A PROPOSED PROGRAM IN SOIL SCIENCE, FOR STUDENTS IN THE IMPERIAL ETHIOPIAN COLLEGE OF AGRICULTURAL AND MECHANICAL ARTS

By

DAWIT DEGUEFU

Bachelor of Science
Imperial Ethiopian College of Agricultural and Mechanical Arts
Alem Maya, Ethiopia
1958
Master of Science
Oklahoma State University
Stillwater, Oklahoma
1960

Submitted to the Faculty of the Graduate School of
the Oklahoma State University
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE
August, 1960

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Thesis Approved:

Thesis Adviser

Robert L. Price

Dean of the Graduate School

ACKNOWLEDGEMENTS

The writer expresses sincere appreciation to Professor C. L. Angerer, Professor Emeritus, major thesis adviser, for his invaluable counseling in planning, assistance, and guidance in writing this thesis.

Sincere gratitude is expressed to Dr. Robert R. Price, Head of the Agricultural Education Department, who served as adviser, for the constant encouragement and help he rendered in every way.

To Dr. H. F. Murphy, who together with Dr. Price approved the general study plans for the writer, secured all necessary information from the institutions surveyed, made helpful suggestions, and showed interest in the study of agricultural education, due gratitude is expressed with sincerity.

Indebtedness is due Professor Don Orr and Dr. Robert Reed for furnishing reference materials and useful advice.

The cooperation of the staff of the Agricultural Education Department and the special help of Mrs. Betty Coffman in the preliminary typing of portions of the manuscript are acknowledged.

The writer thanks Miss Leah Schedler, Assistant Registrar, for making suggestions pertaining to tabulations.

Appreciation is expressed to Mrs. Elizabeth Blocker for making corrections of the English and accurately typing the manuscript.

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INTRODUCTION

The "trial and error" method in the struggle to insure a better living has taught many a person that the inability to produce a sufficient quantity of products for consumption and sale has resulted in low income and a low level of living. The Ethiopian farmer is no exception. Although he has produced some crops for subsistence and some more for sale in the past, he has not, by any means, exhibited a full gesture to the world market. What he has is a potential capacity to produce a greater quantity of quality crops; but he lacks adequate technical skills in a highly competitive world market.

As one travels down the Nile Valley and observes the vast amount of fertile soils, one attaches the importance of an ample supply of water to this soil, if it is to produce abundantly. One also becomes cognizant of the growing population in Africa and the middle east along with a corresponding pressing need for food.

For many years, farming in Ethiopia has been unparalleled in significance as the sole segment of activity for making a living. This is reflected by the fact that over eighty-five percent of the country's population is engaged in agriculture. Being ideally situated from the climatic point of view, Ethiopia experiences a remarkable cooperation of desirable natural factors that promote the happy cause of this industry. Success in farming here is primarily a function of fertile soils, ample rainfall

during the growing season, and favorable temperatures for the growth of many different kinds and varieties of crops. Some of these crops are indigenous to Ethiopia; others have been domesticated.

Currently, as a result of the felt need for more and better skills in order to realize an increment of agricultural expansion, scientific agriculture is in its budding stage. In fact, this period can be very appropriately referred to as a transition from primitive to modern times in the annals of Ethiopian agriculture. Unlike in the past when farming was a business of only teams of oxen and coordinators of the plow-pull, today's Ethiopia has institutions especially established in the name of agriculture. Through these institutions and other contributions, specialization is finding a leeway.

Ever since Hillgard developed the idea of "unique kinds of dynamic soils, each formed under unique combinations of climate and associations of native plants," and ever since Dokuchaev et al., (13) showed that soils are "individual, natural bodies, each with its own morphology," the treatment of soils of a specific area with specific approach has been justified.

This report deals specifically with the question of possible inclusions of the courses of study for soil science majors in the Imperial Ethiopian College of Agricultural and Mechanical Arts in Alem Maya, Ethiopia. The objectives of the report are three-fold: (a) to study a selected group of ten agricultural institutions in the United States in regard to their respective curricula for soil science majors and thereby to determine the up-to-date standard curriculum for teaching soils, (b) to study the feasibility of adapting the general information acquired with some modifications to meet the special needs in Ethiopia, and (c) to propose a course of study

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Numbers in parenthesis stand for literature cited.

for soil science majors in the Imperial Ethiopian College of Agricultural and Mechanical Arts and to suggest units of instruction in the courses proposed.

STATEMENT OF THE PROBLEM

Ten institutions in the United States offering a major in soil science were selected for this study. Data were secured from the soils departments of the ten institutions to determine the various courses in soils offered in the four-year curricula and the amount of credits required in each. As a result of this study, it is proposed to develop a course of study for soil science majors in the Imperial Ethiopian College of Agricultural and Mechanical Arts in Ethiopia, and to determine unit of instruction.

PURPOSE OF THE STUDY

Learning is known to be effective, especially if the objective thereof is to solve a recognized problem of an immediate need. It follows, then, that it is commendable to give priority to that knowledge which is contributive toward a definite value. This motivates the teacher and the pupil alike. It imparts vividity to the particular knowledge sought, and reality to a life situation is thereby created. Interest to progress survives and the desire to learn increases.

