destiny and rise from ages of blind drift to a plane of mastery, it will be through discovering and utilizing new types of education."

The land-grant colleges, the foundations for which have been laid, by the Morrill Land-Grant Act of 1862, by developing a new type of education, have endowed large numbers of men and women with special technical knowledge to perform useful service to humanity.



ANALYSIS OF CURRICULA AND STATISTICAL SUMMARY

By WALTON C. JOHN

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Since 1910 a number of educators have made careful studies of the curricula in agriculture, engineering, and home economics. Some of these studies bring out in detail the quantitative relations of the courses, particularly with respect to the proportion of time given to the different subjects. In other studies the quality of the content of subject matter and question of curriculum organization are discussed. The following are some of the more important contributions:

Agricultural education: American Agricultural Colleges, by Dr. C. D. Jarvis, former specialist in agricultural education, United States Bureau of Education, published in 1918; the Curriculum of the Colleges of Agriculture, by Carl. R. Woodward, Rutgers College, State University of New Jersey, published in 1920. Both of these studies were published by the United States Bureau of Education.

Engineering education: A Study of Engineering Education, by Dr. C. R. Mann, published in 1918 by the Carnegie Foundation for the Advancement of Teaching; the Report of the Committee on Chemical Engineering Education of the American Institute of Chemical Engineers, published in 1922; the Report of the Committee on Technical Education of the Mining and Metallurgical Society of America, published in 1921; Report of the Conference on Education for Highway Engineering and Highway Transport, by F. L. Bishop and W. C. John, published in 1921, by the United States Bureau of Education; the Proceedings of the Second National Conference on Education for Highway Engineering and Highway Transport, published in 1923 by the Highway Education Board, Washington, D. C.

Home economics education: Home Economics Courses and the Higher Institutions of Learning, by Dr. Agnes Fay Morgan, University of California, "School Review," September, 1920.

Home Economics in College and University, by David Snedden, "School and Society," January 15, 1921.

A Comparative Study of Home Economics Courses in Colleges, by Jean Krueger, "Journal of Home Economics," June, 1920.

The College Course in Home Economics, by Elizabeth C. Jenkins, "Journal of Home Economics," July, 1917.

The foregoing list does not include the many studies and reports found 'in respective journals of the various technical educational societies.



PROPORTION OF TIME GIVEN TO SUBJECTS

TABLE 1.—A comparison of the distribution of the requirements for graduation in agriculture and in engineering

· ·	Subjects	Agricul- ture 1	Engineering
Vontechnical subjects: English Foreign language Mathematics		Per cent 6.8 2.7 2.4	Per cent 6. 7. 13.
Pure science (chemis Social science	ysical education	4.7 5.6	4
Total		46. 6	48.
Cechnical subjects (a) General technica (b) Agricultural subj	subjects or applied science	(42. 7) 6. 2 36. 5	50.
Total		42.7	50.
Electives. Total requirement		10.7	2. 100.

¹ These data are based upon the study made by Jarvis in 1918; the figures according to later comparisons hold true for 1920.

¹ Analysis made by the editor in 1920 of civil engineering curricula in eight land-grant college angineering schools: Iowa State College, Purdue University, Massachusetts Institute of Technology, University of Delaware, University of Wisconsin, University of Maine, Agricultural and Mechanical College of Texas, Oregon Agricultural College.

The study by Woodward exhibits the following table:

TABLE 2.-Time given to the different classes of subjects

Subjects		Per cent
Academic		22
Scientific.	26.4	24.
Special agriculture	12.5	
Total agriculture		38.
Free electives		14.
Total		100.

According to the foregoing table the proportion of time devoted to the academic and scientific subjects is 46.5 per cent, or virtually the same as the figures given in the preceding table for the curricula in agriculture and slightly less than the figures for civil engineering. The time devoted to technical subjects in civil engineering is approximately 7 per cent more than for those in agriculture, without taking into consideration the much larger proportion of free electives allowed in the agricultural curricula.

1ABLE 3.—Distribution of time for the subjects required for engineering (four-year courses of study)	graduation in mining
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	Subjects	Per cent
 English, histor Physical trainin Mathematics, of Geology, miner Mining and me 	economics, foreign language ; electives emistry, physics, and mechanical drawing ogy, surveying, civil, mechanical, and electrical engineering.	9. 4. 35. 26.
Total	and By, mereding more	23.0

. Based on report of committee on technical education, Mining and Metallurgical Society of America, Sept. 30, 1921.

If this table should be interpreted according to the plan of the preceding tables, we would find that approximately 50 per cent is devoted to nontechnical subjects and 50 per cent to technical and mining subjects. However, according to the method of the committee on technical education, numbers 3, 4, and 5, in the foregoing table,21 are all considered as purely engineering subjects.

Thus it appears that the percentage of time devoted to technical subjects in mining engineering is about the same as for civil engineering.

DISTRIBUTION OF HOURS FOR SUBJECTS IN CHEMICAL ENGINEERING CURRICULA

Inasmuch as the investigation made by Dr. A. D. Little's com-, mittee is based upon the study of the number of clock hours required in lectures and laboratory for the several subjects, it is difficult to make an exact comparison of the data of his report with the data given elsewhere in this article. However, in view of the value of this investigation a short discussion is included here.

According to Doctor Little's study the average hours in lectures and laboratory for 73 institutions are computed as follows:

Subjects	Lectures	Labo- ratory	and labo ratory
A English Languages Mathematics Physics History Miscellaneous	158 181 303 153 102 321	None. None. 135 None. None.	158 181 303 220 102 321
Mechanics. Elementary engineering. Civil engineering. Mining engineering. Sanitary engineering. Industrial engineering. Chemistry. Total (60 per cent).	109 41 306 42 78 65 56 93 650	86 45 287 80 82 77 60 None. 1, 148	1, 285 132 633 500 855 110 103 863 1, 124

TABLE 4.—Average number of hours assigned to major subjects a

• Based on Exhibit E of the report of the committee on chemical engineering, American Institute of Chemical Engineers.

This column has been added to the table by the editor. The number of hours in laboratory have been. added to the number of lecture hours on the basis that two hours of laboratory are equivalent in academic wedit to one hour of recitation or lecture with proper preparation.

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" Based on report of committee on technical education, Mining and Metallurgical Society of America Sept. 30, 1921.



HIGHWAY ENGINEERING AND HIGHWAY TRANSPORT

The curriculum in civil engineering was studied carefully at the Second National Conference on Highway Engineering and Highway Transport with a view to adapting it to the new demands of National and State highway programs and the related problems caused by the great development of automotive transportation within the past ten years.

Ten educational committees reported and recommended a number of quantitative adjustments, including also vital changes in the content of the curriculum. The methods used and the results obtained by the several educational committees are worthy of careful study by educators interested in curriculum reorganization.

HOME ECONOMICS

With respect to education in home economics, it would appear that the proportion of time given to the liberal arts and sciences is considerably more than that given to the technical courses.

