ORGANIZATION OF THE DEPARTMENT OF AGRONOMY

Effective July 1, 1942

Name	Experiment Station Title	College Title	Major Responsibilities
R. W. Cummings	Agronomist Head of Department	Prof. of Agronomy Head of Department Head of Soils Research	Will teached Advanced Soil Fertility in addition to administrative duties
C. B. Williams	Agronomist	Emeritus Professor of Agronomy	1. Chairman, Tobacco Work Conference 2. Honorary Chm. Agron. Res. Com., Sou. Agrl. Workers 3. Prepare soil fertility work for publication 4. Serve as consultant in all phases of agronomy work.
		CROPS SECTION	
		G. K. Middleton, Head of Section	
L. S. Bennett	Assistant (Seed Improvement)		A. Experiment Station and Extension Service 1. Leader, Seed Inspection Program 2. Chm. Photographic and Visual Aids Com.
P. H. Harvey	Associate (Corn Breeding)	Assoc. Prof. Agronomy	A. Experiment Station 1. Leader, corn breeding investigations 2. Chm., Corn Com. of the Experiment Sta. 3. Co-leader, peanut breeding investigations 4. Chm. Greenhouse Committee B. College 1. Teach: Plant Breeding
S. H. Holman		Instructor	A. College 1. Teach: Cotton Classing
P. H. Kime	Associate (Cotton Breeding)		A. Experiment Station 1. Leader, cotton breeding investigations Coop. with Bureau of Plant Industry.

Name	Experiment Station Title	College Title	Major Responsibilities
R. L. Lovvorn	Associate (Forage Crops)	Assoc. Prof. Agronomy	A. Experiment Station 1. In charge forage crop investigations B. College 1. Teach: Pastures and Forage Crops
Russell W. McMillen	Assistant (Small Grain Breeding)		A. Experiment Station 1. Assist in small grain breeding invest.
G. K. Middleton	Associate, In Charge Field Crop Investigations	Prof. of Agronomy Head, Field Crops Section	A. Experiment Station 1. In Charge Field Crops research 2. Leader, small grain and peanut breeding 3. Chm. Cotton and Small Grain Committees of the Experiment Station. 4. Acting, in charge of the department in absence of Head. B. College 1. Head, Field Crops Teaching 2. Teach: Cereal Crops 3. Chm. Committee on departmental meetings and seminars. C. Extension Service 1. Director in charge Seed Improvement program
J. H. Moore	Associate (Cotton Technology)		A. Experiment Station 1. Leader, cotton fiber investigations (technology)
Floyd W. Olive	Junior Agronomist		A. Experiment Station 1. Assistant in cotton breeding and cotton fiber investigations.
J. A. Rigney	Associate (Forage Crops)	Assoc. Prof. Agronomy and Experimental Statistics	A. Experiment Station 1. Leader, soybean investigations 2. Chm. Soybean Com. of the Exp. Station 3. Chm. Project Com. of Department. 4. Advisor on experimental designs and statistical interpretations on all projects.

Name	Experiment Station Title	College Title	Major Responsibilities
J. A. Rigney(cont.)			B. College 1. Teach: Research Methods in Agronomy
E. F. Schultz	Junior Agronomist		A. Experiment Station 1. Asst. in soybean and peanut breeding investigations.
B. W. Smith	Assistant (Forage Crops)	Asst. Prof. Agronomy	A. Experiment Station 1. Leader, grass breeding investigations B. College 1. Teach: Cytogenetics 2. Chm. Com. on Library needs of department
A. D. Stuart	Associate (Seed Improvement)	Assoc. Prof. Agronomy	A. Experiment Station and Extension Service 1. Sec-Treas. N. C. Crop Improvement Assoc. 2. Cultural studies with cover crops. B. College 1. Teach: General Field Crops, Cotton production, Taxonomy, Market Grading, Seed Judging
Fred L. Wellborn	Assistant (Seed Improvement)		A. Experiment Station and Extension Service 1. Leader, Official Yield Tests
	SOILS SECTION		
	R. W. Cummings, In Charge Soils Research J. F. Lutz, In Charge Soils Teaching		
N. C. Brady	Junior Agronomist		A. Experiment Station 1. Assistant in soil fertility investigations
L. F. Burkhart	Assistant (Plant Chemistry		A. Experiment Station 1. In charge of plant chemistry laboratories 2. Leader soil fertility studies with strawberries 3. Co-leader in soil fert. studies on peanuts 4. Chm. Com. on general laboratory problems.

Name	Experiment Station Title	College Title	Major Responsibilities
E. R. Collins	Associate (Soil Fertility)	Assoc. Prof. Agronomy	A. Experiment Station and Extension Service 1. In charge, Agronomy Extension 2. Leader, extension program on soil fertility and fertilizers 3. Coordinator of extension and research programs of the department 4. Chm. Peanut Com. of the Exp. Station B. College 1. Teach: Fertilizers
W. E. Colwell	Associate (Soil Fertility)	Assoc. Prof. Agronomy	A. Experiment Station 1. Leader, soil fertility and mineral nutrition work with soybeans and peanuts 2. Leader, fert. placement investigations B. College 1. Teach: Physical and Colloidal Chemistry of Soils and beginning Soils
Ronald M. Evans	Graduate Assistant		A. Experiment Station 1. Asst. in soil fertility studies with corn and strawberries.
William Gettys	Assistant (Soil Survey)		A. Experiment Station 1. Field party in soil survey in Graham Co.
Paul Gibson	Assistant (Soil Fertility)		A. Experiment Station 1. Asst. pasture and forage crop invest.
E. F. Goldston	Assistant (Soil Survey)		A. Experiment Station 1. In charge, field party in soil survey in Graham County.
A. R. Knudsen	Graduate Assistant		A. Experiment Station 1. Asst. soil fertility studies with cotton Coop. B.P.I.

Name	Experiment Station Title	College Title	Major Responsibilities
W. D. Lee	Associate (Soil Survey)	Asst. Prof. Agronomy	A. Experiment Station 1. In charge of soil survey 2. Assist in the field aspects of the research program in soil development and classification. B. College 1. Teach: Soils of North Carolina C. Extension Service 1. Extension specialist in soils with major emphasis on soil differences in relation to soil fertility practices and land use
J. F. Lutz	Associate (Soils)	Prof. of Agronomy Head, Soils Teaching	A. Experiment Station 1. Leader, tobacco research of department which will be carried out in cooperation with E. G. Moss, in charge of tobacco investigations in the state. 2. Chm. Tobacco Com. of the Exp. Station 3. Co-leader and consultant, research in soil conservation, soil development and classification and soil physics B. College 1. In charge, Soils Teaching 2. Teach: Soil Management, Soil conservation and Land Use, Soil Physics, Tobacco Production.
Adolf Mehlich	Associate (Soil Chemistry)		A. Experiment Station 1. Leader, soil chemistry studies in relation to soil borne diseases, in cooperation with T. E. Smith and K. J. Shaw, Pathology Department 2. Co-leader, laboratory investigations in soil chemistry. 3. Co-leader, research on soil development.

Name	Experiment Station Title	College Title	Major Responsibilities
W. L. Nelson	Assistant (Soil Physics and Chemistry)		A. Experiment Station 1. Leader, soil fertility work with cotton in cooperation with B.P.I. 2. Consultant and co-leader, soil physics investigations.
J. R. Piland	Associate (Soil Chemistry)	Asst. Prof. Agronomy	A. Experiment Station 1. In charge soil chemistry laboratories 2. Leader, boron studies with legumes 3. Asst. in oil studies with peanuts and soybeans 4. Consultant and co-leader, laboratory investigations in soil chemistry. B. College 1. Teach: Soil Fertility Evaluation Methods
W. H. Rankin	Associate (Soil Fertility		A. Experiment Station 1. Leader, soil fertility research with corn and small grains 2. Chm. com. responsible for fertilizer and lime needs of department.
J. F. Reed	Associate (Soil Chemistry		A. Experiment Station 1. Leader, research in connection with soil testing work. Coop. State Dept. Agrl. 2. Adviser, soil fertility studies 3. Chm. Committee on laboratory methods
Champ B. Tanner	Graduate Assistant		A. Experiment Station 1. Assistant in organic matter studies with tobacco.
W. W. Woodhouse, Jr.	Assistant (Soil Fertility).		A. Experiment Station 1. In charge fertility investigations in cooperation with T.V.A. 2. Leader, soil fert. research with pastures 3. Chm. Pasture Com. in the Exp. Station.

Name	Extension Service Title	Major Responsibilities
L. S. Bennett	Ext. Seed Improvement Specialist	Leader Seed Inspection Program, cooperation of Agricultural Experiment Station.
E. C. Blair	Agronomy Extension Specialist	Leader, rotation and general crops projects.
E. R. Collins	In charge, Agronomy Extension	1. In charge, Agronomy extension program 2. Leader, soil fertility and fertilizer program 3. Coordinator of extension and research programs of the dept.
D. F. Holler	Cotton marketing Extension Specialist (Cooperation with Agr. Marketing Admr., Cotton Branch, U.S.D.A.)	1. Responsible for statistical gins of the Agr. Marketing Service, for supervision of free government classification of cotton, and pertinent market news. 2. Assisting in one variety cotton program.
W. D. Lee	Agronomy Extension Specialist	Leader, extension project in soils.
L. L. McLendon	Agronomy Extension Specialist	Leader in peanut oil production goal program.
E. H. Meacham	Extension Soil Conservationist	Leader, soil conservation project in cooperation with Soil Conservation Service.
J. A. Shanklin,	Agronomy Extension Specialist	Leader, one variety cotton improvement program. Cooperation with Bureau of Plant Industry.
A. D. Stuart	Ext. Seed Improvement Specialist.	Sec'y-Treas. N. C. Crop Improvement Association

1. Seminars and departmental meetings will be held on Monday during the academic year until further change. All members of the department (Experiment Station, College, Extension and cooperating agencies) are expected to attend as regularly as possible. Dr. Middleton and his committee will arrange the program for such meetings.
2. Whenever research projects overlap between the major responsibilities of different individuals, such projects should be worked out cooperatively.
3. The national emergency may require that all of us get together and help each other with various aspects of our work. We hope that we will not be handicapped so much that the main objectives of our research program cannot be achieved.
4. A list of committee assignments for the coming year is attached.

AGRONOMY DEPARTMENT

Committee Assignments - 1942-43

1. Departmental Meetings and Seminar:
G. K. Middleton, Chmn; J. F. Lutz; R. L. Lovvorn

This committeewill be responsible for arranging the program for the department seminars and for other special meetings of the department.

2. Fertilizer and Lime Needs:
W. H. Rankin

Responsible for the condition of the fertilizer house and for canvassing the department periodically as to lime and fertilizer needs and seeing that these are on hand at the proper time. This will require the full cooperation of every member of the department.

3. Photographic and Visual Aids:
L. S. Bennett, Chmn., E. R. Collins, A. D. Stuart, W. E. Colwell.

Responsible for studying the photographic and visual aids needs of the department, listing the equipment now available, making recommendations as to supplementary equipment and facilities needed, and working out plans for most efficient and effective use of the available equipment and of the photographs and slides made by or in possession of the various members of the department.

4. Greenhouse Committee:
P. H. Harvey, Chmn, L. F. Burkhart, W. E. Colwell

Responsible for studying greenhouse problems of the department and making plans and recommendations for improvement in and use of present space. The construction of additional facilities, when possible, will clear this committee.
The chairman of this committee will be responsible for assigning greenhouse space to those needing it for experimental work and all needs for space should be submitted to him.

5. Project Committee:
J. A. Rigney, Chmn., E. R. Collins

A project should have the approval of the appropriate Experiment Station sub-committee (for example cotton projects approved by cotton committee) before being submitted to the head of the department. It will then be submitted to this committee whose primary responsibility will be to see that it is statistically OK. and that it has incorporated the suggestions of the extension specialists. If the project could be discussed with both these groups before submission, time and effort would be saved. Where the project overlaps in two or more fields, all concerned should assist in development of the plans.

6. Library Needs of the Department:
B. W. Smith, Chmn., E. R. Collins, L. F. Burkhart

Responsible for study of library needs of department and making recommendations from time to time as to how these needs can best be met. Any suggestions as to departmental library needs should be submitted to this committee.

7. Laboratory Methods:
J. F. Reed, Chmn., J. R. Piland, L. F. Burkhart, Adolf Mehlich, J. F. Lutz, W. L. Nelson.

Responsible for review of laboratory methods used in laboratories of the department, standardization of methods where desirable, initiating work on needed improvement in methods, introduction of new methods, etc. The work of this committee will require constant study of the literature on the subject.

8. General Laboratory Problems:
L. F. Burkhart, Chmn., J. R. Piland, J. F. Lutz, W. L. Nelson, Adolf Mehlich, J. F. Reed, W. E. Colwell

This committee should consider all problems of laboratory organization, maintenance, specialized equipment, joint use of equipment, preparation and storage of samples, etc.

[ND]

Graduate Courses in Field Crops

Committee Report

In developing a proposal for graduate course work in Field Crops, the committee has worked from the following basic considerations:

1. Graduate students in field crops must have a comprehensive understanding of fundamental plant science.

2. Efficiency in experimental statistics and reasonable facility with foreign languages are essential tools for the research investigator.

3. Course work is only one component of a successful graduate program. The soundness of the courses and the enthusiasm and inspiration which the instructors are able to impart, however, will largely determine a student's success or failure. Graduate courses in science must be concerned not only with subject matter, but also with the scientific method.

4. Students in field crops will usually major in plant breeding or in crop ecology. It is not desirable to restrict graduate students to a prescribed curriculum, but rather to require a few basic courses and to offer additional work which may be elected according to the interests and specialization of the individual.