There are numerous things which are basic in their service to all mankind, but their use is modified from place to place and varies from one individual to another--the magnitude of this variation depending on how much they mean wherever they are needed. The utility of soils, for instance, is essentially the same, be it in the east or west. Nonetheless, to respond favorably under different environments, they need different

treatments. Hence, it is only natural to state that there must be some specificity in the attentions given to soils of a definite place. Thus a justification is evidenced to deal separately with the teaching problems of soils in Ethiopia with the emphasis on the particular needs of the country.

It is the purpose of this report to: (1) present a detailed and summarized study of the curricula designed for soil science majors in ten institutions in the United States, selected on the basis of conditions somewhat similar to those in Ethiopia, and (2) suggest a proposed course of study for soil science majors in the Imperial Ethiopian College of Agricultural and Mechanical Arts in order to meet the particular needs of the country in connection with problems in soils.

LIMITATIONS OF THE STUDY

Ten institutions in the United States located in areas of nearly similar conditions to those in Ethiopia were surveyed in regard to the requirements of soil science majors in these institutions. The original list of the institutions selected for study was slightly altered due to the fact that the data obtained from some of the institutions could not be used in the exact way desired.

METHODS OF PROCEDURE

The standard curriculum for soil scientists adopted by the Soil Science Society of America in 1940 was consulted. In addition, a letter was sent to each department of soils at the ten institutions of agriculture in the United States. A survey form was prepared to secure the information available. Also, the latest institutional catalogs of the institutions in question were reviewed for confirmation of the information

used in the data assemblage. In the process of determining the total minimum number of credit hours required in soils and related courses for graduation with a B.S. degree in soil science, the credit hours were reduced by one-third of the total required for the institutions operating on a quarter system. This was done to develop uniformity in figuring the credit hours on a semester basis. A table of the standard curriculum developed by the Soil Science Society of America and a table of the curriculum for soil science majors at each of the ten institutions selected is made available in order to reveal all details of the analyses, and to make a recommendation of a course of study for soil science majors in the Imperial Ethiopian College of Agricultural and Mechanical Arts. This includes suggested units of instruction.

REVIEW OF LITERATURE

The term "curriculum" designates activities for any one individual or group with like abilities and interests (14). Its functions are recognized to consist of stimulation and guidance of mental, social, and emotional growth, and as such, it is known to guide one to grow into the ways of thinking, feeling, and acting (10). A "course" of study, on the other hand, is differentiated from curriculum to the extent that it embraces specific training in preparation for a definite vocation.

According to Lancelot (5), the first step in preparing to teach any course is the selection of objectives which have "the highest possible value" to the trainees. In this connection, the sequential orders of technique in preparing the objective of such a course are suggested by Lancelot to include the determination of important abilities, the determination of understandings, the careful statement of specific interest, the ideal of purpose, and understanding "leading to the teaching process," and the arrangement of various related groups of teaching objectives in order to develop effectiveness in teaching.

The schools in Ethiopia have used different curricula for the different phases of education (6). For instance, traditional curricula were used in church schools, which are in the neighborhood of ten thousand in number. Primary and secondary schools, higher institutions of collegiate level, as well as vocational schools have and are still following western curricula. There is quite an international flavor in the general educational system underway in the country. Some of the schools have diversities

in methods of teaching and organization. This difference sprouts from the fact that some instructors and personnel of the schools come from particular sections of the eastern and western hemispheres. For instance, the Imperial Ethiopian College of Agricultural and Mechanical Arts, the Jimma Agricultural Technical School, and the American mission schools emphasize the American system of education; the Ambo Agricultural School and the German School in Addis Ababa follow the German method. There are schools operated in which the Swedish method and organization are accentuated. The Lycee Franco-Gebremariam School and other French-taught schools employ the French system; the English School and the General Wingate Secondary School, along with some others, are strictly British in their plans and organizations. The Italian School of Addis Ababa follows the Italian way. The above are illustrations of a few of those schools which operate under different systems.

It is of interest to comprehend, however, that although these schools have specificities in methods and emphases, their operations are geared to the standard pattern approved by the Ministry of Education in Ethiopia. This standard pattern is developed on the basis of native philosophy in conjunction with ideas recommended by various advisory committees to the Ministry.

The pattern is indeed not static; on the contrary, with the advancement of time, selection of such ideas fitted to the progress of the country will be continued and injected into what is available at present. The present general trend is toward a concentrated effort on the expansion of education of the masses with particular attention on some specialization. Complementary to this, there is intensive research going on for an effective utilization of the country's resources. One of these invaluable assets to the growth of the nation's wealth is its

soil. Sharp attention is focussed on its conservation. In the past, the Government has sponsored preliminary surveys in the field of agriculture as a whole, which entailed valuable recommendations.

In light of this fact, Murphy (9) made a detailed chemical analysis of soils representative to the country and wrote the first technical bulletin of useful information pertaining to the soils. In his report, he particularly warned about erosion and nitrogen deficiency status of certain soils.