According to the best information available, 60 per cent of the courses are in nontechnical subjects and 40 per cent in technical home economics subjects, on the average.

GENERAL DIVISION OF SUBJECT MATTER

The various studies concur in showing that the majority of curricula in agriculture and engineering, as well as in home economics, include the nontechnical subjects in the freshman and sophomore year courses, leaving practically all of the work of the junior and senior years for technical specialization.

. With these facts in mind and considering the influence exerted over the secondary school curricula through the college entrance requirements, a great opportunity presents itself for the study and improvement of the coordination and sequence of the subjects required in the last two years of high school and the first two years of the college.²²

The consideration of curricula from a quantitative basis has been criticized more and more within recent years because of the undue emphasis placed upon the credit value in hours of course rather than on the content of the course or the educational values to be obtained; however, this mistake has been made by students of lesser caliber rather than by the curriculum makers.

Perhaps this part of the discussion can not be concluded in a better way than by quoting from Prof. C. J. Tilden:²¹



¹¹ For further statistical data on this problem see pages 231-245, Bul., 1920, No. 7, U. S. Bu. of Educa. Also pages 41 *et seq.*, Bul., 1922, No. 19, by Dr. Geo. F. Zook; also "Sch. Rev.," Oct., 1921, by L. V. Koos. ¹² Address on "Educational Trends" at the Second National Conference on Highway Engineering and Highway Transport, Washington, D. C., Nov., 1923, by Prof. C. J. Tilden, chairman of the division of engineering, Yale University.

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First of all, we have the inexorable time limit, . The undergradute curriculum is four years long, or, to be a little more precise, three years and nine months. Into that we must put the subjects that we want to teach-taking the boy after he leaves high school and in three years and nine months from that time turning him out with a bachelor's degree and the training in engineering which that implies. To do this we take certain courses and fit them together into the mosaic of the four-year curriculum. Each course is so many hours a week and extends through a term, or a semester, or an entire year, but we must fit them all into this box which is three years and nine months long; that is all the time we have. If something else must go in, if it becomes necessary to teach a new subject, we must take something out to make room for it. It is well, therefore, to consider carefully some of the more general aspects of this important task-the design of a curriculum. * * * We forget that culture in college does not come by putting a course in history into the sophomore year or a French course into the junior year or a course in economics into the first term of the senior year. These may help, but they do not by any means solve the problem of breaks ening the student's general vision. That can only be done by bringing in the ideas of public service and responsibility, of the great human relationships, and the engineer's duty to his fellow men. For that we must have as teachers men who have looked at these problems from that standpoint, men who have worked with those ideals before them and are able to pass on to the students some of that " vision.

STATISTICAL SUMMARY²⁴

THE LAND-GRANT COLLEGES AND HIGHER EDUCATION

In 1919-20 there were 51 land-grant colleges listed among the 670 universities, colleges, and professional schools of the country. Of the latter grouping, 109 were publicly controlled; consequently the land-grant colleges comprised nearly 50 per cent of all the publicly controlled higher colleges and universities.²⁵

Enrollments.—A study of recent data shows that the land-grant colleges are educating approximately one-third of all college or university students in the United States, and of all those trained at publicly controlled colleges and universities over three-fourths are enrolled at land-grant colleges and universities, as is shown by the following table:

TABLE 5.—Relation of	land-grant college curollments for	o all other college or university
	enrollments, 1919-20	a series and

Institutions	Men	Women	Total
Total enrollments in all colleges and universities. Total enrollments in all private colleges and universities. Total enrollments in all public colleges and universities. Total enrollments in all land-grant colleges and universities. Percentage of land-grant college enrollments to all colleges and universities (per cont). Percentage of land-grant college enrollments to all public colleges and universities (per cent).	334, 226 200, 219 134, 007 108, 923 32 80	187, 528 125, 659 61, 869 40, 074 22 65	821, 754 325, 878 195, 876 148, 997 30 76

¹⁴ For other information regarding educational and financial statistics of land-grant colleges see Bul., 1922, No. 34, U. S. Bu. of Educ., by Dr. L. E. Blauch and succeeding annual reports.

¹⁰ In addition to these institutions, attention is called to the 17 land-grant colleges for Negroes which have shared with the white land-grant colleges of the several Southern States the benefits of both Federal and State aid. Since 1920, the Territory of Alaska has fulfilled the requirements made by Congression land-grant colleges and has established the Alaska Agricultural College and School of Mines, located at Fairbanks.



Degrees.—In 1919-20 the colleges and universities of the United States granted 52,149 degrees. Of these 13,094 were granted by the land-grant colleges, or more than one-fourth of the total for the country. The distribution with respect to graduate and undergraduate degrees is given in the next table.

TABLE 6.—Relation of degrees granted by land-grant colleges and universities to the total number granted in the United States

	1 · · ·	4	 			
		Degrees granted		Men	Women	Total
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By all col (a) U (b) G (c) P	léges and universit ndergraduate raduate rofessional	ies: •		23, 272 3, 457 1 8, 774	15, 280 1, 396	38, 522 4, 853 8, 774
	Total		 	35, 501	16, 576	52, 149
By land-i (a) U (b) G	rant colleges, etc. ndergraduate and raduate	, professional	 	8,485 11,281	3, 269 59	11, 754 1, 340
	Total.	× ×	 	10, 766	3, 328	13, 094

¹ A lew women are included.

Property. - The property of all colleges and universities, including plant, grounds, and all furnishings for 1919-20, was valued at \$646,530,402. For the land-grant colleges the corresponding sum was \$168,460,589, or about 26 per cent of the total for the United States.

The total productive funds for all colleges and universities for the year 1919-20 was \$556,350,140, and for the land-grant colleges \$64,800,000, or 9 per cent of the total.

Receipts.—The total receipts for all colleges and universities for 1919-20 amounted to \$240,141,994; and the total receipts of the landgrant colleges to \$83,325,288, or more than one-third of the total.

COMPARATIVE TABLES

This section contains in detail the statistics concerning teaching staff, student enrollment, property, libraries, and income of the landgrant colleges, with particular reference to the changes occurring from 1910-11 to 1919-20, inclusive. The figures include those for 1916-17, because that year marks the close of the period preceding the World War. The figures for 1917-18 show the changes peculiar to the war period.

The data for the accompanying tables are based upon the annual reports required by law and made by the presidents and treasurers of the several land-grant institutions. These data have been revised and rechecked by the proper officers.



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The data of the foregoing table have been summarized in the following form:

	Colleges of agriculture and mechanic arts					•Grand total in-	
Years	Full ar time te college	nd part- achers in classes ¹	Total to sta	eaching 117	arts, la cine, et	w, medi- c. ³	Total
	Men	Women	Men	Women	Men	Women	
1910-11 1916-17 1917-18 1917-20	$2,918 \\ 4,438 \\ 4,027 \\ 3,712$	324 510 587 531	3, 471 6, 114 7, 628 7, 613	444 830 2, 157 1, 858	6, 380 9, 612 11, 349 12, 876	755 1, 331 2, 651 2, 927	7, 135 10, 943 13, 991 15, 803

TABLE 8. — Teaching staf	f in land-gran	t colleges
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¹ Includes full and part-time teachers of classes of college grade, excluding nonresident teachers of summer courses. The rather large decline in the number of teachers shown in these columns may in part be explained by the large reduction in the employment of part-time teachers, the tendency being to use full-time officers as much as possible.