The advanced courses in Field Crops will all depend upon basic training to be obtained in other departments. For this reason, the courses in Botany, Zoology, and Experimental Statistics which are pertinent to Field Crops work are listed. The committee is recommending the expansion of the Botany courses now offered in physiology, pathology, and morphology. In addition, new courses in crop geography, advanced taxonomy, and statistical genetics are recommended. These suggestions have been discussed with members of the departments concerned and have been well received.

5. An additional group of students in agronomy, who expect to pursue careers in agricultural extension, will be more concerned with the evaluation of research findings than in carrying out independent investigation. The committee suggests that these men be offered a master's degree in agronomy, with the work equally divided between crops and soils, and that additional course work and library research might be substituted for the traditional thesis problem.

AGRONOMY: FIELD CROPS SECTION

UNDERGRADUATES AND GRADUATES

Primarily for Undergraduates (Juniors and Seniors):

1. Pastures and Forage Crops (3+2) lect. & lab.
   Prerequisites: General field crops

2. Plant Breeding (3+1) lect. & lab.
   Prerequisites: Two terms elementary genetics

3. Weeds and Their Control (1+2) lect. & lab.
   Principles of control. Practice in identification of plants and seeds.

Primarily for Graduates:

1. Advanced Plant Breeding and Genetics 2 terms (3-3) lect. 0-0-3
   Prerequisites: Good foundation in genetics, cytogenetics, plant morphology and evolution.

   Theory, procedure, and technique.

2. Cytogenetics 2 terms (5-5) lect. & lab.
   Prerequisites: Elementary microtechnique; foundation in genetics, plant morphology and evolution.

   Principles of cytology, cytogenetics, in theory and practice.

3. Forage Crop Ecology (2+1) lect. & lab.
   Prerequisites: Pasture and Forage Crops, Plant Ecology.

   Research methods and consideration of the literature.

4. Research Methods in Agronomy 1 term (3) lect.
   Prerequisites: Experimental Statistics 412.

   Experimental techniques, records, and interpretation of experimental data.

Graduates:

5. Research - Special Subjects - cr. arranged.

6. Seminar in Genetics 1-1

7. Agronomy Seminar 1-1

BOTANY

UNDERGRADUATE

To be required of Field Crops Majors, these or equivalent required of graduates without credit.

1. General Botany (4-4)
2. Systematic Botany (3)
3. Plant Physiology (5)
4. Diseases of Field Crops (3+) Add laboratory

UNDERGRADUATE AND GRADUATE

A. Present Courses

Agronomy students will elect these courses according to their chosen fields of interest.

1. Plant Ecology (3)
2. Advanced Plant Ecology (3)
3. Plant Microtechnique (3)
4. Advanced Systematic Botany (3)
5. General Bacteriology (4)
6. Soil Microbiology (3)
7. Microanalysis of Plant Tissue (3)
8. Research Methods in Plant Physiology (See (1) below)
9. Pathogenic Fungi (3-3-3)
10. Advanced Bacteriology (3)

B. Suggested Expansion in Present Botany Courses

1. Advanced Plant Physiology 2 terms ( ) lect. & lab.
   Prerequisites: Elementary Plant Physiology

   An expansion of the present course in this subject to permit more detailed consideration of the subject with the inclusion of additional topics.

2. Mycology and Plant Pathology
   1st. term: Mycology - lect. & lab.
   Prerequisite: Elementary Plant Pathology and Plant Physiology

   General survey of fungi with typical life histories, to provide background necessary for a study of pathogenic forms.

   2nd and 3rd terms: Advanced Plant Pathology
   Prerequisites: Mycology

   Study of life histories, symptoms, transmission, and control of type plant diseases.

3. Plant Morphology (3 terms) lect. & lab.
Prerequisites: General Botany, Systematic Botany

1st term: Thallophytes
Survey of algae and fungi

2nd term: Archegoniates
Survey of bryophytes, pteridophytes, and gymnosperms.

3rd term: Angiosperms
Survey of the flowering plants including life history and anatomical relationships with emphasis on economic species.

C. New Botany Courses

1. Crop Geography lect.
History, distribution, and ecology of cultivated plants.

2. Advanced Taxonomy (2 terms, alternate years) lect. & lab.

1st year: Gramineae and related groups.

Identification and classification of native and cultivated species.

2nd year: Economically important families of dicotyledons.

Identification, classification, and economic importance of such groups as the Rosaceae, Leguminosae, Solanaceae.

ZOOLOGY

UNDERGRADUATE AND GRADUATE - (Graduate students in plant breeding should not receive graduate credit for the first term.)

1. Genetics 2 terms (4-4) lect. & lab.

UNDERGRADUATES AND GRADUATES

1. Advances Genetics 1 term (3) lect. & discussions
   Prerequisite: Elementary genetics
2. Economic Entomology 1 term lect. & lab.

EXPERIMENTAL STATISTICS

1. Experimental Statistics 1 or 2 terms (3-3) lect.
2. Design of Experiments 1 term (3) lect.
3. Experimental Designs 1 term (3) lect.
4. Statistical Genetics 1 term lect. Comstock
   Prerequisite: Foundation in genetics and statistics.

LANGUAGES

The committee recommends that graduate students be permitted and encouraged to substitute Russian or Spanish for French, but that German should be required of Ph. D. candidates.

W. C. Gregory, Associate Agronomist

J. A. Rigney, Associate Agronomist

B. W. Smith, Associate Agronomist

TENTATIVE SUGGESTIONS FOR GRADUATE SCHOOL OPERATION

Prepared by

THE AGRONOMY GRADUATE COMMITTEE

FOR DISCUSSION PURPOSES IN THE AGRONOMY DEPARTMENT

CONTENTS

In this publication is presented information on the Graduate School at State College, how it is organized and administered, the types of graduate work which are offered, advanced degrees conferred and their requirements, facilities available to the student, and other information regarding graduate work at this institution.

Objectives of the Graduate School

It is the purpose of the Graduate School to provide the opportunity and the facilities for advanced instruction and research in the various phases of Agriculture, Engineering, and Textiles. Graduate instruction in these fields may lead to an advanced degree.

Organization and Administration

History

The University of North Carolina was created by an act of the General Assembly of 1931. This act provided for the consolidation of three independent state institutions, namely, the University of North Carolina at Chapel Hill, the North Carolina State College of Agriculture and Engineering at Raleigh, and the College for Women at Greensboro. One of the major objectives of this consolidation was the creation of a University Graduate School. This objective has been accomplished and a Graduate School with a division at each unit of the University has been established.

When the Graduate School was formed its administration was placed under the direction of a Dean and three Associate Deans. The Associate Deans have general supervision of the graduate work at the college at divisional level. There is also a "Graduate Executive Council" which assists the Dean in the performance of his duties and to which must be submitted for approval any recommendations which affect the organization or administration of the Graduate School.

Graduate Faculty

The Faculty of the Graduate Division at State College consists of two groups: (1) an ex officio group including the Chancellor, the Associate Dean of the Graduate School, the Deans of the various schools in which advanced degrees are given, and the Directors of the Experiment Stations, (2) Teaching and Research Professors, associate professors, assistant professors, and instructors who are actively engaged in directing the work of graduate students or who serve in an advisory capacity as members of student committees.

The Graduate Division is under the general direction of the Graduate Faculty. The Associate Dean has administrative supervision of all graduate students and is the medium of communication between the students and the Graduate Faculty and administration. Direct supervision of graduate students' work rests with the department in which the student is enrolled and the committee appointed to supervise and direct the work of the individual student.

To assist the Graduate Faculty and the Associate Dean in the performance of their duties, there is a committee on policy, the duty of which is to consider matters which may be referred to it and to recommend to the Graduate Faculty those things which it considers of benefit to the Graduate School. This committee is elected by the Faculty. It consists of five members, one selected from Agriculture, one from Engineering and one from Textiles. The remaining two members may be chosen from any other department of the College. The committee elects the chairman from its members. Election is for two years and members may succeed themselves.

Facilities

Exceptional opportunities and facilities are offered for graduate work in Agriculture, Engineering and Textiles. The equipment and personnel of the Agricultural and Engineering Experiment Stations, of the Textile Research Laboratories, and of various cooperating Federal Agencies are integral parts of the college. Graduate students have the advantages offered by all of these agencies, and many graduate thesis problems are conducted as part of the research program of one or more of these agencies.

In addition to the many facilities at State College, provision is made for advanced graduates to work at Chapel Hill either by commuting or by entire terms in residence. Transportation is furnished for those who commute. For larger groups desiring work in a particular subject, provision is made to have the instructor come to Raleigh.

The State College Library includes all books and periodicals belonging to the college. The collection numbers over 65,000 exclusive of fairly complete sets of a number of publications of the Federal Government, the various state agricultural experiment stations, the state extension divisions, the engineering experiment stations, and research agencies of many foreign countries. The University Library at Chapel Hill and the Library at Duke University are among the largest collections in the country. Their facilities are available to graduate students in all divisions of the Consolidated University.

Scholarships and Fellowships

The college offers annually a number of graduate, teaching and research fellowships. Others are supported by various commercial organizations, scientific societies, educational and research foundations, and the Federal Government.

Graduate fellowships provide a stipend of $600 an academic year, paid in ten equal installments throughout the academic year beginning with October. The holder of a fellowship may be required to render a maximum of ten hours a week of service to the department in which he is majoring.

Teaching and research fellowships pay from $750 to $900. Usually the teaching fellowships pay $75 a month for 10 months and the research fellowships pay $75 a month for 12 months. It is possible in some instances for a student to hold a teaching fellowship during the academic year and to work on experiment station projects for compensation the rest of the year.

The amount of residence credit allowed a student who holds any appointment requiring a significant part of his time shall be determined by the policies committee upon recommendation of the student's advisory committee. In no case shall such credit exceed three-fourths, and in the case of full-time instructors one-half of full residence credit.

Some research assistantships are available from time to time. The stipend and the time required to obtain an advanced degree is determined individually on the basis of the student's qualifications and the nature of his duties. (Individual scholarships and fellowships to be listed from year to year, giving stipend, source of funds and other pertinent information).

Applications for scholarships and fellowships must be in the hands of the Associate Dean of the Graduate School by March 15 for appointment the following school year. Inquiries about scholarships, fellowships, research facilities, etc. may be addressed to the department concerned.

EXPENSES

Living Expenses:

One dormitory is reserved for graduate students. The rooms contain the necessary furniture, but the student must furnish his own bed covers, linens, and towels. The rent is approximately $25 a quarter. Rooms are available in private homes near the campus at reasonable rates. Board may be obtained at the college cafeteria for $20 to $25 a month.

Tuition and Fees:

There is a registration fee of $2.00 a term. A fee of $3.00 per credit hour is charged for course work. This fee is waived for all students holding scholarships, fellowships or assistantships. Student activities and athletic fees are optional. One course per term may be audited without charge.

Thesis:

When the thesis for any degree is accepted, the student must deposit with the college treasurer $4.00 to pay for binding the library and departmental copies.

Candidates for the Ph. D. must pay $10.00 for publishing an abstract of the thesis unless the thesis is published otherwise (see page

Cap, Gown, and Hood:

A fee of two or three dollars is charged for use of a cap and gown at the time of receiving the degree. Doctors candidates must pay an additional fee of approximately $10.00 for a hood.

ADMISSION TO THE GRADUATE SCHOOL

Requirements:

Admission to the Graduate School is based primarily upon the undergraduate record. Any student with a satisfactory scholastic record and a Bachelor's degree, or its equivalent, from a college or university approved by the Association of American Universities will be admitted with the approval of, first the department in which he expects to major and second, the Associate Dean. Students with exceptional qualifications from other institutions may be admitted, each case being considered on its own merit.

The student is expected to have an undergraduate major in the field of his graduate major or an equivalent amount of closely related fundamental course work. He will be expected to make up any deficiencies in undergraduate courses.

Seniors at North Carolina State College who are within six credits of graduation and who have the grade-point average required of graduate students may be admitted to the Graduate School.

Procedure:

An application for admission should be filed with the Associate Dean of the Graduate School, State College Station, Raleigh, North Carolina. Blank forms will be supplied on request.

The applicant should file a transcript of credits from all institutions attended. Such transcripts become a part of the student's permanent record when he

registers and cannot be returned. The applicant should ask three or four persons who are acquainted with his personal and professional qualifications to send letters of recommendation directly to the Associate Dean of the Graduate School.

GENERAL REQUIREMENTS AND PROCEDURES

Advisory Committee:

The program of each graduate student is guided by an advisory committee. The student should consult the head, or a representative, of the department in which he expects to major and select his major professor, who will serve as chairman of the advisory committee. A tentative program of study should be planned and the other members of the advisory committee selected, with the approval of the Associate Dean, to represent the phases of work covered by the tentative program.

For the Master of Agriculture degree the committee will consist of at least five members with a maximum of two from any one department.

For the Master of Science degree, the advisory committee will consist of at least three members, one of whom must be from some department other than the major.

For the Doctor of Philosophy degree, the committee will consist of at least five members with at least two departments other than the major represented.

The advisory committee will approve a program of study for the student as early as possible, and any changes made in it must be approved by the committee.

Graduate Courses:

Courses numbered in the 400 and 500 groups are considered as graduate level courses. In exceptional cases, if courses of a lower number are found to fit the particular program of a student, they may be awarded graduate credit upon the approval of the student's advisory committee, the department in which the course is offered, and the Associate Dean.