That these soils are indispensable to the ever-growing economy of the country points to the obvious. As such, it calls for the initiative to be taken toward its maintenance and improvement in the possible maximum way. This can spring from a systematic study of the subject. Outlining a sound group of courses to teach in soils based on the needs heretofore mentioned is one of the requisite steps to arrive at this end.

The farmer in the field appears to be the one who is constantly confronted with the problems of soils. Therefore, it is essential to guide him closely through the program of accurate dissemination of information to the public. This can be done in more than one way. For instance, the current exercise underway by extension agents is one example. Kebret (7) is convinced that the training in vocational agriculture should be part of the public education. He further suggested that development of a community education program in which a systematic training of young and adult farmers is included will prove profitable. It is this writer's observation that such a program operates successfully in the United States, and the inclusion of agricultural education in rural elementary and secondary curricula as proposed by Kebret may be worth the trial in Ethiopia. Through such a program, the cause of soils will indeed be promoted.

Wheeler (15) made a study of curriculum development in agricultural colleges and used "needs of those taught" as a basis for the study, justifying this choice by such discussions as "Particular ends call for particular means." The factors he took into account in the study included coherence, significance, probability, type unit, proved superior merit, and sufficient possession.

The Soil Science Society of America voted in 1940 that a committee be formed to study and recommend a specific undergraduate and graduate training in soil science (11). Accordingly, the president of this society appointed a committee that suggested standard undergraduate curriculum for technical soils majors. The objectives in developing the standard curriculum was to better prepare soil scientists of competence, to establish a standard knowledge in soil science, and to meet local conditions. Basic features taken into consideration embraced broad training in the fundamental natural sciences, thorough training in mathematics, a logical sequence of courses, and ample opportunities for electives. The table of the curriculum recommended by the committee is as follows:

Freshman Year

First Semester	Credits	Second Semester	Credits
English	3	English	3
Chemistry, general	4	Chem., general and qual. anal.	3
Botany, general	5	Geometry, analytical	4
Mathematics (Algebra and Trig.)	4	Field Crops or Hort.	3
Military drill	1	Geology	3
	17	Military drill	1
			17

Sophomore Year

First Semester	Credits	Second Semester	Credits
Soils, general survey, lect. and lab.	4	Soil Analysis (chemical), lect. and lab.	3
Physics, general	3	Physics, general	3
Chem., quant. anal.	3	Calculus	3
Calculus	3	Chemistry, organic	4
Military drill	1	Military drill	1
Electives	3	Electives	3
	17		17

Junior Year

First Semester	Credits	Second Semester	Credits
Soil genesis, classification and mapping, lect. and field work	3	Advanced soil chem. and plant nutrition, lect.	2
Bacteriology, general	4	Chemistry, physical	3
Chemistry, physical	3	Botany, plant physiology	4
Econ., general basic	4	Soil bacteriology	3
Electives	3	Electives	5
	17		17

Senior Year

First Semester	Credits	Second Semester	Credits
Soil genesis, classification and mapping, lect. and field work	3	Soil use and conservation, lect. and field work	3
Fertilizers and soil management, lecture	3	Soil thesis or problem	2
Soil thesis or problem	2	Soils seminar	1
Soils seminar	1	Land economics	3
Electives	9	Electives	8
	17		17

Suggested Electives
(depending upon special aims and needs)

Climatology
Plant pathology
Economic geography
Biochemistry
Economic entomology
Public speaking
Ecology
Drawing
Forest soils
Language (if elected, preferably two semesters)
Animal husbandry
Advanced field crops or horticulture
Advanced geology
Sedimentation
Glaciation
Mineralogy
Agricultural engineering (surveying, drainage, irrigation, and erosion control structures)
Biometry
Psychology

The courses were recommended to follow a particular sequence; in other words, soils is to be preceded by general chemistry, geology, and introductory field crops or horticulture; quantitative analysis is to precede soil analysis; adequate mathematics should precede physics, physical chemistry, and soil physics; organic and physical chemistry should precede or accompany advanced soil chemistry and physiology; soil genesis is preceded by advanced soil chemistry, soil physics, soil bacteriology, botany, and physical chemistry; fertilizers, soil management, soil use and conservation and other practical or applied courses--as well as soils thesis or problem work--are preceded by the basic courses in soils and other subjects. Electives are ample from the sophomore year on to meet special needs.

The committee which functioned later on (12) reviewed the recommended curriculum prepared and published during the preceding years. It analyzed certain criticisms created pertaining to the earlier implementation of the curriculum. The criticisms included that there was too much chemistry and mathematics required and there was too little variation allowed for local differences in course offerings. Also, suggestions were made that numbers of hours of mathematics, chemistry, and soils and agronomy be reduced. In addition, it was pointed out that the setting apart of the requirements

for courses in soils was necessary. In response, the committee made little modification on the minor courses and defined the following requirement for graduation with a degree in soil science:

Subject Matter	Semester Hours
Chemistry, physics, and mathematics (The total is allowed to consist of any combination of course work in the three subjects which includes a minimum of 18 semester hours of chemistry, 6 semester hours of physics, and 9 semester hours of mathematics)	42
Geology	3
Botany (including plant physiology)	8
Bacteriology	3
English	6
Soils	12

These requirements are considered minimum and not optimum.