² Comprises in addition to those included under preceding heading, teachers of preparatory, secondary, short course, and extension classes and experiment station staff, and also extra teachers employed only in the summer school; duplicates excluded.

³ Comprises all members of the faculty, including other departments or schools as liberal arts, law, medicine, etc.; duplicates excluded.

The increase of men teaching full time and part time in college classes in the colleges of agriculture and mechanic arts ²⁶ was 27 per cent during the decade; the increase of women, 64 per cent.

The increase of the men on the entire staff of the colleges of agriculture and mechanic arts was 119 per cent, and the increase of women 318 per cent.

The increase for the teaching staff of the land-grant colleges, including liberal arts, law, medicine, etc., was 102 per cent for the men and 287 per cent for the women.

Considering the increase of the entire staff, we find that there was a gain of 121 per cent during the decade.

Land-grant colleges for Negroes.—The increase in the teaching staff at the institutions for Negroes was as follows: 457 teachers in 1910–11, 535 teachers in 1915–16, 556 teachers in 1920–21, increase of about 20 per cent during the decade.

²⁶ This term applies to the independent fand-grant colleges and to the schools, colleges, or departments of agriculture, mechanic arts (engineering), and home economics in the State universities which are land-grant institutions.



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	Women and the second se	Men Men <th men<="" td="" th<=""><td>Four- trai and frout- frout- inal and frout- frou</td><td>Four- urgear Total in urgear Total in arreul- tural and feal Total in arreul Total in arreul Ween Barroul- teral and feal Ween Pour- institu- institu- institu Total in arreul Ween Women Barroul- institu Pour- institu Total in arreul Ween Women Men Wen Ween Yomen Pomen Pomen Men Women 238 10 232 Men Women 233 1, 070 232 Men Women 238 1, 070 232 Men Women 233 1, 070 232 Men Women 233 1, 070 232 Men Women 232 1, 070 232 Men Women 232 1, 070 232 Men Wen Wen 1, 070 232 Men Wen Wen 1, 070 232 Men Men Wen 1, 070 232</td></th>	<td>Four- trai and frout- frout- inal and frout- frou</td> <td>Four- urgear Total in urgear Total in arreul- tural and feal Total in arreul Total in arreul Ween Barroul- teral and feal Ween Pour- institu- institu- institu Total in arreul Ween Women Barroul- institu Pour- institu Total in arreul Ween Women Men Wen Ween Yomen Pomen Pomen Men Women 238 10 232 Men Women 233 1, 070 232 Men Women 238 1, 070 232 Men Women 233 1, 070 232 Men Women 233 1, 070 232 Men Women 232 1, 070 232 Men Women 232 1, 070 232 Men Wen Wen 1, 070 232 Men Wen Wen 1, 070 232 Men Men Wen 1, 070 232</td>	Four- trai and frout- frout- inal and frout- frou	Four- urgear Total in urgear Total in arreul- tural and feal Total in arreul Total in arreul Ween Barroul- teral and feal Ween Pour- institu- institu- institu Total in arreul Ween Women Barroul- institu Pour- institu Total in arreul Ween Women Men Wen Ween Yomen Pomen Pomen Men Women 238 10 232 Men Women 233 1, 070 232 Men Women 238 1, 070 232 Men Women 233 1, 070 232 Men Women 233 1, 070 232 Men Women 232 1, 070 232 Men Women 232 1, 070 232 Men Wen Wen 1, 070 232 Men Wen Wen 1, 070 232 Men Men Wen 1, 070 232

The following summary has been made of the foregoing table:

Enrollments in land-grant colleges

	Colleges o	fagricultu	re and mec	hanic erts	Grand to	Grand total includ-		
Years ,	Number dents year courses	of stu- in four- college	Total er in ag and m colleges	nrollment ricultural echanical , etc. ¹	ing lib law, 1 and a departs	eral arts, medicine, 11 other nents ¹	Total	
	Men	Women	Men	Women	Men	Women		
1910–11 1916–17 1917–18 1919–20	24, 809 31, 678 24, 078 39, 997	3, 379 6, 507 6, 355 7, 444	38, 776 50, 140 44, 959 66, 681	7, 164 14, 669 17, 026 13, 676	63, 585 80, 578 79, 458 108, 923	20, 052 40, 571 36, 117 40, 074	83, 637 121, 149 115, 675 148, 997	

¹ Comprises all regular college students working for an undergraduate degree, including home economics students.

¹ Comprises regular collegiate, secondary, preparatory, special, greduate, short course and summer school students, including those in home economics and excluding correspondence and extension students and duplicates.

⁴ Including students from all departments of the institution and 'excluding correspondence and extension students and duplicates.

The foregoing tabulation shows that for the decade from 1910-11 to 1919-20^a the increase in students in four-year college courses of study in the colleges of agriculture and mechanic arts²⁷ was 61 per cent for men and 120 per cent for the women.

Likewise there was an increase in the total enrollment of the colleges of agriculture and the mechanic arts of 72 per cent in men and 91 per cent in women.

The increase of enrollment in all departments of land-grant colleges and universities, including liberal arts, law, medicine, etc., was 85 per cent in men and 100 per cent in women.

Considering the increase of enrollment as a whole we find that there was a gain of 88 per cent during the decade.

Land-grant colleges for Negroes.—The increase in enrollments in colored land-grant colleges is as follows: For the year 1910–11, there were 8,138 students; 1915–16, 10,613; 1920–21, 11,527 students; or an increase of about 30 per cent for the decade.

Degrees	. 1910-11	1919-20	Per cent increase
(a) First degrees in— Agriculture. Engineering (mechanic arts). Home economics. All other courses of study.		2, 296 2, 532 913 6, 295	159 13 300 59
Total		12,036	65
(b) Advanced degrees— Agriculture. Engineering (mechanic arts). Home economics. All other courses of study.	83 111 3 	321 142 59 818	286 28 1, 806 65
Total	. 7 693	1. 340	93

TABLE 10.-Increase in number of degrees granted 1910-11 to 1919-20, inclusive

"This term applies to the independent land-grant colleges and to the schools, colleges, or departments of agriculture, mechanic arts, engineering, and home economics in the State universities which are landgrant institutions.



The foregoing data show marked differences in the increases in the number of degrees granted in the several specialties. The gain for engineering degrees, both undergraduate and graduate, is decidedly less than in agriculture or any of the other specialties. The growth in home economics degrees is largely due no doubt to the fact that curricula leading to degrees in home economics were developed later than those in agriculture and engineering.