Fifteen credit hours a term, including audits, is considered a full load. Students receiving no remuneration from the college are allowed that much. Those holding scholarships, fellowships, or assistantships have the load reduced according to the compensation, with full-time staff members being allowed one course per term. The student's course load is determined on the academic year rather than on the term basis in order to allow more freedom in scheduling and to allow adjustments of the course load to any seasonal peaks in departmental requirements of the student's time.

Audits:

Graduate students and staff members are allowed to audit one course per term without charge. Audit courses differ only from credit courses in that they carry no credit toward a degree. The student is expected to participate fully in the course and be graded as on credit courses.

Thesis:

A thesis is required for the Master of Science degree, plan A, and for the Doctor of Philosophy degree. It is expected that the thesis will be on a topic within a major field. It may be on original research or an analysis and interpretation of published data. In either event an outline should be prepared and approved by the student's advisory committee. The outline used for Agricultural

Experiment Station projects is suggested as a guide. The title is submitted to the Associate Dean with application for candidacy.

The dissertation must be written in acceptable English and should show that the student has a working knowledge of the special and closely related fields. Four copies are required, the original and first carbon for the library, one for the adviser or department, and one for the student. The original must be on special thesis paper, which may be obtained from the college bookstore, and the carbons on approved bond. The two library copies and the departmental copy must contain all illustrative material. The body of the thesis must be double spaced and footnotes and quotations single spaced. The title page should be as follows:

TITLE OF THESIS

A thesis presented to the Faculty of
The Graduate School of the North Carolina
State College of Agriculture and Engineering
of the University of North Carolina in partial
fulfillment of the requirements for the degree of

|_____|

By
JOHN DOE

Raleigh, North Carolina

(year)

Approved by:

_____
Adviser

The title page should not be numbered but it is understood that it is page i. The other introductory pages should contain:

ACKNOWLEDGMENTS - page ii
BIOGRAPHY OF THE AUTHOR, not to exceed 150 words - page iii
TABLE OF CONTENTS - page iv
LIST OF TABLES - page v
LIST OF FIGURES - page vi

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By
JOHN DOE

Raleigh, North Carolina

(year)

Approved by:

_____
Adviser

The title page should not be numbered but it is understood that it is page i. The other introductory pages should contain:

ACKNOWLEDGMENTS - page ii
BIOGRAPHY OF THE AUTHOR, not to exceed 150 words - page iii
TABLE OF CONTENTS - page iv
LIST OF TABLES - page v
LIST OF FIGURES - page vi

If there are only a few tables and figures, both may be listed on the same page.

Arrangement and presentation of the subject matter part of the thesis should be decided by the department concerned, but should conform to standard procedures.

There should be a SUMMARY and a BIBLIOGRAPHY, and references to the bibliography should be by numeral, enclosed in parenthesis as: (1)

The thesis should be examined by all members of the examining committee, and more than one dissenting vote shall constitute disapproval. It must be in the hands of the committee at least ten days before the final examination and at least a month before the end of the term in which the degree is to be awarded.

When the thesis is accepted, the student must deposit with the college treasurer $4.00 to pay for binding the library and departmental copies.

Residence:

A residence requirement of at least one academic year is required for all advanced degrees.

Transfer credits:

Transfer credits from other institutions will not be accepted in amount sufficient to lower the minimum residence requirement.

Grading:

The grading system used is a combination of a letter grade and credit points. Grades of A, B, C, and D are passing and F is failure. Three points per credit hour are given for an A, two for a B, one for a C and none for a D. The student will be placed on probation if his point average for the term is below 2.0. He will be suspended unless permitted by his advisory committee and the Associate Dean to continue, if his point average for two consecutive terms or his general point average falls below 2.0.

Registration:

After the student has been accepted for admission to the Graduate School, he may secure a permit to register from the Associate Dean. He and his major professor should prepare a program of study at least for the ensuing term, and make four copies on the registration forms. All copies should be approved by the adviser and by the Associate Dean. The student will then pay the treasurer and file the necessary forms with the Office of Registration and secure his registration card.

CANDIDACY FOR A DEGREE

Admission to the Graduate School does not admit a student to candidacy for a degree. Admission to candidacy is contingent upon the quality of work done in the Graduate School and upon the personal qualifications of the student. Under no circumstances will a student be admitted to candidacy until he has been in residence at least one term, and until he has removed all deficiencies which may have conditioned his admission to the Graduate School. Staff members of the North Carolina State College or of the several Experiment Stations above the rank of

Instructor may not become candidates for a degree. This rule applies to resident members of the Agricultural Extension staff of similar rank, but not to other members of the staff working for the degree of Master of Agriculture.

The student will be advised by the departmental graduate committee or by his advisory committee concerning any conditions upon which his candidacy is contingent. The student's record will be reviewed by his advisory committee at the end of each term and the student advised of any deficiencies in credits, courses, scholarship or otherwise.

After the necessary prerequisites for candidacy have been fulfilled, the student should apply for admission to candidacy on the form provided. The application must be accompanied by a complete program of work to be offered for the degree and the title of the thesis (if one is required). The application must be approved by the student's advisory committee. Permission to change to candidacy for a different degree may be granted with the approval of a new application by the above committee.

DEGREES OFFERED

The following degrees are offered for work in residence:

1. Master of Agriculture
2. Master of Science
   a. Plan A
   b. Plan B
3. Doctor of Philosophy

   Agricultural Economics
   Agronomy (Soils and Crops)
   Entomology
   Plant Pathology
   Rural Sociology

REQUIREMENTS FOR THE DEGREE OF MASTER OF AGRICULTURE

The degree of Master of Agriculture is intended for the general agricultural worker whose interests cut across the many phases of agricultural science. It is designed for county agricultural agents and vocational agricultural teachers who are interested in expanding their technical training in general agriculture, but who are not interested in becoming research technicians or even specialists in any particular field.

Students who take this degree may not continue toward the doctorate until they have satisfied all the requirements except the thesis for the Master of Science degree under plan A.

All work for this degree must be completed within a period of five years.

Courses:

A total of 60 credit hours and at least four terms of residence are required for this degree. Two six weeks summer sessions constitute one term of residence. The courses may be selected from any department in the school of agriculture and from logically related departments. It is expected that the courses selected will form a logical program that fits the student's need. At least 18 credits must be in courses of the 500 group. Not more than 12 credits may be offered for the degree from any one college department; otherwise, the student should be a candidate

for the Master of Science degree, plan B. The program of work must be approved by the student's committee.

Language:

No foreign language is required for this degree.

Thesis:

No thesis is required for this degree.

Examination:

A final examination covering all work taken by the student and any other closely related must be passed for this degree. The examination may not be taken until all other requirements, except the courses for which the student is registered during his last term of residence, have been satisfied. It must be taken at least four weeks before the end of the term in which the degree is to be awarded. Application for the examination must be filed with the Associate Dean at least a week before it is to be taken. The examination will be conducted by the student's advisory committee, but is open to all members of the graduate faculty. Faculty members under whom the student has worked may be invited to participate, but the decision rests with the committee.

The student should clearly understand that the examination is comprehensive; that it must demonstrate his ability to think and reason clearly rather than to merely memorize data; that it will cover all subject matter from his course work and any other pertinent thereto.

REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

Either of two plans may be followed to obtain the degree of Master of Science. Plan A is for the student who is interested in the more technical and fundamental phases of a specialized field, particularly from the research point of view. Plan B is for the student who is interested in the less technical and more practical phases and differs from the Master of Agriculture degree by being limited to a specialized field.

Students who obtain the Master of Science degree by plan B may not continue toward the doctorate until they have satisfied all the requirements, except the thesis, for the Master of Science degree under plan A.

All requirements for the Master of Science degree by either plan must be completed within a period of five years.

PLAN A

Residence:

The minimum residence requirement for this degree is one academic year. For students who hold fellowships or other remunerative appointments which require part of their time, a longer period is required. More time is required if the student is not proficient in language or if other prerequisites have to be satisfied. The amount of extra time will depend upon the extent of the deficiencies, the student's ability, the amount of remuneration he receives, and the nature of

the work required for the remuneration. Usually it will require students who hold fellowships or assistantships at least two academic years to satisfy the residence requirement for the Master of Science degree.

Courses:

A minimum of 45 term credits is required; at least 12, exclusive of research, must be in the 500 group. The others may be from those below the 500 group as approved by the advisory committee. A maximum of 9 of the 45 credits may be on research leading to the thesis.

Major and minor work:

The courses taken by the graduate student shall constitute a unified program in a specialized field with extra departmental courses being closely related. No definite number of credits are specified for a major or minor; it is left to the judgment of the advisory committee to work out with the student a well-rounded and coordinated program of study, the successful completion of which will satisfy the course requirements.

Language:

A reading knowledge of one modern, foreign language, the language to be determined by the major department, is required. Usually German, French or Spanish is required, but others may be accepted. Application for permission to take the language examination shall be made to the Associate Dean on blanks provided. The language requirement must be satisfied before the end of the term preceding the one in which the degree is to be awarded and before the final examination may be given. A student who fails in the language examination may not take another one until the following quarter.

Thesis:

A thesis is part of the requirement for the Master of Science degree under this plan.

Examination:

The successful passing of a final examination is required for the Master of Science degree. It may not be taken until all other requirements, except completing the last term courses, are satisfied, but must be taken at least two weeks before the end of the term in which the degree is to be awarded. Application for the examination must be filed with the Associate Dean at least a week before it is to be taken.

The examination will be conducted by a special examining committee, which usually will be the same as the advisory committee, but is open to all members of the Graduate Faculty. Faculty members under whom the student has worked may be invited to participate but the decision rests with the committee only. More than one dissenting vote shall constitute disapproval. A report of the results of each examination, signed by the members of the committee, shall be filed with the Associate Dean. A candidate who fails the examination may not be reexamined within a period of three months, and until he has fulfilled any special requirements imposed by the examining committee.

The examination will cover the thesis, all course work, and related subject matter. The student should understand that it will be comprehensive and that it will test his ability to think and reason clearly.

PLAN B

This plan is offered for the student who is interested in the more practical and less technical phases of a specialized field. It differs from plan A in the following principal ways:

1. More course work - a total of 60 credits - is required.
2. No foreign language is required.
3. No thesis is required.

All other requirements are the same as for plan A (see page 8)

The Master of Science by plan B is a degree in a specialized field, whereas, the Master of Agriculture (page 7) covers a broad field.

Students who take the Master of Science degree by plan B may not later become candidates for the doctorate until they have satisfied all the requirements, except the thesis, under plan A.

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

The Doctor's degree symbolizes the fact that the recipient is capable of working alone, without supervision. Therefore, the Degree of Doctor of Philosophy is not granted on the basis of the successful completion of a given amount of course work, but rather on the basis of the candidate's comprehensive knowledge and high attainments in scholarship and research in a specialized field. These attainments are determined by the quality of the thesis which he prepares on original research and by the successful passing of comprehensive examinations on the special and related fields of study.

Residence:

A minimum of three academic years of work above the Bachelor's degree is required for the Ph. D. degree. For students holding appointments more time will be required, depending on the amount of service to the department. Each case will be determined separately on the recommendation of the student's advisory committee and the approval of the Associate Dean. Residence credit earned as a candidate for the Master's degree at North Carolina State College, or elsewhere, may be credited toward the Ph. D. degree in amounts to be determined by the advisory committee with approval of the Associate Dean. At least one full academic year must be spent in residence at the North Carolina State College. This preferably should be the last year.

Summer sessions may be counted as residence not to exceed two quarters, at the rate of two six-week summer sessions equal to one term.

Upon the recommendation of the advisory committee and the approval of the policy committee (see page 1), a maximum of two years of residence may be granted for work done in other institutions. Application for such credit must be made not later than the end of the student's second term of residence at North Carolina State College.

By special arrangement, and with the approval of the student's advisory committee, and the Associate Dean, residence credit may be granted for work done in absentia if such is mutually advantageous to the student and to the institution, and provided the student is registered in the Graduate School during such period.

Course of study:

There are no definite requirements in credit hours for the Doctor's degree. Emphasis is placed upon a comprehensive knowledge of a specialized and the supporting fields. Usually a major and two minors are sufficient and expected. In many instances, it may be desirable to select the supporting subject matter from more than two fields.

A proposed program of study must be outlined by the advisory committee, in consultation with the student, before registration for the second term of residence. This program should be filed in the Graduate office. During the first week of the last year of residence, the student must file a complete program of study and the thesis title with the Graduate office. This program should bear the approval of the advisory committee and the Associate Dean.

Admission to candidacy:

Application for admission to candidacy for a degree should be made at the same time that the complete program of study is filed. This application is essentially an application to take the preliminary examination. Successful passing of the examination is prerequisite to candidacy and fulfillment of the language requirements is prerequisite to the examination. Admission to candidacy must be attained at least two complete terms before the degree is conferred.

Languages:

Two modern, foreign languages are required for the Ph. D. degree. Usually German and one other are expected. However, with the approval of the advisory committee and the Associate Dean another group of two may be accepted.

Proficiency in the languages must be attested by the Modern Language Department and a certificate to that effect filed with the Associate Dean before the preliminary examination may be taken.

Thesis:

A thesis is required for the Ph. D. degree. Usually the thesis is prepared on original research in the candidate's major field, and under the supervision of the chairman of his advisory committee. Preparation of the thesis shall follow the procedure outlined for the Master's thesis on pages 4 and 5.

In addition, the candidate is required to prepare an abstract, in duplicate, of approximately 1500 words for publication. This requirement may be waived if arrangements are made for publication of the essential parts of it through recognized channels. A fee of $10.00 is assessed the candidate for publication of the abstract.

The thesis should be examined by all members of the examining committee and more than one dissenting vote shall constitute disapproval.