In 1959 it was recommended that students who complete the above-shown requirement be awarded the SSSA certificate (13). The procedure calls for the respective department heads where the students belong to recommend these students. The recommendation will be evaluated, and if satisfactory, will entitle the students for membership in the SSSA. The objective here is to "improve the level of undergraduate training in soil science," and to "encourage more and abler students to study soil science."

PRESENTATION AND ANALYSIS OF DATA

In this study, the range and average of credit hours in soils and other courses required for a B.S. degree in soil science in ten institutions in the United States were outlined. The institutions were selected on the basis of the close typicality to areas in Ethiopia. Tables one to eleven show the names of the institutions with the required subjects and the range and average credit hours designated for each subject included in each course of study.

The general information secured indicated that lectures, laboratory, and field trips were included as important methods for developing the soils curricula. These were no doubt listed in order to provide fundamental knowledge of both theory of the subject and the practical aspects of it in agricultural production. The out-of-class observations are conducted on college farms, nearby ranches, experiment stations, soil and water conservation demonstrations, and other points of interest and value. Some of the institutions selected for this study included more courses in the basic sciences than have normally been required of agricultural students. The particular information from Texas Technological College shows that there is a tendency to require more advanced work in basic science, including as much as 20 hours of chemistry, 6-12 hours in mathematics, 8 hours in physics, and 20-25 hours in biological science along with English and other subjects. It was also pointed out that each curriculum for majors in technical soils required some 15-20 hours of courses in soils and less in crops courses. In general, the students are allowed wide choices in elective subjects.

Table 1.

CALIFORNIA STATE POLYTECHNIC COLLEGE

CURRICULUM IN SOIL SCIENCE

Freshman	F	W	S
Soils (SS 121)	4		
Soil Management (SS 122)		4	
Soil Materials (SS 123)			3
General Field Crops (CP 230)	4		
Agricultural Mechanics (AE 121)		2	
Language Communication (Eng 104, 105, 106)	3	3	3
Agricultural Mathematics (Math 102, 103)		3	3
Physical Education (PE 141, 142, 143)	½	½	½
Health Education (PE 107)			2
General Botany (Bot 121, 122)	4	4	
General Nursery Practices (OH 230)			3
Electives			2
	15½	16½	16½

Sophomore			
Fertilizers (SS 221)	4		
Soil Conservation (SS 202)		3	
Range Management (SS 223)			4
General Fruit Production (FP 230)		4	
Agricultural Surveying I (AE 131)		2	
Farm Tractors (AE 241)			2
General Plant Pathology (Bot 223)	4		
Public Speaking (Sp 201)	2		
Mathematics (Math 114, 115)	3	3	
Sports Education (PE 241, 242, 243)	½	½	½
General Entomology (Ent 126)			4
General Inorganic Chemistry (Chem 324, 325)	4	4	
Organic Chemistry (Chem 326)			4
Electives			2
	17½	16½	16½

Junior			
Soil Classification (SS 321)	4		
Soil Fertility (SS 322)		3	
Range Technology (SS 332)			3
Irrigation (AE 240)			4
Literature	3		
Principles of Economics (Ec 201, 202)	3	3	
Farm Records (FM 321)			3
American Government (Pol Sc 301)	3		
Growth of American Democracy (Hist 304)		3	
General Bacteriology (Bact 221)		4	
Agricultural Biochemistry (Chem 328)		4	

Table 1. (continued)

Junior (continued)	F	W	S
General Animal Husbandry (AH 230)	4		
General Dairy Husbandry (DH 230)			4
*Optional Courses			3
	17	17	17
Senior			
Farm Management I (FM 322)	4		
**Economics electives		3	
U. S. in World Affairs (Hist 305)		3	
Family Relations (Psy 206)			3
Senior Project (SS 461, 462)	2	2	
Undergraduate Seminar (SS 463)			2
Soil Microbiology (SS 422)			4
Soil Chemistry (SS 423)		3	
Soil Physics (SS 432)	4		
*Optional Courses	6	3	
Electives		3	6
	16	17	15

DESCRIPTIONS OF COURSES IN SOIL SCIENCE

SS 121 Soils (4)
Physical, chemical, and biological properties of soils as related to agriculture. 3 lectures, 1 laboratory.