Land-grant funds, including unsold land \$28, 215, 695 \$31, 129, 952 Other endowment funds 17, 604, 489 33, 741, 159 Farms, grounds, and buildings 61, 403, 286 127, 009, 088 Apparatus and machinery 11, 816, 248 30, 026, 551 Libraries 5, 476, 287 9, 108, 027 Livestock 741, 084 2, 323, 943	Value of property	19	10-11 1920.	-21 Per ce increa	ent nse
Tetal 125, 347, 093 233, 338, 700	Land-grant funds, including unsold land Other endowment funds. Farms, grounds, and buildings. Apparatus and machinery. Libraries. Livestock	\$28, 17, 61, 11, 5,	215, 695 \$31, 12 604, 480 33, 74 493, 286 127, 00 816, 248 30, 02 476, 287 9, 10 741, 084 2, 32	19, 952 11, 159 19, 068 26, 551 18, 027 23, 943	10 92 100 154 60 213
Total	Total	125,	347, 093 233, 33	38, 700	90

TABLE 11.-Increase in property of land-grant colleges

Table 11 shows a general increase in the value of property of 90 per cent for the period. Perhaps the most significant increases are those which refer to apparatus and machinery, and livestick; these show an increase of 154 per cent and 213 per cent in values, respectively.

The following table gives the increase in books and pamphlets by institutions:

	Institution	1910-11	1919-20
Alabama Polytechnic Books Pamphlets	institute:	23,974	34, 000 6, 000
Total		*26, 974	39,000
University of Arizona: Books. Pamphlets	-	16,500 10,000	32, 600 6, 000
Total		32, 500	_38, 600
University of Arkansa Books Pamphlets	51	15, 420 5, 621	32, 300 12, 500
Total		21.041	44, 800
University of Californ Books Pamphlets	a:		479, 000 185, 000
Total			664, 000
Colorado Agricultural Books Pamphlets	College:	48,000	32, 711
Total		98,0	57, 711
Connecticut Agricultu Books Pamphiets	Iral College:	12,000	16, 64 2, 00
Tatal		13.000	18.64

TABLE 12.-Growth of libraries in the land-grant colleges, 1910-11 to 1919-20



41

University of Delaware: Books Pamphlets		
Books. Pamphlets	1	•
	18,000	27, 700 6, 700
Total.	20, 500	34, 400
Jniversity of Florida: Books Pamphlets	12, 500	35, 500 30, 500
Total	16, 500	66,000
Jeorgia State College of Agriculture: Books	36, 825	65, 000 57, 000
Total	41, 825	112.000
Jniversity of Hawaii: Books Pamphlets	8, 650	21, 788
Total	16 650	19,773
Iniversity of Idaho:		41, 001
Pamphlets	23, 861	44, 500 8, 000
	. 26, 861	52, 500
Books. Pamphlets	188, 186 23, 191	461, 598 54, 615
Total	. 211, 377	516, 213
urduo University: Books Pamphlets	29, 867	53, 893 3, 000
Total	64, 867	56, 893
wa State C'ollege: Books Pamphlets	32, 500	77, 715
Total	72 500	117 715
ansas State Agricultural College: Books		
Pamphlets	36, 973 18, 000	68, 412 26, 000
/ Total	54, 973	93, 412
niversity of Kentuçky: Books	7, 533	41, 261
Total	16,033	41, 261
uisiana State University and Agricultural and Mechanical College: Books	33,000	50, 325
Total	43,000	52,825
aiversity of Maine: Books. Pamphlots	43, 811	70,000
Totel	11,000	21,000
aiversity of Maryland:	09,811	91,000
Books. Pamphlets	6, 000 5, 000	30, 000 7, 000
Total	11,000	37,000
assacnusetts Agricultural College: Books	34, 448	61, 439

TABLE 12.-Growth of libraries in the land-grant colleges-Continued



• Institution -	1910-11	1919-20
Massachusetts Institute of Technology: Books Pamphlets		140, 737 51, 000
Total	109, 180	191, 737
Michigan Agricultural College:		·
Books	34, 217 7, 203	44, 443 9, 550
Total	42, 421	53, 993
University of Minnesota: Books Pamphlets	150,000	300, 000 25, 000
Total	170,000	325,000
Mississioni Agricultural and Mechanical College:		
Books. Pamphlets	25, 428	34, 803 19, 995
Total	36, 641	54, 798
University of Missouri		
Books. Pamphlets.	114, 134	239, \$70 96, 000
Total	134, 134	335, 470
Montana State College of Agriculture and Mechanic Arts: Books. Pamphlets	11, 300	
Total	17.800	23, 12
University of Nebraska: Books Books	93,678	147, 50
	07 179	155 65
1004		109,00
Books. Pamphlets.	19,500	34, 07 14, 75
Total	31,000	48, 82
New Hampshire College of Agriculture and Mechanic Arts: Books.	28,000	42,79
Tampulos.	37.000	57 79
10181	37,000	=
Rutgers College: Books. Pamphlets	64, 521 5, 000	110, 00 15, 00
Total	09, 521	125,00
New Mexico College of Agriculture and Mechanic Arts: Books.	13, 676	19,06
Pamphlets	5,000	42, 80
- Total	18,676	61,86
Cornell University: Books. Pamphlets	395, 209	630, 63
Total	455, 209	
North Carolina State College of Agriculture and Engineering		
Books	10,028 5,330	10, 08
(Data)	15 348	

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, Institution	1910-11	1919-20
North Dakota Agricultural College: Books Pamphlets	22,800	30, 25
Total	23,900	31.19
Ohio State University: Books	106 390	235 210
Pamphlets	10,000	400, 410
	. 116, 390	
Books. Pamphlets	14, 506	25,050 100,500
Total	24, 506	125, 550
Oregon Agricultural College: Books	15.563	41.45
Pamphiets	15,000	160, 816
Total	30, 563	202, 266
Pennsylvania State College: Books. Pamphlets	43, 510 80, 099	77, 500
Total	73, 510	127, 500
Julversity of Porto Rico: Books. Pamphlets.	3, 729	6, 500
Total	5 499	15 500
Rhode Island State College:	0,488	10,000
Pamphlets	22, 031 5, 000	22, 700 5, 000
Total	27, 031	27,700
Clen.son Agricultural College (South Carolina): Books Pamphlets	16, 488	
Total	25 488	28 490
outh Dakota College of Agriculture and Mechanic Arts:		
Pamphiets	12, 500 2, 000	25,000 6,500
Iniversity of Tennessee:	14, 500	31, 500
Books	34, 411 18, 689	50, 250 86, 000
Total	53, 190	136, 250
gricultural and Mechanical College of Texas: Books Pamphlets	20,000	* 18, 348
Total	15,000	21, 300
gricultural College of Utah:	35,000	39, 648
Books Pamphlets	19, 470 20, 612	34, 564 47, 117
Total	40, 082	81, 681
niversity of Vermont and State Agricultural College: Books	83, 040	105,000
Total	117 540	149 600
	111,000	142,000