Examinations:

A preliminary or qualifying examination is required for two major reasons: (1) to determine whether the student shall be admitted to candidacy and continue toward the degree, and (2) to aid in planning the remainder of his work. To meet these two purposes it shall not be given until the student has had at least one year of graduate work, but shall be given at least two full terms before the degree may be conferred (see Candidacy, page 11).

The preliminary examination may be written or oral or both. It shall cover the work taken by the student and may include any work logically related and fundamental thereto, except the thesis. If the student fails to pass, no re-examination may be given, except on the recommendation of the examining committee and in no instance until at least one term has passed.

The examination will be conducted by the student's examining committee, which is usually the same as the advisory committee, with the student's major adviser as chairman. The committee shall consist of at least five members. A three-fourths majority with a minimum of four affirmative votes is required for passing. Any member of the committee may waive his part of the examination, in which case his vote is considered affirmative.

A report on each preliminary examination whether passed, waived, or failed, shall be filed by the committee in the office of the Graduate School.

Final examination - The candidate for the Doctor's degree must pass a final examination covering the major and minor fields, any work logically related, and the thesis. This examination shall be conducted, and the decision rendered, by the student's examining committee, but is open to any member of the Graduate Faculty. The student's adviser shall serve as chairman. This examination may be oral or written or both.

The final examination may not be taken until the thesis has been accepted, but must be taken at least two weeks before the degree is to be conferred. Furthermore, it must be taken within four years after the minimum residence requirement has been met. Application for permission to take the examination may be filed when the thesis is presented and, in any case, it must be filed at least five days before the examination may be given.

A three-fourths majority, with a minimum of four affirmative votes is required for passing.

A written report on each examination, whether passed or failed, shall be filed by the examining committee in the office of the Graduate School.

A candidate who fails the final examination may be re-examined only on the recommendation of the examining committee but in no case until one term has passed.

HISTORY AND ACHIEVEMENTS OF RESEARCH IN AGRONOMY IN NORTH CAROLINA DURING FIFTY YEARS(1879-1927)

By C. B. Williams.

During the early years of the North Carolina Experiment Station, its work in the field of Agronomy was carried on mainly by the Director and his assistant chemists. Later on the efforts of the Botanist, Gerald McCarthy (1888-1897), and of the Horticulturist, W. F. Massey (1889-1905), were devoted to some problems in this particular field.

On Agronomy subjects, McCarthy devoted himself mainly to laboratory studies on the purity and vitality of farm seeds and to the preparation of bulletins on "Lucerne as a Forage Crop" (No.60), "Indian Corn" (No.66), "Weed Pests of the Farm" (No.70), "Best Agricultural Grasses" (No.73), and"Grass and Forage Crops" (No.80a); while Massey confined himself chiefly, outside of his special field of Horticulture, to publicity and to the preparation of bulletins on general agricultural subjects such as "Agricultural Suggestions to the Waldesians" (Special Bul. No.28) and "Farming in North Carolina" (No.162).

At its December meeting in 1885, the State Board of Agriculture, under which the N. C. Experiment Station operated from its establishment on March 12, 1877 until the passage of the Hatch Act on March 2, 1887, purchased for field experimental purposes a ten-acre farm,located one and a half miles northwest of Raleigh and adjoining the property of the State Agricultural Society. To this was added 25 acres more by a gift from said Society, making 35 acres for buildings and for field experi-

ments with ~~different~~ crops and fertilizers. During April of the following year, Milton Whitney assumed charge of the experimental field as superintendent. He remained with the Station in this capacity until December 1887, at which time he resigned to take up work with Clemson College, South Carolina, and later with the Maryland Experiment Station, U. S. Weather Bureau and Federal Bureau of Soils. It was while connected with this Station that Whitney started his studies on the physical properties of soils and the relation of meterology to plant growth.

In ~~During~~ 1887, J. R. Chamberlain became connected with the Station as Agriculturist. He was succeeded by F. E. Emery, three years later, who remained Agriculturist until 1899. Associated with him part of the time was J. M. Johnson, as assistant in live-stock work, who remained in the Department from July 1897 to July 1901. During the period covered by Chamberlain and Emery, the Agriculturist had charge of all the work now embraced in the Departments of Agronomy and Animal Husbandry. Following Emery as Agriculturist came B. Irby who acted in this capacity from August 1899 until July 1901; and C. W. Burkett, from July 1901 to July 1906.

In July 1906, C. B. Williams, entered upon the duties of the first Agronomist of the Station, which position he has held up to the present, except for one year.

Early History of Agronomy Work

From the time of its establishment, the study ~~of value~~ of ~~different~~ fertilizing materials, ~~and fertilizers~~, and ~~the~~ plant-food requirements of the different soils of the State has occupied a prominent place in the work of the Station. Director Dabney in

the Station Report for 1881 stated that "the subject which most interests our people is that of fertilizing the soil". The earliest publications dealt mainly with formulas for making composts, where to buy them and how to make bones useful, the most reliable fertilizers, the use of different fertilizing materials, experience with home-made manures, finely ground phosphate rock, value of Peruvian guano, value of marl, and how to use cotton seed, ashes(leached and unleached), horn, leather, and wool-waste as fertilizing materials, with deep plowing to hasten the maturity of cotton, value of different forms of phosphoric acid, stable manure and kainit as sources of plant food, cost of fertilizing materials, value of cowpeas, care of spotted land, cultivation of cowpeas, how plants obtain ammonia, and fertilizer mixtures for cotton, corn, grasses, fruit trees, wheat and tobacco, and the growing of soybeans, alfalfa, cowpeas, and crimson clover. Considerable attention, too, was devoted to the location of phosphatic, lime(marl), nitrogen(fish offal) resources of the State for fertilizing purposes. All these plant-food resources were carefully located and analyzed and the results made known to farmers of the State.

Field Experiments with Farmers: During the first year after the establishment of the Station, field experiments with different fertilizing materials were conducted with six farmers living in Orange and Chatham counties, using cotton, Irish potatoes, oats and turnips as crops for the studies. In 1889, a number of forage crops, including soybeans, sugar cane, sorghum, pearl millet, Canada field pea, sunflower, flax, broom corn, Kaffir corn and ramie were tested out on the farms of farmers in various localities of the State with very satisfactory results. Later in 1891 and 1892,

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tests of varieties of cotton, corn, and a determination of the value of different grasses and oats and hairy vetch for hay were included in cooperative field tests with farmers. The following grasses and legumes combined with them were used: redtop, tall-oat grass, meadow foxtail, crested dogtail, orchard grass, tall fescue, meadow fescue, sheep fescue, ~~meadow fescue, sheep fescue,~~ Italian rye grass, perennial rye grass, timothy, English blue grass, Kentucky blue grass, fowl meadow grass, alfalfa, alsike clover, red clover, Japan clover, and spring and winter vetches.

Through the years, up to the present time, a study of the deficiencies of our soils has been an important phase of the work of the Station, and as a result there is probably no state in the Union that has a better knowledge of its soils and their plant-food deficiencies and requirements for the most profitable growth of crops than North Carolina. The results of this work has enabled the Department of Agronomy to be in a position to advise farmers of the State quite definitely at the present time with reference to how best meet the fertilizer needs for the growth of different crops on particular soils. However, during the early stages of this work, the application of the field findings were quite limited because of the meager knowledge of soil types and the lack of knowledge of the extent and exact location of each of these in the different counties of the State.

Provision for An Experimental Farm: For several years immediately following the establishment of the Station, especially after the removal of its headquarters from the State University to Raleigh, the Director in succeeding reports to the State Board of Agriculture called attention to the needs for an experi-

mental farm which was provided for in the act establishing the State Department of Agriculture. In 1885, a farm of 10 acres, lying one and one-half miles northwest of Raleigh was purchased. To this was added 25 acres by gift from the State Agricultural Society.

During 1886 a modest start was made in grading and laying off the grounds, draining and constructing roads and walks through them preparatory to laying of the plats. The land was hilly and was covered "with a dense growth of scrub oak and black-jack, with, in some places, some dwarf pines". The land had not been in cultivation for from 15 to 18 years. The first plats to be put out on the Experiment Station farm were tests of grasses for hay and pasturage, using different fertilizers, varieties of corn and cotton, permanent pasture mixtures, relative earliness of five varieties of cotton, some new forage crops, two methods of improving land (growing and turning under cowpeas vs commercial fertilizers), physical properties of soils, and the moisture content of the soil of a cotton field at weekly intervals.

In addition to the field work, twelve pot experiments were started to determine the plant-food needs of the Station farm soil for a maximum growth of cotton and the amount of water transpired by cotton plants.

During 1887, the field work, ~~too~~, was expanded to include experiments on the effects of different distancing in planting cotton upon yield and maturity; the adaptability of Sea Island cotton to soil and climate of the Station farm, the effects of high manuring upon the yields of cotton and corn, and the best fertilizer and soil treatments for the poor and worn-out land for the establishment of a permanent grass sod.

At the close of 1887, "owing to decreased appropriations from the State, upon which the Station had depended for its existence, the experimental field work was stopped, and all work at the farm entirely discontinued". "With the advent of the Hatch funds from the United States in April 1888, the means were supplied for recommencing work in this particular direction. But such had been the interruption in the particular case of this Station that affairs could not be arranged to commence operations until August. Much of the work after this time was preparatory in its nature. Experiments were commenced, however, on the yield of wheat with the various fertilizing ingredients compared with the effects of turning under pea vines; on the value of a new forage plant - - -; and on the practical operations connected with the preparation of corn for ensilage; and other minor work of more or less importance."

In 1889, new experimental plats were added to study the comparative value of various fertilizer applications under different systems of green manuring; to determine the value of phosphoric acid, ammonia and potash as fertilizing applications for cotton; and determine the effects upon the growth of cotton of various applications of lime in different forms combined with ammonia and potash materials, "all compared with the ordinary ammoniated fertilizer and acid phosphate".

It was during 1889, because ~~apparent~~ apparent of the ~~utter~~ futility of getting dependable results on the present farm, it was decided in the future to utilize it for various horticultural work and for growing feed crops for the livestock kept at the farm. From this time on the work out in the State assumed greater importance.

Since 1900 to ~~the~~ present, Agronomy work has been conducted

continuously on the College farm, the main lines having been in soil fertility investigations; a comparison of various carriers of lime, phosphoric acid, potash and ammonia; regular fertilizer experiments; variety tests of cotton, corn, soybeans, cowpeas, alfalfa, wheat, oats, rye and barley; crop rotations, grasses and grass mixtures for hay and pasturage; value of corn suckers; spacing tests with cotton and corn; rate and date of seeding tests with small grains; method of fertilizer application to different crops; and the improvement of staple crops by seed selecting.

Recognition of Importance of Doing Field Work Out in the State: It was early recognized by the Station (See N.C. Station Report for 1886) that not only must it have a suitable farm in close proximity to the main offices of the workers along Agronomy lines, but that field experiments "Should be carried on by farmers themselves, where they would be of value to the individual farmer and community, as a means of education, and of teaching whether they can use with profit any or all of the usual ingredients of commercial fertilizers, considering their soils, climate, crops, etc. This is something which practically cannot be done for them at one point in the State. There should be on every farm, or at least in every county, some farm on which a small place is devoted to manure (fertilizer) experiments with different soils and crops." It was further stated that, "fertilizers, manures or composts are necessary in the present stage of agriculture, for with intensive cultivation of the soil, where a much larger yield is required for the need of the people than would naturally grow, the utmost economy must be maintained in regard not only to the treatment, exposure and cropping of the

soil, but also in regard to the plant food." Later, realizing more fully their importance and value, a system of branch station farms was inaugurated by the State Department of Agriculture on the more important soil types in the three major soil provinces of the State. Work in Agronomy, consisting mainly in experiments in soil fertility, crop improvement and adptation, and a comparison of cultural methods, was a very important part of the research work started on these farms from their inception, experiments having begun on leased fields in Edgecombe and Robeson Counties in 1899; at the Iredell farm in 1903; at the Edgecombe farm in 1902; at the Transylvania farm in 1905; at the Buncombe farm in 1908; at the Reidsville farm in 1912 with tobacco; at the Granville farm in 1913; at the Pender farm in 1905; and at the Washington farm in 1913.

The system of experimental agronomy work made possible by the establishment and operation of these farms with that conducted on the Central farm and on outlying fields has afforded the Department of Agronomy with means of determining quite accurately the plant-food needs and crop adaptations, including information bearing on the best varieties or strains and types of crops for growth on each of the major soil types of North Carolina for most profitable farming in various sections of the State.

SOME OUTSTANDING RESULTS OF AGRONOMY RESEARCH

Below is given some of the more outstanding accomplishments by the Station along Agronomy lines from its establishment up to the present:

I - On the Natural Plant-Food Resources of the State

1. The phosphate beds of the State have been carefully explored and accurately mapped.

2. Acid phosphate made from native phosphate has been distributed and experimented with in every section of the State, and its value shown to equal any similar material.

3. The fishing interest of the east has been benefitted by investigation and advice in reference to the catch of "fat-backs" for the manufacture of fish scrap for fertilizer purposes and for oil.

4. Considerable early special work upon cotton seed, and its products was conducted to determine their value for fertilizing, feeding and other purposes.

5. The by-products of the rice industry were early studied, and their value shown.

6. An examination of the beds of marl and phosphate of the State has been of benefit:

   (a) By showing their location, extent and composition.

   (b) In describing how to use and describing what soils are most helped by applications of these materials.

   (c) And by saving the cost that otherwise would go for the purchase of similar materials bought elsewhere.

II - On the Soils, Soil Fertility and Fertilizers, Including Lime and Magnesia

1. North Carolina was a pioneer state in the establishment of an efficient fertilizer control.

2. It has been established that soil fertility investigations with different crops must be carried on by soil types in the field for the results from them to be a reliable guide for farmers on their different fertilizer problems.