SS 122 Soil Management (4)
Effect of tillage, manuring, drainage, and irrigation practices on soil productivity. 3 lectures, 1 laboratory. Prerequisite: SS 121

SS 123 Soil Materials (3)
Origin, composition, and identification of rocks, minerals, and other materials important in the development of soils. Land forms as related to the nature and properties of soils. 2 lectures, 1 laboratory. Prerequisite: SS 122

SS 202 Soil Conservation (3)
Climate, topography, soils and land use in relation to soil and water losses. Evaluation of soil and water conservation programs and practices. 3 lectures. Prerequisite: SS 121

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*Students electing to specialize in Soil Conservation must select 12 units from the following courses: AE 132, 437, AH 101, 102, 402, Bot 343, Bio 433, OH 220, PH 230, and CP 221, 321.
Students electing to specialize in Technical Soils must select 12 units from the following courses: Zoo 131, Bio 225, Bot 322, Phys 131, PSc 209, Chem 331, 332, 432, Math 201, and Eng 301.

**Economics elective to be selected from FM 304, 310, 403, Ec 213, and FM 421 or 425.

SS 221 Fertilizers (4)
Composition, value, and use of fertilizer materials and soil correctives. Methods employed in the manufacture, distribution, and application of fertilizers. 3 lectures, 1 laboratory. Prerequisite: SS 121

SS 223 Range Management (4)
Soil and plant characteristics of rangelands. Management practices used to maintain range resources and increase production of forage and livestock. 3 lectures, 1 laboratory. Prerequisite: SS 121

SS 321 Soil Classification (4)
Systems used in soil and land classification. Methods employed in soil surveying. Mapping of assigned areas and the preparation of survey reports. 3 lectures, 1 laboratory. Prerequisites: AE 131, SS 123, 202

SS 322 Soil Fertility (3)
Plant nutrient requirements of crops. Effect of soil and climatic conditions on the availability of nutrients in the soil. Diagnostic techniques in soils and crops. 2 lectures, 1 laboratory. Prerequisites: SS 221, 321, Chem 325

SS 323 Range Ecology (3)
Identification of range plants, succession, environment, and the application of ecological factors to the use of rangeland. 2 lectures, 1 laboratory. Prerequisite: SS 223

SS 332 Range Technology (3)
Technical problems in range management. Development of plans for effective production and utilization of range forage. 2 lectures, 1 laboratory. Prerequisite: SS 223

SS 422 Soil Microbiology (4)
Biochemical activities of soil organisms. Effect of soil organisms on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 3 lectures, 1 laboratory. Prerequisites: SS 332, Bact 221

SS 423 Soil Chemistry (3)
Fundamental concepts and practices in soil chemistry. Methods of analysis and interpretation of significant investigations for the management of soils. 2 lectures, 1 laboratory. Prerequisites: Chem 328, SS 322

SS 432 Soil Physics (4)
Advanced study of the physical properties of soils. Application of physical-chemical soil relationships to farming and engineering practices. 2 lectures, 2 laboratories. Prerequisites: Chem 328, Math 115, SS 321

SS 433 Land Use Planning (3)
Evaluation of land use capabilities. Development of plans and practices for the management of crop, range, and forest land. 2 lectures, 1 laboratory. Prerequisites: SS 321

Table 1. (continued)

SS 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

SS 462 Undergraduate Seminar (2)
Review of current research, experiments, and problems related to the students' major field of interest. Preparation and presentation of reports on problems or research activities. 2 lectures.

SS 581 Graduate Seminar in Soils (3)
A review of current research, experiments and problems related to soil science. Development of special demonstration and field plot trials for educational groups. 3 lectures.

SS 582 Graduate Seminar in Land Management (3)
Development of plans and practices for the management of crop, range, and wood land. 2 lectures, 1 laboratory.

Table 2.

KANSAS STATE COLLEGE

TECHNICAL AGRONOMY

First Semester		Second Semester	
FRESHMAN			
Written Comm. I,	3	Written Comm. II,	2
College Algebra,	3	Plane Trig.,	3
Chemistry I,	5	Chemistry II Rec.,	3
Air Science or Milit. Ia,	1	Chemistry II Lab.,	2
Gen. Geol.,	3	Gen. Botany,	5
El. of An. Husb.,	2	Air Science or Milit. Ib,	1
Agr. Seminar,	0	Agr. Seminar,	0
Freshman Assembly,	0	Phys. Educ., M.,	0
Phys. Educ., M.,	0		
Total,	17	Total,	16
SOPHOMORE			
Gen. Physics I,	4	Gen. Zoology,	5
Economics I,	3	Soils,	4
Farm Crops,	4	Gen. Psych.,	3
Gen. Org. Chem., or	5	Oral Comm. I,	2
Org. Chem. I, and Lab.,	5	Air Science or Milit. IIb,	1
Air Science or Milit. IIa,	1	Agr. Seminar,	0
Agr. Seminar,	0	Phys. Educ., M.,	0
Phys. Educ., M.,	0	Option A, B or C,	2
Total,	17	Total,	17
JUNIOR			
Sci. Report Writ.,	2	Prin. of Feeding,	3
Genetics,	3	Gen. Microbiology,	3
Agr. Seminar,	0	Agr. Seminar,	0
English Prof.,	0	Option A, B, C or D,	11
Option A, B, C or D,	12		
Total,	17	Total,	17

Table 2. (continued)

SENIOR			
Intro. to Human. I,	4	Intro. to Human. II,	4
Agr. Seminar,	0	Agr. Seminar,	0
Option A, B, C or D,	13	Option A, B, C or D,	13
Total,	17	Total,	17

Total hours required for graduation, 135.