TABLE 12.—Growth of libraries in the land-grant colleges—Continued



Institution 🐀	1910-11	1919-20
Virginia Agricultural and Mechanical College and Polytechnic Institute: Books. Pamphlets.	12,400	30, 000 82, 000
Total	* 45, 400	112,000
State College of Washington: Books	28, 156 5, 500	74, 300 100, 000
Total	33, 656	174, 300
West Virginia University: Books	- 43,000 2,500	70, 000 18, 500
Total	45, 500	88, 500
University of Wisconsin: Books Pamphlets	169, 602 47, 000	324, 500 80, 000
Total	216, 602	404, 500
University of Wyoming: Books	30, 000	46,000
Total	30,000	46,000
Grand total	3, 377, 355	6, 361, 27
	and the second	

TABLE 12 -Growth o	f libraries in	the land-grant	colleges-Continued
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According to Table 12, the number of volumes and pamphlets in the libraries of the land-grant colleges during the decade 1910-11 to 1919-20 shows an increase of 60 per cent for the 51 institutions. In 1910-11 the number of volumes, including pamphlets, was 3,377,355; in 1919-20 it had increased to 6,361,276.

The median library for 1910-11 contained 36,641 books and pamphlets; in 1919-20 it reached 61,439.

The smallest library in the land-grant colleges in 1910-11 contained 11,000 volumes; in 1919-20 it contained 18,640. The largest library in 1910-11 had 455,209; in 1919-20 this number had increased to 664,000. The largest library in a separate land-grant college in 1910-11 contained 180,000; in 1919-20 the number increased to 202,266.

Table 13 shows the growth of income from the several sources for the decade 1910-11 to 1919-20, inclusive:

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Institutions and year Tuberest and object pand; pa	· · · · · ·	THEORIE ILO	samos thinn in	
A Polytechnic Institute: Rev (200) Rev (200) <threv (200)<="" th=""> Rev (200) <threv (200)<="" t<="" th=""><th>Total State tax and Total endow- appro- ment priations</th><th>I Private Private milits</th><th>Miscella- neous 1 Total</th><th>Grand total</th></threv></threv>	Total State tax and Total endow- appro- ment priations	I Private Private milits	Miscella- neous 1 Total	Grand total
axis bit bit <td>8 - 574, 208 \$1, 160 \$40, 000 \$41, 16</td> <td></td> <td>20 023 20 023</td> <td>1 GIN</td>	8 - 574, 208 \$1, 160 \$40, 000 \$41, 16		20 023 20 023	1 GIN
900 75, 500 76, 500 75, 500 76, 500 76, 500 75, 500 76	1 182, 831 1, 160 191, 208 192, 36 8 1, 120, 068 11, 600 1, 185, 955 1, 197, 55;	368 150	452,807 453,017	439, 4
01 3.900 62.777 66.677 147,900 147,900 147,900 147,900 147,900 147,900 147,900 147,900 147,900 147,900 147,900 167,732 1,775,732 2,744,931 1,772,931 1,775,732 2,744,931 1,772,931 1,775,732 2,744,931 1,772,931 2,744,132 1,772,931 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 2,744,132 <td>0 75, 600 53, 550 550, 50 53, 550 53,</td> <td>550 520 \$2,000 426 464 60,100 364 5,200 252, 700</td> <td>20, 951 23, 471 176, 128 236, 592 612, 646 870, 546</td> <td>152,5 801,1 4,084,8</td>	0 75, 600 53, 550 550, 50 53, 550 53,	550 520 \$2,000 426 464 60,100 364 5,200 252, 700	20, 951 23, 471 176, 128 236, 592 612, 646 870, 546	152,5 801,1 4,084,8
B01 T. T. Statility T. Statility <tht. statility<="" th=""> T. Statility</tht.>	7 155, 520 147, 900 147, 900 147, 900 147, 900 147, 900 147, 900 147, 900 147, 900 147, 900 147, 900 222 929, 222 9298, 944 11, 775, 752 11, 775, 752 11, 775, 755 11, 775 11,	223 223 152 47 80, 32	28, 881 26, 400 42, 623 42, 623 575, 377 655, 952	243, 9 527, 3 3, 420, 6
9.330 73.638 82.968 110.768 127,868 137,178 144,178 2,047,003 57,000 50,000 50,000 50,0	0 131,448 47,733 1,012,557 1,060,204 9 182,766 51,054 2,693,793 2,744,847 5 1,490,132 460,661 18,474,540 18,835,201	200 99, 200 104, 597 947 272, 830 7 943, 326 201 1, 404, 587 3, 417, 262	276, 877 1, 646, 632 7, 237, 053 11, 948, 902	1, 672, 7 5, 790, 4 32, 274, 2
011 57,000 57,000 57,000 57,000 57,000 57,000 10,890 011 61,500 73,500 81,805 71,129 1 416,111 18,000 10,890 011 67,500 73,500 73,129 701,129 1 416,111 18,000 10,800 011 66,600 73,500 73,523 81,055 701,129 1 416,111 18,000 10,800 011 66,600 73,543 833,643 833,643 833,643 833,643 91,666 1,023,400 011 011 011 1,454,731 134,225 91,666 1,023,400 011 66,600 83,543 833,643 568,109 91,666 1,023,400 011 011 011,000 90,000 90,000 91,666 1,023,400 011 012,001 00,000 83,546 83,546 83,566 1,120,833 1,120,800 011 012,001 00,000 90,000 <t< td=""><td>8 82, 988 127, 868 127, 868 127, 868 127, 866 8 130, 192 161, 920 1, 972, 847 144, 178 414, 178 9 1, 072, 847 161, 920 1, 885, 083 2, 947, 003</td><td>808 178 100</td><td>28, 606 28, 606 180, 972 180, 972 667, 825 667, 825</td><td>239, 4 725, 3 3, 787, 6</td></t<>	8 82, 988 127, 868 127, 868 127, 868 127, 866 8 130, 192 161, 920 1, 972, 847 144, 178 414, 178 9 1, 072, 847 161, 920 1, 885, 083 2, 947, 003	808 178 100	28, 606 28, 606 180, 972 180, 972 667, 825 667, 825	239, 4 725, 3 3, 787, 6
11 4, 880 66, 000 70, 980 19, 500 19, 500 19, 500 19, 500 19, 500 19, 500 19, 500 10, 502 400 1, 052, 401 10, 500 91, 606 1, 052, 401 10, 500 90, 000 90, 000 91, 606 1, 500 3. 500 10, 500 10, 502 401 1, 500 3. 500 10, 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 1, 500 3. 500 500, 500 3. 500 500, 500 3. 500 500, 500 500, 500 500, 500 500, 5	68, 750 57,000 57,000 57,000 87, 805 791, 128 1,454, 731 1,454, 731	000 10, 800 111 18, 000 134, 225	71, 525 82, 385 253, 507 271, 507 1, 389, 394 1, 523, 619	206, 11 775, 4 3, 709, 4
11 6.069 52,500 59,469 90,000 90,000 90,000 90,000 1,500 200 201,210 201,210 201,210 201,210 3,760 3,760 210 201,210 102,964 796,658 1,120,853 1,120,853 3,760 211 700,487 796,658 1,120,853 1,120,853 62,950 211 1,044 200,487 796,658 1,120,853 62,950	0 70, 980 19, 500 18, 500 18, 500 18, 500 583, 648 64, 045 544, 045 548, 109	00 H5 19, 466 1, 58, 306 91, 666 1, 092, 401	14, 825 14, 825 14, 825 145, 102 222, 874 517, 009 1, 701, 076	105, 30 407, 44 3, 134, 89
	0 564 469 90, 000 90, 000 90, 000 102, 200, 210 201, 210, 210	00 1. 500	22, 255 23, 755 125, 953 129, 703 646, 240 709, 190	173, 27, 433, 87, 71, 72, 625, 71, 72, 625, 71, 72, 72, 72, 72, 72, 72, 72, 72, 72, 72
20 11, 50 24, 50 157, 373 241, 566 241, 566 1, 400 4, 920 Atal for decade 146, 540 680, 470 830, 010 1, 366, 707 1, 386, 707 1, 386, 707 14, 000 41, 48	0 44, 954 62, 500 62, 500 62, 500 82,	00 1,400 4,926 56 1,400 4,926	9, 348 15, 674 9, 348 15, 674 3, 705, 681 761, 167	173, 12 508, 96 2, 990, 97