3. The value of materials for making fertilizers and home-mixtures for various crops, as well as the needs of the various crops, have been exhaustively studied and the findings made known to farmers.

4. Early in its existence the Station made a special study of kainit and its uses for various crop adaptations. This work was about the first undertaken in America upon potash salts.

5. Finely ground phosphates or "floats" have been critically examined as to their fineness, availability and suitability for fertilizing purposes.

6. Horn, leather, and wool waste have been studied as possible adulterations in commercial fertilizers.

7. In cooperation with farmers, field experiments with fertilizers in every part of the State have helped to a better understanding of the requirements of our soils and of more rational use of fertilizers for different crops. This has lead to the securing of better results from applications made.

8. The special value of improving lands for wheat by turning under ripe pea vines has been fully demonstrated by the securing of an average increased yield of more than 10 bushels of wheat per acre by such treatment.

9. Analyses of many samples of soil, fertilizing materials, mucks, marls, phosphates, and limestones have been made and much valuable informaton on these has been given to farmers and others.

10. Investigations in the laboratory have shown that 94.5 per cent of the phosphoric acid and 85.5 per cent of the potash in cottonseed meal and 94 to 98 per cent of the potash in tobacco stems is available by chemical methods.

11. By a careful study of fertilizers and fertilizing materials, and methods of their analysis and evaluation, the fertilizer trade and the fertilization of crops have been placed on a more rational and scientific basis in the State.

12. Many samples of leaf tobacco have been analyzed in comparison with those grown elsewhere, and their stalks and stems have been evaluated for their fertilizing qualities.

13. The best proportioning and quantities of fertilizer mixtures to use for different crops grown on different types of soil occurring in the State have been determined by field experiments.

14. The best sources of commercial phosphoric acid, potash, ammonia and lime for different crops and soils have been established by field experiments.

15. There has been worked out the most effective methods and time of applying fertilizing materials to different crops grown on different types of soil.

16. Soil survey maps and reports of about three-fourths of the counties of the State have been prepared in each of which the boundaries of soil types are indicated and the types described.

17. The particular soil-type adaptation of such crops as alfalfa, red clover, crimson clover, Japan clover, sugar beets, wheat and sorghum have been determined.

18. Some of the best systems of crop rotations for different soils and types of farming in North Carolina have been worked out.

19. The necessity of a sufficient supply of available magnesia in the soil for the most successful growth of bright tobacco has been demonstrated. If not present naturally in the soil this constituent may be supplied by such materials as dolomitic limestone, sulphate of potash-magnesia and other fertilizing materials carrying this constituent in available form.

20. Largely because of the reliability of the fertilizer recommendations of the Station given to farmers, the consumption of commercial fertilizers in the State has increased thirty times since experimental work was begun.

21. It has been established that the use of lime is essential for the maintenance of the productivity of the soil through crop rotation on the red clay soils of the Piedmont region of the State.

22. In one of the earliest reports on the application of the hydrogen electrode for determination of soil acidity it was shown:

    (a) That practically all soils in North Carolina are acid although the degree of acidity in some of those from basic rocks is negligible.

    (b) That applications of sulphate of ammonia greatly increases, while sulphate of potash slight increases the intensity of soil acidity.

    (c) That acid phosphate applied in normal amounts is without effect on the degree of acidity of the soil.

    (d) That the use of lime decreases soil acidity, as does also nitrate of soda to a less extent.

23. It has been found that the mineral components of the soil furnish a fairly good index of the fertilizer requirements.

24. Soils well supplied with mineral phosphates do not as a rule respond to fertilization with acid phosphate.

25. Potash-bearing minerals vary in their efficiency for producing plant growth, the micas being high in that respect, while the feldspars are relatively low.

26. Liming does not appreciablly increase the availability of soil potash nor that of added potash-bearing minerals.

27. Liming is essantial to corn production on some acid muck soils, beneficial on some and without effect on others. The rate of application giving maximum benefit is in all cases considerably less than that needed entirely to neutralize the acidity of the soil.

28. Nitrification takes place in acid muck soils, but is stimulated in proportion, within limits, to the rate of application of lime. Heavily limed soils have lost appreciable quantities of nitrogen probably by leaching as nitrate.

29. Injury to corn, ~~and~~ soybeans and oats has resulted from liming some of the sandy soils of the Coastal Plain to neutrality. This injury is independent of the form of lime used. In some instances the condition is remedied by small applications of manganese salts.

30. Heavy potash fertilization has also been found to remedy the bad effects of overliming.

31. Cotton rust is more severe on limed soils, but heavy fertilization with potash has been shown to be a remedy.

32. Practically all soils in the State respond to phosphate fertilization, the response being in most cases relative to the deficiency of the constituent in the soil. Exceptions to this are found in the sandy soils of the Coastal Plain where the phosphoric acid content of the soil is low and crop yields are not increased by heavy applications of phosphate.

33. Muck soils are generally less productive of corn with phosphate than without, evidence of injury being found in the deposition of iron in the nodes of the plants.

34. It has been found with good cultural methods that the potash requirements of field crops are largely met by the natural sources of this constituent present in red soils of the Piedmont, but the gray sandy loams of this region respond to moderate fertilization with potash.

35. In the Coastal Plain, the application of potash in moderate amounts is essential for maximum crop production, especially where lime is used. Rust of cotton and "frenching" of soybeans and corn are considered symptoms of potash deficiency.

36. Moderate to heavy applications of low grade potash salts may cause considerable loss in dry spring seasons by decreasing the stand of cotton, tobacco and sweet potatoes.

37. Soluble nitrogenous fertilizers have been found to be the more efficient forms, nitrate of soda, sulphate of ammonia and urea being practically equal in this respect.

38. The exclusive use of soluble nitrogenous materials, especially on sandy soils is unsatisfactory for the reason that in wet seasons there may be considerable loss by leaching, while in dry seasons the killing of the young seedling plants may result from the high concentrations of nitrogen in the soil. For soils of this nature a part of the nitrogen should be derived from the less soluble sources (organic), or if all soluble materials are used a part should be applied as a top-dressing after the plants are up.

39. Notwithstanding the high nitrogen content of the black soils of the lower Coastal Plain region of the State, these respond to heavy applications of nitrogenous fertilizers.

2. Cooperative tests in different parts of the State with various crops have brought some of the best adapted crops and varieties of these into notice, and have aided in a better knowledge and wider use of the better methods of cultivation of crops, particularly with cotton and tobacco.

3. The sugar content of various varieties of sorghum has been determined for the purpose of securing a knowledge of those best suited for syrup-making and for making sugar.

4. Many samples of leaf tobacco have been analyzed in comparison with those grown elsewhere, and their stalks and stems have been evaluated for their fertilizing qualities.

5. Very extensive field trials of all obtainable varieties of cowpeas, soybeans, cotton, oats, wheat, rye, corn, barley, tobacco and peanuts have been carried on and the results made available to farmers.

6. Determined the economic value of corn suckers and factors which promote their development.

7. Determined the value of different grasses for different soils, and the best combinations of these for permanent pastures, hay and lawn purposes.

8. Promoted the wider growth and use within North Carolina of the soybean crop.

9. Determined the particular soil-type adaptation of such crops as alfalfa, red clover, crimson clover, Japan clover, sugar beets, wheat and sorghum.

10. Worked out some of the best systems of crop rotation for different soils and types of farming in North Carolina.

11. Determined some of the best cultural methods for different crops grown in different sections of the State.

12. Injury to corn and soybeans has resulted from liming some of the sandy soils of the Coastal Plain to neutrality. This injury is independent of the form of lime used.

13. Variety tests of cotton on the Station farms and on many private farms have brought about the establishment of two standard varieties(Cleveland Big Boll and Mexican Big Boll) which have largely replaced the many badly mixed unimproved varieties of poor quality and low yield. These two standard varieties are grown on a high percentage of the total cotton acreage of the State.

14. Breeding work with the Mexican Big Boll variety of cotton has resulted in an improvement in its yield, quality, staple and earliness.

15. Pedigreed strains of the Cleveland Big Boll variety of high yielding and quality values have been developed on several private farms.

16. Inheritance of certain characters in cotton and soybeans have been studied.

17. Research investigations of the fiber of several varieties of cotton established the following:

    (a) Diameter and tensile strength of these.
    (b) Density of the cotton fibers on the seed coat and its relation to other qualities of the fiber.
    (c) The relation of length and diameter of cotton fibers.
    (d) The relation of density to twist.
    (e) Distribution of fiber on the seed coat.
    (f) Factors influencing the development of cotton fiber cell walls.
    (g) The relation of fiber characters to spinning quality.

18. Through variety tests and selection work the yield powers of corn, small grains and soybeans have been greatly improved on farms of the State.

19. The best rates of seeding for small grains and soybeans have been determined by careful field tests.

20. Spacing tests with cotton have established the most desirable distances and thickness of cotton plants for the most profitable production of this crop under boll-weevil conditions.

21. The best planting dates for small grains for Piedmont soils and for soybeans and cotton for different sections of the State.

22. Red clover, crimson clover and vetches from different sources have been compared to determine their relative adaptability and resistance to disease.

23. Many varieties of vetches, clovers and other legumes have been grown to determine their actual and relative economic value for the production of seed and of hay.

24. By aid of the use of goodly amounts of acid phosphate in the fertilizer mixtures, recommended by the Station, the cotton-growing area of the State was during the early eighties extended 40 to 50 miles westward and northward across the Virginia line.

25. Has established the futility of attempts at growing grasses on poor soil without heavy manuring or fertilizing.

26. Worked out the best and most practical methods of curing of bright tobacco.

27. Shown that usually soybeans is a larger yielder of seed and hay than cowpeas.

28. Shown thatvvelvet beans is a splendid crop for soil improvement in the eastern portion of the State.

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V - On Methods of Harvesting and Utilizing Crops

1. Methods of harvesting and storing corn silage have been worked out.

2. By analyzing the corn plant, cowpea and soybean vines at different stages of growth to determine the best time to cut each of these for obtaining the greatest amount of food material per acre of best quality.

3. Experiments have been made with a view of improving the methods of making syrup from the sorghum crop.

4. Different methods of curing tobacco have been studied, and the relative cost, yield and value of the products from the different methods have been accurately determined and the results been made known to farmers.

VI - On Farm Drainage, Machinery, and Buildings

1. A plan of hillside ditching has been shown, which can easily be followed with very valuable results for rolling lands subject to washing.

2. The colloidal material of some of the poorly drained and unproductive soils of the Coastal Plain is so highly dispersed as to favor the retention of excessive amounts of soil moisture. It has been found that this condition can be modified by drying but the effect of air drying is only temporary. The colloids are decreased in proportion to the decrease in moisture-content, drainage and flocculation of these soils by treatment with some soil amendment are indicated as the first steps in the preparation of these soils for cultivation.

3. Made known to farmers the different makes of soybean harvesters manufactured in the State and given a brief description of the special features of each.

* Carry to page 36

AGRONOMY RESEARCH PUBLICATIONS

Below is given a list of publications on Agronomy subjects which have been prepared and published since the founding of the Station:

I - Soils, Fertilizers, Soil Fertility Experiments, Including Drainage

N. C. Experiment Station Bulletins:

Ville's formulae for composting. (1878)
Silica vs. Ammonia, Results of Comparative Soil-Tests of Popplein's Silicated Phosphate, with a Number of Ammoniated Guanos. (1878)

Formulas for Composting. (1879)
Value of Active Ingredients of Fertilizers. (1881)
The Use of Agricultural Chemicals. (1881)
Adulterated Chemicals. (1881)
Home-made Manures - High-manuring of Cotton. (1882)
Does Cotton Exhaust? Cotton Seed and Its Uses. (1882)
Stable Manure Saved and Composted. (1882)
Experience with Home-made Manures. (1882)
Treatment of Cotton Lands. (1882)
Horn, Leather and Wool-Waste, and the Fertilizers Made from Them. (1882)
Finely-Ground Phosphates or Floats. (1882)
On Kainit. (1882)
Peruvian Guano. (1882)
N. C. Resources for Commercial Fertilizers:
I. Ammoniates.
II. Potash Sources (1883)
III. Phosphates (1884)
Composition of N. C. Phosphates. (1884)
N. C. Phosphates.
Analyses of Composts.
Formulae for Composts. (1887)
Composts and Ingredients for Composting Them.
Bul. 57 - Field Experiments. (1888)
" 58 - Details of Field Experiments. (1888)
" 61 - Composts, Formulas, Analyses and Value. (1889)
" 62 - (1) Does Stable Manure in Drying Lose Any of Its Ammonia. (2) Pamunky Marl Phosphates. (1889)
" 65 - Cooperative Field Tests During 1888. (1889)
" 71 - Cooperative Field Tests During 1889; Hillside Ditches. (1890)
" 72 - Value of Pea-vine Manuring for Wheat. (1890)
" 77 - Value of Pea-vine Manuring for Wheat. (1891)
" 79 - Facts for Farmers. (1891)
" 80c- Fertilizing Constituents Recovered in Manure in Feeding Cottonseed Hulls. (1891)
" 89 - Cooperative Field Tests During 1891 and 1892. (1893)
" 110 - Marls and Phosphates for North Carolina. (1894)
" 112 - Mixing Fertilizers for Truck Crops. (1895)
" 121 - Hillside Terraces or Ditches. (1895)
" 129 - Horticultural (Fertilizer) Experiments at Southern Pines. (1896)
" 137 - A Warning in Regard to Compost Peddlers. (1897)
" 139 - Home-made Fertilizers and Composts. (1897)
" 159 - Horticultural (Fertilizer) Experiments at Southern Pines for 1896. (1898)
" 162 - Farming in North Carolina. (1899).
" 173 - Another Warning in Regard to Compost Peddlers. (1900)
" 176 - The Relative Value of Some Nitrogenous Fertilizers. (1900)
" 190 - The Formation of Nitrates in the Soil. (1905)
" 227 - Fertilizer Experiments with Cotton on Piedmont Cecil Sandy Loam Soil and Varieties, Culture and Fertilization of Cotton on Piedmont Cecil Sandy Loam and Red Clay Soils. (1914)
" 229 - Fertilizer Experiments with Corn on Piedmont Cecil Sandy Loam Soil and Varieties, Culture and Fertilization of Corn on Piedmont Cecil Sandy Loam and Red Clay Soils. (1915)