Option A, Soil Science, also requires:

- Any soils courses - 9
- Any crops course - 3
- Anal. Geom. and Calculus - 12
- Quantitative Analyses - 4
- Plant Physiology - 4
- Gen. Physics II - 4
- Elements of Statistics - 3
- Electives - 12

Table 3.

MICHIGAN STATE UNIVERSITY

CURRICULA IN SOIL SCIENCE[1]

Freshman Year

Fall		Winter		Spring	
Basic 111, Comm. Skills	3	Basic 112, Comm. Skills	3	Basic 113, Comm. Skills	3
Basic 181, Nat. Sci.	4	Basic 182, Nat. Sci.	4	Basic 183, Nat. Sci.	4
Ag. 101, Dev. of Ag.	1	Chem. 102, Intro.	3	Ag. 210, Soils & Pl. Nut.	5
Botany 201, Gen.	3	Zoology 210, Elem.	4	Chem. 103, Intro.	3
Chem. 101, Intro.	3	H.P.R.	1	H.P.R.	1
Mil. Sci. 101	1	Mil. Sci. 102	1	Mil. Sci. 103	1
H.P.R.	1				
	16		16		17

Sophomore Year

Fall		Winter		Spring	
Basic 231, Soc.Sci.	4	Basic 232, Soc.Sci.	4	Basic 223, Soc.Sci.	4
Ag. 230, An. Gr. & Nut.	5	Geol. 201, Phy.	3	Ag. 240, Ag. Prices & Mkt.	5
Econ. 200, Intro.	3	Math 104[3], Coll. Algebra	4	Math 105[3], Trig.	4
Phys. 158[2], Intro.	3	Phys. 168, Intro.	3	Phys. 178, Intro.	3
H.P.R.	1	H.P.R.	1	H.P.R.	1
Mil. Sci. 204	1	Mil. Sci. 205	1	Mil. Sci. 206	1
	17		16		18

[1]Freshman and sophomore years are same for Agricultural Science, Agricultural Business or General Agriculture majors.

[2]Physics 251, 252, 253 series or 271, 272, 273 series recommended for Agricultural Science majors.

[3]Agriculture Science majors required to take Math. 101 and 102.

Table 3. (continued)

Junior and Senior Years

Agriculture Science Major[4]

Fall		Winter		Spring	
Basic 241, Humanities	4	Basic 242, Humanities	4	Basic 243, Humanities	4
Ag. 250, Pl. & An. Breed.	5	Botany 310, Pl. Phy.	4	Math 224, Calculus	4
Botany 202, Gen.	3	Chem. 261, Biochem.	3	Microb. 230, Gen. Bact.	2
Chem. 221a, Quant.	3	Math. 103, An. Geo.	4	Microb. 231, Morp. & Cult.	2
Farm Crops 304, For. Crops	3	Electives	16	Electives	18
Electives	14				
	32		31		30

Recommended Electives

Ag. 402	Geog. 223, 305, 312	Microb. & Pub. Health 380
Bot. 311, 324, 328	Geol. 311, 312, 313, 321, 322, 453	Phil. 201, 324a
Chem. 341, 364, 383, 384, 390	German or French	Physics 301
Ent. 200	Math. 225, 226	Psych. 201
Farm Crops 409, 412		Soil Sci. 330, 380, 430, 440, 450, 470
		Speech 201
		Zoology 313

[4] Must elect at least 1 credit of elective science and 14 credits in the College of Agriculture.

Table 4.

RUTGERS UNIVERSITY

CURRICULUM FOR SOILS MAJORS

Freshman Year

	First Term	Credit		Second Term	Credit
120:101	General Biology	4	120:102	General Biology	4
160:103	General Chemistry	4	160:104	General Chemistry	4
350:101	Composition	3	350:102	Composition	3
430:141	General Agriculture	1	430:142	General Agriculture	1
640:151	Introd. College Math.	3	640:162	Introd. College Math.	3
740:121	Physical Education	0	740:122	Physical Education	0
	Military Education	2		Military Education	2
	Agriculture Elective	3		Agriculture Elective	3
		20			20

Sophomore Year

	First Term	Credit		Second Term	Credit
030:261	Gen. Econ. for Agr.	3	030:301	Agric. Economics	3
750:201	Physics	3	750:202	Physics	3
450:203	Agric. Geology	4	930:266	Soil Management	3
160:231	Elem. Organic Chem.	4			
130:205	General Botany	3		Elective	6
740:221	Physical Education	0	740:222	Physical Education	0
	Military Education	2		Military Education	2
		19			17

Junior Year

	First Term	Credit		Second Term	Credit
110:301	General Bacteriology	4			
330:301	Tech. Composition	3	045:382	Soil Microbiology	3
780:383	Plant Physiology	3	930:412	Soil Class. & Survey	3
930:311	Land Planning & Utiliz.	3	160:225	Quantitative Anal.	5
160:221	Qualitative Analysis	4		Elective	6
	Elective	3			
		20			17