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	Income fi	rom the Un	ited States	Incol	me from the	State		Income from	other source		
Institutions and years,	Interest from 1862 and other land: grant funds	From Federal appro- priations	. Total	From State endow- ment	From mill tax and appro- priations	Total	Private endow- ments	Private gifts	Miscella- peous	Total	Grand total
versity di Hawali" In 1911 In 1920, for Areada		845, 000 56, 000	a \$45,000 50,000		\$6, 983 53, 488 290, 451	\$9, 993 53, 488 299, 451		\$13, 025 14, 925	\$944 21, 486 62, 064	8044 34, 511 76, 989	\$55, 987 187, 999 871, 440
versity of Idaho: In-1911 - In 1920	\$59, 437 110, 676 822 454	75, 000 103, 472 863, 342	134, 437 214, 148 1, 715, 796		52,000 364,890 1,506,934	52,000 364,890 1,506,934			1, 956 104, 998 274, 042	1, 956 104, 968 274, 042	188, 393 684, 036 3, 496, 772
versity of Dinois:	32,458	775, 0000 775, 0000 770, 174	107, 468 313, 527 1, 627, 045		1, 007, 000 2, 871, 500 21, 610, 996	1,097,000 2,871,500 21,610,996		33, 400 211, 714	355, 572 697, 822 4, 533, 163	356, 572 731, 222 4, 744, 877	1, 560, 040 3, 916, 249 29, 609, 963
Total for gecade fue University: In 1920. Total for decade	000 021	78,000 172,034 1,107,412	92,000 189,034		331, 836 882, 672 8, 483, 102	331, 836 882, 672 5, 483, 102	\$805	83, 487	158, 779 587, 981 3, 075, 490	158, 779 587, 981 3, 159, 782	582, 616 1, 659, 687 9, 920, 296
a State College of Agriculture and Mech de Arts: In 1911. In 1920.	35, 742 35, 087 353, 196	75,000 171,385 1,105,415	110, 742 206, 472 1, 458, 611		518, 834 518, 834 1, 538, 170 9, 745, 331	518, 834 1, 538, 176 9, 745, 331		2, 196 2, 690 - 27, 026	140, 044 530, 414 3, 413, 766	142, 240 533, 004 3, 440, 791	2, 277, 745 14, 644, 733
usus State Agricultural College: In 1911 In 1920	8.8	2000, 522 1500, 461 1056, 461	• 104, 418 185, 770 1.311, 516		341, 900 961, 373 5, 999, 838	341, 900 961, 373 5, 900, 838		22, 450	48, 840 560, 782 2, 896, 410	48, 840 509, 782 2, 918, 860	495, 156 1, 656, 92 10, 230, 214
I other the second Iversity of Kentucky: In 1911 Total for decade	8 8 8 1354	1, 064, 401	77, 119 182, 777 1, 150, 848	,	85, 937 566, 143 2, 558, 913	85, 937 565, 143 2, 558, 913		3,600	10, 015 270, 630 1, 051, 726	10, 015 274, 230 1, 079, 326	250, 190 1, 022, 150 4, 789, 085
distans State University and Agricultura od Mechanical College: In 1920. In 1920. Total for directa	145.556	54, 917 129, 966	69, 473 144, 522 975, 829	1	124,000 210,042 1,610,886	124, 000 210, 042 1, 610, 886		46, 160	21, 984 109, 615 719, 086	21, 984 109, 615	215, 457 464, 177 3, 351, 951
Iversity of Maine: To 1920.	5,915	75,000	80, 915		115, 688	115, 698	4,000		54, 740 283, 892	58, 740	255, 343