Bul. 234 - Farm Drainage in North Carolina. (1915)
" 236 - The Prevention and Control of Erosion in North Carolina, with Special Reference to Terracing. (1916)
" 250 - Fertilizer Experiments with Cotton. (1926)

N. C. Experiment Station Circulars:

Cir. 6 - Composition and Fertilizing Value of Farm Crops and Other Farm Materials. (1913) (Reprinted in 1915)
" 8 - Effects of Applying Commercial Fertilizer to Corn and Cotton by Different Methods. (1913)
" 11 - Source, Availability and Suitability of Different Forms of Plant Food Constituents to Different Crops. (1914)
" 12 - Effect of Different Fertilizing Materials Upon the Maturity of Cotton. (1914)
" 18 - Fertilization and Cultivation of Corn, Cotton and Tobacco. (1914)
" 28 - Use of Lime on the Farm. (1915)

N. C. Experiment Station Technical Bulletins:

Bul. 9 - Relation of the Mineralogical and Chemical Composition to the Fertilizer Requirements of North Carolina Soils. (1914)
" 24 - Nitrification and Acidity in Muck Soils of North Carolina. (1923)

N. C. Experiment Station Press Bulletins:

Bul. 22 - Use of Lime on the Farm. (1911)
" 25 - Fertilization and Cultivation of Corn and Cotton, Fertilization of Tobacco. (1913)

N. C. State Department of Agriculture Bulletins:

1. Preliminary Report on Soil Survey Work in the State, and Fertilizer, Culture and Variety Tests of Cotton, Corn, Irish and Sweet Potatoes, Grasses and Grains on Edgecombe and Red Springs Farms. (1900)
2. Fertilizer, Culture and Variety Tests of Cotton and Corn and Experiments on Black or Pocosin Soils. (1902)
3. (a) Variety and Distance Tests of Corn and Cotton at Edgecombe and Red Springs Farms.
   (b) Fertilizers for Corn, Cotton and Tobacc. (1903)
4. (a) Variety and Distance Tests of Corn
   (b) " " " " " Cotton
   (c) Fertilization and Cultivation of Corn and Cotton
   (d) Composts and Composting
   (e) Fertilizers for Tobacco. (1906)
5. (a) Variety and Distance Tests of Corn
   (b) " " " " " Cotton
   (c) Fertilization and Cultivation of Corn and Cotton
   (d) Composts and Composting
   (e) Fertilization of Tobacco. (1906)
6. Miscellaneous Fertilizer Tests Conducted on the Department Test Farms During 1904, 1905 and 1906. (1907)
7. (a) Variety and Distance Tests of Corn
   (b) " " " " " Cotton
   (c) Fertilization and Cultivation of Corn and Cotton
   (d) Composts and Composting.

(e) Fertilizers for Tobacco. (1907.

7. (a) Fertilizer Experiments with Cotton on Piedmont Red Clay Soils.
   (b) Varieties, Culture and Fertilization of Cotton on Piedmont Red Clay Loam, Red Clay and Valley Soils. (1910)
8. Fertilizer Experiments with Cowpeas on Piedmont Red Clay Loam Soil and Varieties and Culture of the Cowpea on this Soil. (1910)
9. (a) Fertilizer Experiments with Corn on Piedmont Red Clay Loam Soil.
   (b) Varieties, Culture and Fertilization of Corn on Piedmont Red Clay Loam, Red Clay and Valley Soils. (1910)
10. Preliminary Report on Mountain Soils. (1911)
11. Fertilizer Experiments with Corn on Sandy Loam Soils (Norfolk sandy loam) of the Coastal Plain. (1913).
12. Fertilizer Experiments with Cotton on Sandy Loam Soils (Norfolk sandy loam) of the Coastal Plain. (1914)
13. Report on Piedmont Soils. (1915)
14. Report on Mecklenburg County Soils and Agriculture. (1917)
15. Report on Gaston County Soils and Agriculture. (1917)
16. Report on Union County Soils and Agriculture. (1917)
17. Report on Cabarrus County Soils and Agriculture. (1917)
18. Report on Coastal Plain Soils. (1918)
19. (a) Fertilizer Experiments with Wheat on Mountain Soils
   (b) Wheat Culture in North Carolina. (1920)
20. Relative Value of Acid Phosphate and Rock Phosphate on North Carolina Soils. (1920)
21. Fertilizers for Crops Commonly Grown in North Carolina. (1921)
23. (a) Fertilizer Experiments with Corn on Toxaway Loam (Bottom Soil) and Porter's Loam (Upland Soil)
   (b) Varieties, Culture and Fertilization of Corn on Mountain Soils. (1922)
24. (a) Fertilizer Experiments with Wheat on Piedmont Red Clay Loam Soils.
   (b) Wheat Culture in North Carolina. (1923)
25. Fertilizer Experiments with Cotton and Irish Potatoes on Some of the Principal Soil Types of North Carolina. (1924)
26. Fertilizer Experiments with Flue-Cured Tobacco. (1927)

Scientific and Other Papers:

1. The Response to Liming and Fertilization of the Reclaimed Muck Lands of North Carolina. (Abstract in Jour. Am. Soc. Agro., Vol. 18, No. 11 (1926), p.1035)
2. Studies in Soil Reaction as Indicated by the Hydrogen Electrode. (Jour. Agr. Res.,Vol.12,No.1(1918)pp.19-31)
3. Petrography of Some North Carolina Soils and Its Relation to Their Fertilizer Requirements. (Jour.Agr.Res.,Vol.5, No.13,(1915) pp.569-584.
4. Availability of Potash in Some Common Soil-Forming Minerals. Effect of Lime Upon Potash Absorption by Different Crops. (Jour.Agr.Res.,Vol.14,No.8 (1918) pp.297-315.)
5. Effect of Liming on the Availability of Soil Potassium, Phosphorous, and Sulphur. (Jour.Am.Soc.Agro.,Vol.13,No.4. (Apr.1921)
6. How the Soil Survey is Proving Most Valuable to North Carolina. (Jour.Am.Soc.Agro.,Vol.16,No.7(1924),pp.447-451.)

7. Plant Food Deficiencies of Coastal Plain and Piedmont Soils. (Jour.Ind. and Eng. Chem.,Vol.8,No.9(1916) pp. 823-826)
8. Fit the Crops to Adapted Soils. (N.C. Ext.Farm-News, Vol. 12, No.10(1927) p. 3.)
9. The Influence of Potash on Cotton Bolls and Foliage on a Potash Deficient Soil.(Better Crops, Vol.5, No.5(Jan.1926) pp. 8-10, 43-46)
10. Which and Why-Facts About Soil Fertility Studies on Branch Station Farms. (Better Crops, Vol.7,No.1(Sept.1926, pp.5-6,47).
11. Wisdom + Fertilizer = Better Cotton. (Better Crops,Vol.7, No.6(Feb. 1927) pp.5, 54-56).

II - On Crops, Their Improvement, Uses and Cultivation

N. C. Experiment Station Bulletins:

Sugar Beet in North Carolina. (1878)
Extension in Cotton Culture. (1882)
Treatment of Cotton Lands. (1882)
Rice and Its Products - Food and Fodder Plants. (1882)
The Soja Bean and Waste Products of Tobacco Factories. (1883)
Special Bul. No. 28 - Agricultural Suggestions to the Waldesians. (1895)
" " " 49 - Sugar Beets. (1898)
Bul. No. 59 - Purity and Vitality of Seeds. (1888)
" " 60 - Lucerne, Its Value as a Forage Crop. (1888)
" " 63 - Tests of Seeds and Rust of Wheat and Cotton. (1889)
" " 66 - Indian Corn. (1889)
" " 67a- Seed Tests. (1889)
" " 70 - Weed Pests of the Farm; Japan Clover. (1890)
" " 73 - The Best Agricultural Grasses. (1890)
" " 80a- Grasses and Forage Crops. (1891)
" " 91 - Some Experiments in Wheat Culture. (1893)
" " 98 - Some Leguminous Crops and Their Economic Value.(1894)
" " 108 - Seed Testing; Its Uses and Methods. (1894)
" " 125 - Forage Grasses and Hay Making. (1896)
" " 133 - Some New Forage, Fiber and Other Useful Plants.(1896)
" " 145 - Crimson Clover. (1897)
" " 146 - Miscellaneous Farm Bulletin. (1897)
" " 162 - Farming in North Carolina. (1899)
" " 168 - Experiments with Field and Forage Crops. (1899)
" " 171 - Corn Culture in North Carolina. (1900)
" " 180 - The Sugar Beet in North Carolina. (1901)
" " 204 - Some Factors Involved in Successful Corn Growing.(1909)
" " 226 - Report of Variety Tests of Cotton for 1913, and Summary of Results for the Past Eleven Year. (1914)
" " 230 - Variety Tests of Corn in 1914. (1915)
" " 231 - Report on Variety Tests of Cotton for 1914.(1915)
" " 232 - Results of Variety Tests of Wheat, Oats and Rye.(1915)
" " 237 - Tobacco Culture in North Carolina. (1917)
" " 241 - Soybeans and Cowpeas for North Carolina.(1919)

Experiment Station Circulars:

Cir. 3 - Method of Improving Cotton by Seed Selection. (1913)

Cir. 7 - The Premier Clover for N. C. Farmers. (1913)
" 9 - Grass Mixtures for N. C. Pastures. (1915)
" 10 - Hairy Vetch. (1914)
" 13 - Long Staple Cotton in North Carolina. (1914)
" 14 - Buying Cotton Seed for Planting. (1914)
" 16 - Results of Variety Tests of Cotton in Mecklenburg County. (1914)
" 18 - Fertilization and Cultivation of Corn, Cotton and Tobacco. (1914)
" 20 - Rape for Hog Pasturage. (1914)
" 21 - Improving Cotton by Seed Selection on the Farm.(1914)
" 30 - Oats for North Carolina. (1915)
" 31 - Soybean Growing in North Carolina. (Reprinted 1915)
" 32 - Increasing our Crop Yields by Seed Selection on the Farm. (1915)
" 35 - Velvet Beans; How to Grow and Use. (1917)

N. C. Experiment Station Press Bulletins:

Bul. 27(old series) - Best Sorghum for Molasses, Syrup and Sugar. (1892)
" 28 " " - Broom Corn. (1892)
" 33 " " - Fertilizing Vineyards; Comparative Value of Cured Tobacco Upon the Stalk, and the Leaf Cured Upon Wire. (1892)
" 38 " " - Harvesting Peas. (1892)
" 16 - Selecting Seed Corn for Larger Yields. (1909)
" 25 - Fertilization and Cultivation of Corn and Cotton. Fertilization of Tobacco. (1913)

N. C. State Department of Agriculture Bulletins:

1. Preliminary Report on Soil Survey Work in the State, and Fertilizer, Culture and Variety Tests of Cotton, Corn, Irish and Sweet Potatoes, Grasses and Grains. (1900)
2. Fertilizer, Culture and Variety Tests of Cotton and Corn and Experiments on Black or Pocosin Soils. (1902)
3. Variety and Distance Tests of Corn and Cotton. (1903)
4. Improvement of Corn by Seed Selection. (1903)
5. Variety and Distance Tests with Corn and Cotton. (1904)
6. Hairy Vetch and Bur Clover. (1904)
7. (a) Variety and Distance Tests of Corn
   (b) " " " " " Cotton
   (c) Fertilization and Cultivation of Corn and Cotton
   (d) Composts and Composting.
   (e) Fertilizers for Tobacco. (1905)

8. (a) Variety and Distance Tests of Corn
   (b) Variety and Distance Tests of Cotton
   (c) Fertilization and Cultivation of Corn and Cotton
   (d) Composts and Composting
   (e) Fertilization of Tobacco. (1906)
9. Alfalfa Growing. (1906)
10. Selecting Seed Corn for Larger Yields. (1906)
11. (a) Variety and Distance Tests of Corn
    (b) Variety and Distance Tests of Cotton
    (c) Fertilization and Cultivation of Corn and Cotton
    (d) Composts and Composting.
    (e) Fertilizers for Tobacco. (1906)

12. Some Facts Concerning Those Characters of the Corn Plant Associated with Yield and Factors Which Influence Them. (1909)
13. Some Factors Involved in Successful Corn Growing. (1909)
14. (a) Fertilizer Experiments with Cotton on Piedmont Red Clay Soils.
    (b) Varieties, Culture and Fertilization of Cotton on Piedmont Red Clay Loam, Red Clay and Valley Soils. (1910)
15. Fertilizer Experiments with Cowpeas on Piedmont Red Clay Loam Soil and Varieties and Culture of the Cowpea on this Soil. (1910)
16. (a) Fertilizer Experiments with Corn on Piedmont Red Clay Loam Soil.
    (b) Varieties, Culture and Fertilization of Corn on Piedmont Red Clay Loam, Red Clay and Valley Soils. (1910)
17. Report on Variety Test of Cotton for 1915. (1916)
18. Variety Tests of Corn. (1919)
19. (a) Fertilizer Experiments with Wheat on Mountain Soils
    (b) Wheat Culture in North Carolina. (1920)
20. Farm Practices with Soybeans. (1920)
21. (a) Fertilizer Experiments with Corn on Toxaway Loam (Bottom Soil and Porter's Loam (Upland soil).
    (b) Varieties, Culture and Fertilization of Corn on Mountain Soils. (1922)
22. (a) Fertilizer Experiments with Wheat on Piedmont Red Clay Loam Soils.
    (b) Wheat Culture in North Carolina. (1923)

Scientific and Other Papers:

1. Economic Value of Scorn Suckers. (N.C.Sta.Rpt.for 1921,pp.37-40).

III - On Crop Products: Their Uses and Analyses.