Table 4. (continued)

Senior Year

	First Term	Credit		Second Term	Credit
510:231	Amer. Econ. History	3	510:232	Amer. Econ. History	3
	Humanities	3	430:482	Agricultural Topics	1
	Social Sciences	3		Humanities	3
930:409	Soil Physics	3	930:402	Soil Fertility	3
	Elective	6	930:414	Chem. Anal. Soils, Plants & Fert.	3
				Elective	6
		18			19

Suggested Electives

For General Agriculture Science Students

General Entomology
General Plant Pathology
Meteorology, Climatology
Ecology
Genetics
Air Photo Interpretation
Farm Crops, Forestry, Horticulture, Mech. Agriculture

For Preparation for Research Students

Calculus
Physical Chemistry
Geomorphology
Elementary Statistics
Language

Table 5.

CORNELL UNIVERSITY

NEW YORK STATE COLLEGE OF AGRICULTURE

Typical Course Outline for a Student
Interested in Graduate Work in Soils

(The physical education and ROTC courses have not been included.)

Freshman Year

Fall	Hours	Spring	Hours
English 111	3	English 112	3
Botany 1 (general)	3	Botany 1 (general)	3
Chemistry 105 (general)	3	Chemistry 106 (general)	3
Geology 101 (general)	3	Geology 102 (general)	3
Ag. Econ. 50 (Agric. Geog.)	4	An. Husbandry 10 (feeds)	4
Orientation	1		
	17		16

Sophomore Year

Fall	Hours	Spring	Hours
Chemistry 201 (Qual.)	4	Chemistry 215 (Quant.)	4
Agronomy 1 (soils)	5	Mathematics 161 (calculus)	3
Pl. Breeding 101 (genetics)	4	Botany 31 (Pl. physiology)	4
Meteorology 1	3	Ag. Econ. 102 (farm mgmt.)	5
	16		16

Junior Year[1]

Fall	Hours	Spring	Hours
Physics 107 (general)	4	Physics 108 (general)	4
Agronomy 11 (crops)	4	Agronomy 101 (classification)	3
Mathematics 162 (calculus)	3	Mathematics 163 (calculus)	3
Sociology 101 *	3	Plant Pathology 1	3
Ext. Teaching 101 (speech)	2	Economics 103 *	3
	16		16

* Any social science courses which meet University requirements may be elected.

1 Students interested in soil microbiology should see advisor for alternate program.

Table 5. (continued)

Senior Year

Fall	Hours	Spring	Hours
Chemistry 407 (physical)[2]	3	Chemistry 408 (physical)	3
Chemistry 303-305 (organic)	6	Entomology 10	3
Agronomy 106 (micro.)	3	Sociology 102 *	3
Pl. Breeding 210 (statistics)	3	Pl. Breeding 211 (statistics)	3
		Agricultural elective	3
		Agronomy 90	1
	15		16

* Any social science courses which meet University requirements may be elected.

[2] Students may wish to substitute a foreign language for physical chemistry.

The program as outlined contains 5 units of lower campus electives which can be taken only with special permission.

Courses which are underlined are considered essential.

Table 6.

THE OHIO STATE UNIVERSITY

GENERAL CURRICULUM IN AGRONOMY

SOILS

FIRST YEAR

English	(416)	3
Chemistry	(411)	5
Botany	(401)	5
Survey of Agriculture	(401)	1
Physical Education	(401)	1
Military or Air Science	(401)	2
		17
English	(417)	3
Chemistry	(412)	5
Botany	(402)	5
Health Education	(400)	1
Physical Education	(402)	1
Military or Air Science	(402)	2
		17
English	(418)	3
Chemistry	(413)	5
Geology	(401)	5
Physical Education	(403)	1
Military or Air Science	(403)	2
		16

SECOND YEAR

Agronomy	(501)	4
Mathematics	(416 or 421)	5
Zoology	(401)	5
Chemistry	(421)	4
Military or Air Science	(501)	2
		20
Agronomy	(515)	4
Mathematics	(417 or 422)	5
Agr. Economics	(420)	5
Agr. Biochemistry	(410)	3
Military or Air Science	(502)	2
		19
Zoology	(403)	5
Mathematics	(418 or 440)	5
Military or Air Science	(503)	2
Elective		3-5
		15-17

THIRD YEAR

Agronomy	(520)	4
Physics	(411-531)	5
Social Science option		5
Technical Agr. option		5
		19
Agronomy	(611)	3
Physics	(412 or 532)	5
Social Science option		5
Agr. Economics	(502)	5
		18
Agr. Engineering	(507)	5
Physics	(413 or 533)	5
Social Science option		5
Technical Agr. option		5
		20

FOURTH YEAR

Agronomy	(608)	5
Bacteriology	(607)	5
Humanities option		5
Elective		2-5
		17-20
Agronomy	(712)	5
Communications option		3-5
Humanities option		5
Elective		3-5
		16-20
Agronomy	(603)	5
Agronomy	(601)	5
Humanities option		5
Elective		2-5
		17-20

Table 7.