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107, 797 508, 001 2, 474, 998	433, 274 1, 001, 967 6, 564, 119	602, 853 1, 602, 501 20, 189, 747	2, 106, 723 2, 106, 723 10, 767, 836	1, 770, 770 4, 758, 895 28, 610, 340	462, 638 1, 048, 537 6, 426, 437	853, 392 1, 757, 791 12, 273, 814	172, 823 729, 640 3, 573, 809	2, 359, 566 2, 359, 566 14, 188, 196	289, 557 431, 907 3, 111, 860	160, 650 506, 666. 2, 973, 826	248, 684 790, 951 4, 403, 175	L
149, 658	118, 383 222, 902 1, 573, 506	563, 547 1, 480, 819 19, 038, 972	256, 494 034, 847 4, 567, 837	1, 496, 092 7, 013, 336	131, 211 510, 465 3, 046, 264	79, 315 580, 747 - 2, 895, 196	23, 139 157-014 549, 712	130, 232 580, 112 2, 790, 777	37, 902 96, 840 661, 221	80, 309 250, 300 1, 310, 592	118, 903 339, 645 1, 904, 411	
149, 658 , 448, 886	118, 383 222, 902 1, 573, 506	417, 329 951, 450 5, 434, 666	256, 404 934, 847 4, 567, 837	203, 981 1, 332, 798 6, 743, 840	131, 211 510, 298 3, 044, 837	78, 715 522, 133 2, 737, 527	23, 139 157, 014 649, 712	130, 232 549, 112 2, 790, 777	21, 992 90, 801 439, 016	45, 070 216, 255 957, 802	67, 772 274, 077 1, 014, 111	
4 2		66, 653 4, 065 11, 154, 142	100,000	163, 294 269, 496	009	41, 011 43, 124			16,000	1, 364	15, 700 17, 528 499, 207	
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36, 000 218, 859 1, 073, 638	247, 591 683, 290 4, 191, 227	28,000 100,000 833,000	173, 410 935, 000 4, 289, 557	1, 434, 632	264, 221 .377, 192 2, 377, 863	671, 576 952, 976 8, 003, 689	53, 466 430, 500 1, 831, 241	480, 990 1, 577, 020 9, 907, 231	176, 565 232, 796 1, 517, 799	9, 460 , 188, 375 , 138	448, 801 322, 316 1, 483, 669	*
30, 000 218, 859 1, 073, 638	224, 278 679, 977 4, 158, 097	29,000 100,000 933,000	173,410 935,000 4,259,557	1, 434, 632 2, 998, 359 19, 896, 658	204, 22† 377, 192 2, 377, 863	638, 329 913, 207 7, 569, 140	53, 466 430, 500 1, 831, 241	480, 960 1, 577, 020 9, 907, 231	176, 565 232, 796 1, 517, 799	9, 460 188, 375 668, 138	48, 891 322, 316 1, 483, 600	
*	3, 313 3, 313 33, 130					33, 247 39, 679 434, 549						
71, 797 139, 444 951, 432	67, 300 95, 775 799, 386	20, 306 21, 682 217, 775	145, 304 238, 876 1, 810, 442	1, 708, 340	67, 206 160, 880 1, 002, 310	102, 501 224, 068 1, 374, 929	96, 218 142, 135 1, 192, 856	117,250	75,000 102,271 982,530	79,800 127,990 1,006,096	80,800 128,990 1,015,095	+
06, 000 132, 936 896, 067	60, 000 88, 475 726, 386	15, 000 16, 607 165, 003	75,000 168,140 1,095,434	73, 000 154, 562 31, 032, 690	52, 820 146, 492 858, 434	72, 187 186, 690 1, 131, 184	75, 000 102/783 892, 449	75, 000 136, 436 997, 879	75,000 83,609 862,891	75,000	75,000	
5, 797 6, 548 54, 705	77 77 200 2000 12	5, 306 5, 015 52, 772	70, 304	50, 157 100, 882 075, 456	14, 386 14, 388 14, 388	30, 314 37, 378 243, 745	21, 218 39, 352 300, 407	42, 250 58, 998 492, 279	8, 662 69, 639	4, 500 4, 4, 800 600 600	44 800 800 800 800 800 800 800 800 800 8	
n 1911. n 1920. achusetta Agricultural College:	n 1911 n 1920 Total for degade mechaetts Institute of Technology	n 1911 n 1920 Potál for decade tran A articultural Collean:	n 1911 n 1920 Total for decade	n 1911 n 1920. Total for decade Isstippi Agricultural and Mechanical	n 1911 n 1920 Total for decade ersity of Missouri:	n 1911	n 1911. n 1920. Total for decade	n 1911 1 1920 Total for decade erstry of Nevada:	a 1911. Total for decade Hampshire College of Agriculture and	1 1911 /	a 1911 a 1920 Total (or decade	Figures for 1918-19.



	Income fr	om the Unl	ted States	Inco	ome from the	State	1	ncome from	other sources		
Institutions and years	Interest from 1862 and other frant funds	From Federal appro-	Total	From State endow- ment	From mill tax and appro- printions	Total	Private endow- ments	Privato gifts	Miscella- neous	Total	Grand total
Mexico College of Agriculture and nanic Arts: 1991	\$1,083	876, 000 104, 791	\$76, 063 104, 791		\$17, 036 109, 554	\$17,036 100,554		æ	\$13, 576 170, 282 646, 200	\$13, 576 170, 282 646, 200	\$106,695 384,627 2,039,107
otal for decade. I University: 1901 1920 1920 for decade	15, 084 34, 428 34, 280	900, 509 72, 000 1, 078, 585 1, 078, 017	106,429 106,429 11,422,301		280, 433 1, 082, 441 7, 920, 830	280, 433 1, 062, 441 7, 920, 830	\$404, 059 707, 644 5, 857, 673	\$300, 382 1, 142, 215 8, 328, 306	938, 282 1, 827, 544 12, 021, 953	1, 642, 723 3, 673, 443 26, 207, 932	2, 029, 585 4, 978, 898 35, 561, 069
Carolina College of Agriculture and nearing: 1911	7, 500	60, 150 172, 961	67, 650 180, 461		000 000 383,843 1.619,917	103,000 383, 843 1, 619, 917			56, 233 295, 315 1, 110, 122	56, 233 295, 315 1, 110, 122	226, 883 850, 619 3, 802, 724
Total for decade 1911. 1921.	59, 514 59, 514	75, 000 117, 011	133, 514 200, 930		175, 314 226, 010 1, 466, 160	175, 314 226, 010 1, 406, 160			15, 958 131, 297 575, 788	15, 958 131, 297 575, 788	824, 786 556, 237 3, 705, 652
Fotal for decade	20, 168 29, 168 44, 968 401, 478	45,000 234,737 958,408	84, 148 279, 505 1, 359, 886		667, 868 1, 717, 496 12, 028, 034	687, 868 1, 717, 445 12, 028, 034	16, 293 17, 354 155, 614	3, 673 2, 065 64, 623	148, 976 637, 258 3, 392, 326	168, 942 656, 711 3, 615, 563	2, 653, 711 17, 003, 483
oma Agricultural and Mechanical Col 1911	43, 053 44, 053 201	70, 500 155, 441	98, 948 198, 494 1 181, 854		235, 627 385, 801 2, 600, 169	23.5, 627 385, 801 2, 690, 169			14,000 108,879 630,508	14,000 108,879 530,508	348, 575 693, 174 4, 502, 551
Total for decade a Africultural College: 1911. 1920.	11 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	75,000	86, 083 121, 044		233, 725 978, 256 5, 018, 870	233, 725 978, 256 5, 018, 870			23, 058 220, 465 783, 735	23, 058 220, 465 783, 735	342, 816 1, 319, 775 6, 832, 505
Total for decade Namia State College: . 1911.	31,020	75,000	106, 020 290, 803		304.553 921, 810 5. 213.012	304, 553 921, 810 5, 213, 012		6, 000	77, 068 381, 429 1, 742, 898	77, 068 381, 429 1, 748, 898	487, 631 1, 584, 132 8, 614, 947
Total for decade		45,000	45,000		80,300	80,300			5,454	5, 454	130, 754