N. C. Experiment Station Bulletins:

Does Cotton Exhaust? Cotton Seed and Its Uses. (1882)
Rice and Its Products - Food and Fodder Plants. (1882)
The Cotton Seed and Its Products. (1882)
The Soja-Bean - Waste Products of Tobacco Factories. (1883)
No. 80 - Silos and Ensilage. (1891)
Bul. 90a - Results of Chemical Analyses of Tobacco Cured by the Leaf Cure on Wire and the Stalk Processes. (1893)
" 90b - Chemical Analyses of Some Native Grasses, Forage Plants, Grains, Seeds and Byproducts. (1893)
" 122 - Types of Tobacco and Their Analyses. (1895)

N. C. Experiment Station Circulars:

Cir. 34 - Soybean Products and Their Uses. (1916)

N. C. State Department of Agriculture Bulletins:

1. The Cotton Plant. (1906)

Scientific and Other Papers:

1. How Favorable and Opportunity the Crushing of Soybeans by Oil Mills Offers to Farmers. (Cotton Oil Press, Vol.10, No.6,(1926), pp.33-35).

IV - On Harvesting and Curing Crops.

N. C. Experiment Station Bulletins:

Bul. 86 - Tobacco Curing by the Leaf Cure on Wire, and the Stalk Processes. (1892)
" 104 - Why Pull Your Corn Fodder? (1894)
" 125 - Forage Grasses and Hay Making. (1896)
" 238 - Harvesting Tobacco by Priming or Picking the Leaves as Compared with Cutting the Stalks.(1917)

N. C. State Department of Agriculture Bulletins:

1. Farm Practices with Soybeans. (1920)

V - On Farm Buildings and Equipment

N. C. Experiment Station Bulletins:

Bul. 68 - Farm and Dairy Buildings. (1889)
142 - Comfortable Low Cost Barns. (1897)

VI - Miscellaneous Subjects.

N. C. Experiment Station Bulletins:

Bul. 96 - Miscellaneous Agricultural Topics. (1894)
" 103 - Miscellaneous Agricultural Topics. (1894)
" 115 - Miscellaneous Agricultural Topics. (1895)

N. C. Experiment Station Circulars:

Cir. 15 - Farmers' Clubs, Their Organization and Work. (1914)

N. C. Experiment Station Miscellaneous Publications:

Cir. - N. C. Corn Growers Special Train. (1908)

N. C. College of Agriculture and Engineering:

Cir. - Vitalizing the Study of Agriculture. (1918)
How N. C. Farmers Can Effectively Meet the Boll Weevil Attack. (N. C. State College Record, Vol.20, No. 9(1922).

N. C. State Department of Agriculture Bulletins:

1. Publications for Farmers. (1906).

Agronomy Extension Bulletins

I - Soils, Fertilizers, Soil Fertility Experiments, Including Drainage.

Cir. 20 - Bur Clover for the Improvement of Coastal Plain Soils. (1916)
" 24 - How to Use Lime on the Farm. (1916) (Revised and reprinted 1919)
" 32 - How N. C. Soil Survey is Being Used to Help Farmers. (1916)
" 70 - Composition and Fertilizing Value of Farm Crops and Other Farm Materials. (1918) (Reprinted 1925)
" 141 - Fertilizer Needs of N. C. Soils. (1924)
" 149 - Fertilizers for Tobacco. (1925)
" 165 - Crop Rotation for the Coastal Plain Section of North Carolina. (1927)

Extension Folders:

Folder No. 18 - Fertilizer Recommendations for North Carolina Soils. (1925)

II - On Crops, Their Improvement, Uses and Cultivation.

Cir. - - Instructions for Putting OutVariety Test of Corn.
" - - Cooperative Alfalfa Experiments by the State and National Departments of Agriculture.
" 2 - Selecting Seed Corn for Larger Yield. (1915)
" 9 - Soybean Industry of Eastern North Carolina. (1916)
" 15 - Crimson Clover. (1916)
" 16 - Hairy Vetch. (1916)
" 17 - Grass Mixtures for N. C. Pastures. (1919)
" 20 - Bur Clover for the Improvement of Coastal Plain Soils. (1916)
" 21 - Rape for Hog Pasturage. (1916)
" 28 - How to Secure Better Lawns in N. C. (1916)
" 31 - Soybean Growing in N. C. (1915)
" 37 - Improving Cotton in Scotland Neck Community. (1917)
" 54 - Length of Staples of Cotton Produced in N. C. (1917)
" 57 - Soybeans - A Future Economic Factor in N. C. (1917)
" 96 - Vetch for North Carolina. (1919)
" 98 - Crimson Clover for North Carolina. (1919)
" 102 - Sweet Sorghum Variety Demonstrations in 1919. (1920)
" 108 - Community Cotton Improvement in N. C. (1920)
" 111 - Soybeans for Piedmont and Mountain Sections of North Carolina. (1921)
" 112 - Spacing Cotton on N. C. Soils. (1921)
" 120 - Long and Short Staple Cottons Compared. (1921)
" 127 - Soybean Growing in North Carolina. (1922)

Extension Folders:

Folder 8 - Tobacco Plant Beds. (1923)
" 9 - Growing Quality Tobacco. (1923)
" 17 - Cultural Practices for Growing Cotton Under Boll Weevil Conditions. (in part) (1925)
" 27 - Ridge Methods of Cultivation of Tobacco. (1927)

III - On Crop Products: Their Uses and Analyses.

Cir. 9 - Soybean Industry of Eastern North Carolina. (1916)
" 29 - The Commercial Uses of Soybeans. (1916)
" 57 - Soybeans - A Future Economic Factor in N. C. (1917)

IV - On Harvesting and Curing Crops:

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V - On Farm Buildings and Equipment.

Cir. 18 - Tobacco Curing Barns. (1916)
" 38 - Farmers' Limestone, Shell and Marl Grinding Plants. (1917)
" 56 - Soybean Harvesters. (1917)
" 80 - Soybean Harvesters. (1921)
" 122 - Equipment for Making Sorghum Sirup. (1921)

VI - On Miscellaneous Subjects.

Folder 14 - N. C. Boll Weevil Program. (1924)

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AGRICULTURAL DEVELOPMENT AS A RESULT OF RESEARCH FINDINGS

More than any other industry agriculture is dependent on stability for success. For this reason many practices that are apparently profitable but fundamentally unsound must be opposed while proper methods are being advocated. The department has made every effort to emphasize this viewpoint in its recommendations to the agricultural interests of the State.

Some of the outstanding developments consequent to research in Agronomy are the following:

1. The publication of results of fertilizer experiments has stimulated the use of commercial fertilizers until North Carolina is now one of the largest markets for fertilizer in the Union. The fertilizer industry has adopted many of the recommendations of this Department in an effort to improve its product.

2. The data furnished by the soil survey has been fundamental to the success of colonization projects and other private agricul-

tural exploitations as well as serving as a basis for instruction and research by other Departments of the Station and College.

3. Some soil types naturally deficient in plant nutrients have been brought into profitable cultivation by the use of suitable fertilizers and specially adapted crops.

4. Through carefully conducted crop improvement experiments, better producing strains of the major field crops grown in the State have been originated and distributed widely among farmers of the State. Through the intelligent use of fertilizers and best adapted seed for planting purposes, North Carolina farmers are securing average acreage yields of most crops much above the average of the Southern States as a whole.

5. Through field trials and in other ways the annual acreage devoted to soybeans, cowpeas, crimson clover, red clover, Japan clover and grasses have been greatly extended to the betterment of the agriculture of the State.

6. Although not as general as should be, better rotation of crops is being more and more practised by farmers than was formerly the case.

7. The more intelligent and wider use of lime is being practised.

8. Better Methods of preparation of the soil, planting of crops, and their cultivation are gradually coming into use.

9. In the fertilization of crops, farmers are more nearly approximating the optimum amounts and quantities for largest yields, and are proportioning the constituents better so as to secure the development of those qualities of each crop of greatest economic importance.

10. Through the encouragement of the Station, the soybean

crop acreage of the State has been greatly extended for the production of seed, hay making, soil improvement and for grazing purposes, and the beans themselves are being crushed in large amounts for their oil and meal by the cotton-oil mills of the State.

11. The wider use of the better methods of harvesting corn and other crops has taken place.

12. Since the foundation of the Station, the grade of commercial fertilizers bought and used by farmers of the State has been greatly improved without materially increasing, if at all, their price per ton.

13. The reduction of the erosion of the farm lands of the State has been reduced by the wider use of improved methods of drainage, encouraged by the Station.

14. The commercial qualities of cotton, tobacco and other crops grown in the State have been greatly improved.

15. The rational growth and use of leguminous crops has been more generally been brought into more general practise on the farms of the State.

AGRONOMY PROBLEMS BEING STUDIED BY RESEARCH WORKERS

The experimental work of this Department in its several branches covers two fields: research of a more practical nature and fundamental research. Problems in the latter category have been chosen with a view to the practical use of the results obtainable and this effort has gone far toward eliminating the antagonism of farmers of the State toward pure scientific investigations.

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A list of the experimental projects of the Department is given below, classified according to subject matter:

I - Soil Type Studies

1. The classification and mapping of North Carolina soils as a basis for soil fertility investigations and crop adaptations. Begun 1900.(1)

2. A study of the relation of soil type to chemical composition. -- Central Station. -- Begun 1923.

3. Study of the Development and classification of the Durham series of soil. -- Central Station. -- Begun 1926.

II - Phosphate Studies

1. A comparison of rock phosphate and acid phosphate when applied alone to corn, wheat and red clover in rotation on Cecil Clay loam, the acid phosphate being applied in normal amounts, and the rock phosphate applied in normal, two, three, four, six and eight times the normal amounts. - Piedmont Branch Station. -- Begun 1910.

2. A comparison of rock phosphate and acid phosphate as sources of phosphoric acid for corn and crimson clover (turned under) in a one-year rotation on Toxaway loam. - Mountain Branch Station. -- Begun 1910.

3. Rock phosphate versus acid phosphate as a source of phosphoric acid for corn, oats, wheat and soybeans in rotation:
   (1) When used with normal amounts of nitrogen and potash;
   (2) When used with stable manure;
   (3) When used with potash and legumes turned under on Toxaway loam. - Mountain Branch Station. -- Begun 1910.

4. Rock phosphate, acid phosphate and basic slag compared as sources of phosphoric acid for corn, wheat and red clover in rotation:
   (1) When the sources of phosphoric acid are used with normal amounts of nitrogen and potash;
   (2) When the acid phosphate and basic slag are applied in normal amounts and the rock phosphate in one, two, four, six and eight times the normal applications.

conducted on Toxaway loam. - Mountain Branch Station. -- Begun 1915.

III - Nitrogen Studies

The phases of the nitrogen problem studied were -

(1) Sources of Nitrogen.
(2) Time of application of nitrogen carriers.

(1) Conducted in cooperation with the U.S. Department of Agriculture, Bureau of Soils.

1. A study of the effects of different sources of nitrogen upon the quality and yield of tobacco when applied alone and as sole sources of nitrogen in a complete fertilizer on Durham sandy loam. -- Tobacco Branch Station. (1)

2. A comparison of the efficiency of nineteen sources of nitrogen when each are used as the sole source of nitrogen and in certain combinations in a complete fertilizer for corn and cotton on Cecil sandy loam. -- Central Station. -- Begun 1924.

3. A comparisonof the efficiency of eight sources of nitrogen when each are used as the sole source of nitrogen in a complete fertilizer for cotton and corn on Cecil clay loam. - Piedmont Branch Station. -- Begun 1920.

4. A study of the effects of time of applying nitrate of soda as a top-dresser to cotton on Cecil sandy loam. - Central Station. -- Begun 1926.

5. A study of the effects of time of applying nitrate of soda as a top-dresser for corn and Cecil sandy loam. - Central Station. -- Begun 1926.

6. A study of the effects of time of applying nitrate of soda, as a top-dresser to cotton, upon yield and maturity on N Norfolk sandy loam. - Upper Coastal Plain Branch Station. -- Begun 1925.

7. A study of the effect of time of applying nitrate of soda, as a top-dresser to corn, in relation to yield and quality of grain. - Upper Coastal Plain Station. -- Begun 1924.

8. Study of the efficiency of sources of nitrogen when compared in a complete fertilizer (10-4-3) and measured by the yield and quality of cotton produced on Norfolk sandy loam. - Upper Coastal Plain Station. -- Begun 1925.

IV - Potash Studies

1. A study of the effects of different sources of potash upon the yield and quality of tobacco when used with and without dolomite and calcite on Durham sandy loam. - Tobacco Branch Station.(1)

2. A comparison of sulphate and muriate of potash as sources of potash in a complete fertilizer for tobacco when used with and without applications of dolomite on Durham sandy loam. - Tobacco Branch Station. -- Begun 1911. (1)

V - Concentrated vs. Standard Fertilizers

1. A comparison of complete fertilizers of the same proportioning of constituents and quantity of plant food, but differing in concentration, when measured by stand and yield of cotton on &&& Norfolk sandy loam. - Upper Coastal Plain Station. -- Begun 1927.