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Total for decade	2, 4, 2, 800	75,000 90,946 857,910	77, 500 93, 446 882, 910	30,000 130,929 662,327	30, 000 130, 929 662, 327			42, 061 113, 670 705, 838	42, 051 113, 670 705, 838	149, 561 338, 045 2, 251, 075	
Common Agricultural College In 1911 In 1920 Total for decade Bouth Dakota College of Agriculture and Me-	5, 754 5, 754 57, 540	52, 400 132, 995 793, 539	58, 164 138, 749 851, 079	 2, 216, 284	381, 418 381, 468 2, 216, 234	3, 512 31, 608		3, 200 392, 531 1, 013, 661	3, 200 1, 045, 259	175, 467 916, 260 4, 112, 622	
challer Arts: [n 191] [n 1920] [n 1920] [n 1920] [n 1920]	20, 856 76, 518 419, 521	75,000	104, 856 193, 241 1, 356, 746	* 59, 978 263, 840 1, 707, 118	50, 978 263, 840 1, 707, 118			31, 811 277, 623 905, 708	31, 811 277, 623 905, 708	196, 645 734, 704 3, 969, 572	HIS
In 1911 In 1911 Total for deade	Z39, 600	75, 000 204, 821 1, 088, 631	98, 960 228, 781 1, 328, 231	56, 745 273, 000 2, 326, 019	56, 715 273, 000 2, 326, 019	2, 644 250 18, 196	41, 972 49, 675 135, 407	73, 386 230, 661 1, 040, 500	118,002 280,576 1,194,103	273, 707 782, 357 4, 848, 353	STORY
In 1920. Total for decode	8, 233 10, 450 110, 936	63.750 233.566 1, 260, 017	71, 983 244, 016 1, 370, 953	259,250 1, 182, 915 5, 942, 118	259, 250 1, 142, 915 5, 942, 118			171, 287 1, 494, 458 4, 513, 109	171, 287 1, 494, 458 4, 513, 109	502, 520 2, 921, 389 11, 826, 180	AND
In 1910 In 1920 Total for decade	10, 659 15, 405 136, 524	75,000 100,559 887,490	85, 659 115, 964 1, 024, 014	 87, 350 270, 112 1, 793, 134	87, 350 270, 112 1, 793, 134		12, 030	15, 595 66, 301 314, 269	15, 595 66, 301 326, 299	188, 604 452, 377 3, 143, 447	EDUC
Louisse: La 1920. La 1920 deside	8, 130 8, 130 121 130	75,000 99,853 886,321	83, 130 107, 943 970, 745	 18, 000 63, 272 493, 889	16,000 63,272 403,559	31, 800 34, 651 353, 601	1, 948 125, 000 154, 201	64, 819 350, 538 1, 537, 233	98, 567 510, 189 2, 045, 036	197, 697 681, 444 3, 509, 660	ATION
In 1911 In 1920 Total for decade	20, 659	60,000 156,845 946,956	80, 659 177, 504 1, 153, 546	80,000 339,541 1,533,161	80,000 339,541 1,533,161			83, 241 400, 099 1, 985, 300	83, 281 409, 099 1, 985, 210	243, 940 928, 144 4, 672, 007	AL O
Total for decade	29,000 78,046 549,868	75,000 118,294	104,000 196,310 1,490,522	277, 268 691, 314 3, 725, 180	277, 268 691, 314 3, 725, 180		2, 510	43, 270 327, 626 1, 291, 086	43, 270 327, 626	424, 528 1, 215, 250 6, 500, 298	BJECT
Total for decade	6, 000 8, 877 64, 539	66, 000 132, 311 999, 908	72,000 141,158 1,064,447	138,000 698,1%5 3,513,992	138, 000 698, 145 3, 513, 992	90		39, 157 168, 362 1, 042, 318	39, 253 168, 342 1, 064, 278	249, 253 1, 007, 735 5, 632, 717	rives
In 1911 In 1920	25, 400 25, 613 253, 613	75,000 200,461 1,110,945	100,400 226,242 1,364,568	1, 234, 354 1, 958, 527 17, 376, 685	1, 234, 354 1, 958, 527 17, 376, 695	4, 649 15, 711 99, 413	13, 873 87, 292 411, 032	468, 498 1, 442, 203 8, 803, 832	487, 020 1, 545, 206 9, 374, 277	1, 821, 774 3, 730, 015 28, 115, 520	
Total for decade	12, 626 49, 063 205, 133	76, 000 96, 413 871, 665	87, 626 144, 476 1, 076, 788	62, 377 207, 192 1, 173, 306	62, 377 207, 492 1, 173, 306	25	400	11, 239 74, 827 319, 109	11, 647 78, 827 323, 882	161, 670 430, 795 2, 573, 976	



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LAND-GRANT COLLEGE EDUCATION, 1910-1920

The following tables show the amount of income received by the several land-grant institutions over the 10-year period.

TABLE 14.—Incomes of	State universities which are land-grant decade 1910-11 to 1919-20	institutions, for the

Name of institution	Total in- come from 1910 to 1920	Name of institution	Total in- come from 1910 to 1920
Cornell University	\$35, 551, 069 32, 274, 235 29, 609, 903 28, 617, 340 28, 115, 520 17, 003, 483 14, 188, 166 12, 273, 814 5, 632, 717 4, 548, 353 4, 789, 087	 12. University of Arizona. 13. University of Maine. 14. University of Montana. 15. University of Vermont. 16. University of Idaho. 17. University of Idaho. 18. University of Idaho. 19. University of Nevada. 20. University of Florida. 21. University of Porto Rico. 	\$4, 084, 816 3, 853, 641 3, 573, 809 8, 509, 669 8, 406, 772 3, 420, 648 3, 351, 955 3, 111, 55 2, 625, 711 2, 573, 976 1, 556, 193



Name of institution	Total in- come from 1910 to 1920	Name of institution	Total in- come from 1910 to 1920
 Massachussetts Institute of Tech- nology	\$20, 184, 747 14, 644, 733 11, 826, 180 10, 767, 836 10, 200, 214 9, 920, 296 8, 614, 947 6, 832, 505 6, 564, 119 6, 509, 298 6, 426, 437 4, 672, 007 4, 502, 551 4, 403, 175	 Clemson College, South Carolina South Dakota State College	\$4, 112, 622 3, 969, 572 3, 802, 724 3, 787, 677 3, 769, 477 3, 705, 655 3, 143, 444 3, 134, 896 2, 990, 977 2, 973, 822 2, 776, 644 2, 474, 999 2, 251, 077 871, 440

Incorporated as the University of Delaware in 1921.
Incorporated as the University of New Hampshire in 1923.
Incorporated as the University of Maryland in 1920.
Incorporated as the University of Hawaii in 1920.

Table 14 shows that two institutions of the State university landgrant college group have received between thirty and thirty-six million dollars during the decade; two have received between twenty and thirty million dollars; three have received between ten and twenty million dollars; four have received between four and ten million dollars; seven have received between three and four million dollars; two have received between two and three million dollars; and one has received between one and two million dollars.

Table 15 shows that among the separate land-grant colleges, one institution has received in the decade over twenty million dollars:



four institutions have received between ten and fifteen million dollars; six institutions have received between six and ten million dollars; four institutions have received between four and five million dollars; seven institutions have received between three and four million dollars; six institutions have received between three and four million dollars; six institutions have received between two and three million dollars; and one institution has received less than one million dollars.

In connection with Tables 14 and 15, it should be stated that Cornell University, as a whole, receives the larger part of its income, from private sources. This is also true of Massachusetts Institute of Technology.

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