(1) Conducted in cooperation with U.S. Dept. ofAgriculture, Bureau of Plant Industry.

2. A study of methods of applying concentrated fertilizers to cotton on Cecil sandy loam. - Central Station. -- Begun 1927.(2)

3. A comparison of complete fertilizers of the same analyses and quantity of plant food, but differing in concentration when measured by stand and yield of cotton on Cecil sandy loam. - Outlying Field, Mecklenburg County. (2)

4. A comparison of complete fertilizers of the same analyses and quantity of plant food, but different in concentration, when measured by stand and yield of cotton on Marlboro sandy loam. - Outlying Field, Northampton County. -- Begun 1926. (2)

5. A comparison of complete fertilizers of the same analyses and quantity of plant food, but differing in concentration, when measured by stand and yield of cotton on Cecil sandy loam. - Outlying Field, Gaston County. (2)

6. A comparison of complete fertilizers of the same analyses and quantity of plant food, but differing in concentration, when measured by stand, yield and quality of sweet potatoes on Norfolk loamy fine sand. -- Outlying Field, Currituck County. (2)

VI - Lime Studies.

1. A comparison of limestone, burnt lime and hydrated lime when used with acid phosphate for crimson clover, soybeans, rye, oats and vetch, and cotton in a four-year rotation on Cecil sandy loam. - Central Station. -- Begun 1917.

2. A study of sources and rate of application of lime for corn on muck soil when used with and without a complete fertilizer. - Blackland Branch Station. -- Begun 1917.

3. A study of the effects of time and method of applying gypsum and ground limestone upon the yield and quality of peanuts on Norfolk fine sandy loam. - Outlying Field, Bertie County. -- Begun 1926.

4. A study of the effects of time and method of applying gypsum and ground limestone upon the yield and quality of peanuts on Coxville very fine sandy loam. - Outlying Field, Hertford County. -- Begun 1926.

VII - Magnesia Studies

1. A study of magnesia deficiency in certain sandy soil types of North Carolina. - Central Station. -- Begun 1926.

2. A study of the effects of magnesia upon the quality and yield of tobacco when applied in varying amounts to plats that receive a complete fertilizer on Durham sandy loam. - Tobacco Branch Station. -- Begun 1923. (1)

(1) Conducted in cooperation with U.S. Dept. of Agrl., Bureau of Plant Industr
(2) " " " " " " " " " Chem. and Soils.

3. A study of the effects of magnesia, sulphur, and chlorine upon the quality of tobacco when applied with a complete fertilizer composed of ammonium nitrate, dicalcium phosphate and potassium nitrate on Durham sandy loam. - Tobacco Branch Station - Begun 1920. (1)

VIII - Fertilizer Requirements of Crops in Rotation

1. Fertilizer requirements for wheat, red clover and corn grown in rotation on Davidson clay loam. - Outlying Field, Davie County. Begun 1923. (2)

2. Fertilizer and lime requirements for cotton, rye, corn, wheat and red clover when grown in rotation on Cecil clay loam. - Piedmont Branch Station. -- Begun 1903.

3. Fertilizer and lime requirements for Irish potatoes, wheat and soybeans when grown in rotation on Toxaway loam. - Mountain Branch Station. -- Begun 1915.

4. Fertilizer and lime requirements for corn and soybeans grown in rotation, the soybeans being utilized for seed production in one series, and for hay production in another. - Upper Coastal Plain Branch Station. -- Begun 1926.

5. Fertilizer and lime requirements for crops in a three-year rotation of corn, oats, vetch, soybeans (turned under), rye (turned under), soybeans(for seed), and rye(turned under) on Norfolk sandy loam and Norfolk fine sandy loam. - Upper Coastal Plain and Coastal Plain Stations. -- Begun 1915.

6. Fertilizer requirements for corn, wheat and soybeans when grown in a three-year rotation on Toxaway loam - Mountain Branch Station. -- Begun 1910.

7. A study of the fertilizer requirements for tobacco when grown in a three-year rotation with oats, cowpeas and rye on Durham sandy loam. -- Tobacco Branch Station. - Begun 1911.(2)

8. Fertilizer and lime requirements for crops in a three-year rotation of corn, oats, soybeans broadcast(turned under) and Irish potatoes on muck - Blackland Branch Station. -- Begun 1922.

IX - Effects of Rotation Upon Succeeding Crops When Normal Amounts of Fertilizer are Used.

1. A study of the effects upon yield and quality of tobacco when grown with different combinations of cotton, corn, small grain, legumes, meadow and fallow to form three year rotations on Durham sandy loam. -Tobacco Branch Station. -- Begun 1911.(2)

(1) Conducted in cooperation with the U.S. Dept. of Agriculture, Bureau of Chemistry and Soils.
(2) Conducted in Cooperation with U.S. Department of Agriculture, Bureau of Plant Industry.

2. A Study of the utilization of crops grown in rotation with cotton by two different methods as follows:

(1) A rotation of cotton, corn, soybeans, rye and crimson clover.
(2) All crops harvested.
(3) All crops except cotton harvested by swine.
(4) A measure of effects upon succeeding crops on Norfolk sandy loam. -
Upper Coastal Plain Station. -- Begun 1926.

3. A study of the effects upon yield and quality of tobacco when grown in a four-year rotation with crimson clover, corn, oats, cowpeas(for hay) and Sudan grass on Durham sandy loam. - Tobacco Branch Station. Begun 192_ (1)

4. To what extent can phosphoric acid and potash be used to correct the effects upon quality of tobacco when cowpeas are grown in the rotation and turned under on Durham sandy loam. - Tobacco Branch Station. -- Begun 1912. (1)

5. A study of the yields and quality of succeeding crops when cotton and corn are grown continuously and when grown in two, three and four year rotations with small grain and legumes on Cecil clay loam. - Piedmont Branch Station.

6. A study of the yields and quality of succeeding crops when corn and wheat are grown continuously and when grown in two and three year rotations with and without legumes on Porter's loam. - Mountain Branch Station. -- Begun 1910.

7. A study of the yields and quality of succeeding crops when corn and cotton are grown continuously and when grown in combinations with each other and with legumes in two and three year rotations on Norfolk sandy loam - Upper Coastal Plain Station. -- Begun 1910.

8. A study of yields and quality of succeeding crops when cotton, corn and peanuts are grown continuously on the same plats and when they are combined in two and three year rotations on Norfolk sandy loam. - Upper Coastal Plain Branch Station. -- Begun 1924. Revised 1927.

X - Fertilizer Requirements for Crops According to Soil Type

1. Fertilizer and lime requirements for strawberries grown on Norfolk fine sandy loam. - Coastal Plain Station. -- Begun 1926(2)

2. Fertilizer requirements for corn grown on Ashe Loam.- Outlying Field, Burke County. -- Begun 1927.

(1) Conducted in cooperation with the U.S. Department of Agriculture, Bureau of Plant Industry.
(2) Conducted in Cooperation with National Fertilizer Association.

3. Potash requirements for corn grown on Iredell silt loam. - Outlying Field, Davie County. -- Begun 1925.

4. Fertilizer requirements for cotton grown on Norfolk sandy loam. - Outlying Field, Wayne County. -- Begun 1924.

5. Fertilizer ration and quantity requirements for cotton grown on Orangeburg sandy loam and tested by the triangular method. - Outlying Field, Northampton County. (1)

6. Fertilizer ration and quantity requirements for cotton grown on Marlboro sandy loam and tested by the triangular method. - Outlying field, Wilson County. (1)

7. A study of the relation of phosphoric acid, nitrogen and potash ratio to early maturity and yield of cotton under boll-weevil conditions. Upper Coastal Plain Station. -- Begun 1923. (1)

8. Fertilizer ratio and quantity requirements for cotton grown on Davidson clay loam. - Outlying Field, Davidson County. Begun 1926. (1)

9. Fertilizer requirements for cotton grown on Cecil clay loam. - Outlying Field, Mecklenburg County. -- Begun 1926. (1)

10. Fertilizer requirements for cotton grown on Appling sandy loam. - Outlying Field, Davie County, -- Begun 1927.

11. Fertilizer requirements for cotton on Iredell silt loam. - Outlying Field, David County. -- Begun 1925.

12. Fertilizer requirements for peanuts grown on Norfolk fine sandy loam. - Outlying Field, Bertie County. -- Begun 1926.

13. Fertilizer requirements for peanuts grown on Coxville very fine sandy loam. - Outlying Field, Hertford County. -- Begun 1926.

14. Fertilizer requirements for soybeans grown on Elkton sandy loam. - Outlying Field, Currituck County. -- Begun 1926.

15. Fertilizer ratio and quantity requirements for sweet potatoes on Cecil sandy loam. - Outlying Field, Catawba County. -- Begun 1927. (1)

16. Fertilizer ration and quantity requirements for sweet potatoes grown on Norfolk loamy fine sand when tested by the triangular method. - Outlying Field, Currituck County. (1)

XI - Muck Soil Studies

1. A study of depth of breaking and methods of culture in relation to crop stand and yields on muck soil. - Blackland Station. -- Begun 1926.

2. A study of muck soils with reference to factors which limit crop production. - Blackland Branch Station. -- Begun 1923.

(1) Conducted in cooperation with U.S. Dept. of Agrl., Bureau of Soils.

XII - Crop Variety Studies

1. Test of winter legumes. Comparison of strains of crimson clover, vetches, strains of lespedeza to determine their adaptation for hay and for use in rotation. - Central Station. -- Begun 1926.

2. A study of the adaptation of red clover grown from seed of known domestic and foreign sources. -Piedmont Branch Station. -- Begun 1925.

3. Soybean variety and strain studies at the Central and Branch Station. -- Begun 1915.

4. Cotton variety test in old tobacco belt where cotton is being introduced as a cash crop to supplement tobacco in areas invested with tobacco wilt. -- Tobacco Branch Station.

5. The testing of new and old varieties and strains of small grain (wheat, oats, barley and rye). - Mountain, Piedmont and Central Stations. -- Begun 1922.

6. Comparative field studies with varieties and strains of tobacc. - Tobacco Branch Station. -- Begun 1922. (1)

XIII - Crop Culture Experiments

1. Tests to study the value of certain crops grown alone and in combination for the production of roughage. - Central, Coastal Plain and Blackland Station. -- Begun 1926.

2. A study of the effects of time of prearing seed-bed for cotton upon stand and yield. - Central, Upper Coastal Plain and Piedmont Station. -- Begun 1924.

3. A study of the effects of close and broad spacing of cotton upon yield and quality. Central, Upper Coastal Plain and Piedmont Stations. -- Begun 1923.

4. Rate of seeding new varieties of soybeans for seed and hay. - Central Station. -- Begun 1924.

XIV - Seed Improvement and Breeding Studies

1. Soybean breeding. - Central and Mountain Stations. -- Begun 1915.

2. A study of the relation of physical properties of cotton fibers to spinning and the improvement of cotton. - Central Station. -- Begun 1927. (2)

(1) Conducted in cooperation with U.S. Department of Agriculture, Bureau of Plant Industry.
(2) Conducted in cooperation with the Office of Cotton Marketing, Bureau of Agrl. Economics and the North Carolina Textile School.

3. A study of the effects of machine separation of planting cotton seed upon stand and yields as follows:

(1) The relation of size of seed to stand, growth and fruiting.
(2) The value of mechanical separation to the grower. - Central and Upper Coastal Plain Branch Stations. -- Begun 1924.

4. A study of the effect of cotton seed treatment upon the stand and yield when planted at different dates. Treatments include machine delinted, dry heated, semisan, Bayer dust, and normal seed as checks.- Upper Coastal Plain Station. -- Begun 1924. (1)

5. Seed selection studies with Mexican Big Boll cotton for securing information on the value of selection and for supplying improved seed to growers from the Central and Branch Station farms. This project also concerns the production of cottons demanded by North Carolina cotton manufacturers. - Central, Upper Coastal Plainand Piedmont Station, and two Outlying Fields. -- Date Begun 1915.

6. The mode of inheritance of the fuzzy tip on cotton seed, and its use in cotton improvement. -- Central Station. -- Begun 1925.

XV - Farm Engineering

1. A study of the draft of plows in various soil types and the effect of liming upon the draft of plows. - Central Station. -- Begun 1926.

2. A study of factors influencing the draft of farm wagons. - Central Station. -- Begun 1926.

OUTLOOK ALONG AGRONOMY LINES FOR NORTH CAROLINA FARMERS

In the growth of crops, the farmers' acreage yields and profits are largely a resultant of the action of controllable and uncontrollable factors. The more favorable the following controllable factors, essential the the most profitable yields, are made then the more prosperous will be the operations of North Carolina farmers:

1. Fertilization
2. Planting seed
3. Crop rotation
4. Cultural and seeding methods
5. Drainage
6. Harvesting.

(1) Conducted in cooperation with the Dept. of Plant Pathology, N. C. State College.

Through the years, the Agronomy work has been centered on determining the optimum of the method to use with each of these different factors for best yields. Much progress has been made not only in working them out but also in having them adapted in the best ways in the farming operations of the State to their improvement and profitableness. The importance of crop-growing may be appreciated, when it is realized that about four-fifths of the income of North Carolina farmers is annually secured by this means. When farmers fail to secure a reasonable net income from the crop-growing, North Carolina agriculture and industries will rapidly decline and the State as a whole will be in a bad way.

* Insert upon production on page 16