OKLAHOMA STATE UNIVERSITY

SUGGESTED CURRICULUM
Soils Major

Freshman

Fall	Credit	Spring	Credit
Chem. 134, General Chemistry	4	Chem. 144, General Chemistry	4
Def. 1A2 or 172, Military or Air Science	2	Engl. 115, Freshman Composition	5
Agr. En. Elective	2	Def. 1B2 or 182, Military or Air Science	2
Animal Science Elective	3-4	Hist. and Govt. Elective or	
Bot. 114, General Botany	4	Soc. Sci. 114, Challenges in American Democratic Life	3-4
Agr. 111, Agricultural Orientation	1	Zool. 123, General Zoology for Agriculture Students	3
Total	16-17	Total	17-18

Sophomore

Fall	Credit	Spring	Credit
Agron. 224, Fundamentals of Soil Science	4	Agron. 204, Principles of Crop Production	4
Chem. 245, Organic Chemistry	5	Chem. 205, Introduction to Quantitative Analysis	5
Def. 2A2 or 272, Military or Air Science	2	Def. 2B2 or 282, Military or Air Science	2
Math 173, College Algebra or		Physics 114, Mechanics, Heat and Sound or	
Math. 145, Beginning and Intermediate Algebra or		Physics 215, Mechanics, Sound and Heat	4-5
Math. 143, Intermediate Algebra	3	Hist. and Govt. Elective or	
Geol. 114, Physical Geology	4	Soc. Sc. 124, Challenges in American Democratic Life	3-4
Total	18	Total	18-20

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Table 7. (continued)

Junior

Fall	Credit	Spring	Credit
Agron. 301, Agronomy Seminar	1	Agr. Ec. 303, Agricultural Prices	
Agron. 353, Genetics	3	or	
Entom. 223, General Entomology	3	Econ. 223, Principles of Economics	
Agr. Ec. 203, Principles of Economics as Applied to Agriculture		or	
or		Soc. 233, Principles of Rural Sociology	3
Econ. 213, Principles of Economics		Bact. 214, General Bact.	4
or		Journ. 452, Agricultural Journalism	
Soc. 213, Principles of Sociology	3	or	
Animal Science Elective	3	Speech 202, Essential of Public Speaking	2
Agron. Elective (Soils)	3	Agron. Elective (Soils)	3
		Bot. 344, Plant Pathology	4
Total	16	Total	16

Senior

Fall	Credit	Spring	Credit
Bot. 365, General Plant Physiology	5	Agr. En. Elective	2
Agron. 471, Soils Seminar	1	Agron. Elective (Soils)	5
Agron. Elective (Soils)	5	Elective	8
Agron. Elective (Crops)	3-4		
Total	14-15	Total	15

Table 8.

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS

CURRICULA IN AGRICULTURE

By properly selecting the elective, this basic first year program will prepare a student for any later specialization within the School of Agriculture.

For General Training in a particular production field, the beginning course in that field should be elected.

For Scientific Training in preparation for later specialization, the elective should be Math 103 - Trigonometry - 3.

Freshman Year

First Semester		Second Semester	
Basic 102 Remedial Reading	1	Biol 107 (2-3) Vertebrate Zoology	3
Biol 101 (2-3) General Botany of Seed Plants	3	Chem 102 (3-3) General Chemistry	4
Chem 101 (3-3) General Chemistry	4	Engl 104 (3-0) Composition and Rhetoric	3
Engl 103 (3-0) Composition and Rhetoric	3	Hist 106 (3-0) History of the United States	3
Hist 105 (3-0) History of the United States	3	Military or Air Science	1
Math 102 (3-0) Algebra	3	P. E. 102	R
Military or Air Science	1	Elective *	3
P. E. 101	R		
Total	18	Total	17

* See above for alternatives

Table 8. (continued)

FOR A MAJOR IN AGRONOMY

Plant and Soil Science Option
(Freshman Year - with Math 103 elected)

Sophomore Year

First Semester		Second Semester	
Agronomy 105 (2-2) Fundamentals of Crop Production	3	Biol 206 (2-4) Introductory Microbiology	3
Chem 216 (2-6) Quantitative Analysis	4	Eco 205 (3-0) Principles of Economics	3
Engl 203 (2-0) Composition and Literature	2	Engl 210 (2-0) Writing and Discussion	2
Math 104 (3-0) Analytics	3	Ento 201 (2-2) General Entomology	3
Physics 201 (3-3) College Physics	4	Physics 202 (3-3) College Physics	4
Lib. Arts 311 (0-2) Use of Library Resources	1	Gov 306 (3-0) American National Gov.	3*
Military or Air Science	1	Military or Air Science	1
P. E. 201	R	P. E. 202	R
Total	18	Total	19

*Students who take the soil science option should take Geology 201 in the sophomore year in place of Gov. 306, and take Gov. 306 in the senior year.

Junior Year

First Semester		Second Semester	
Agronomy 301 (3-2) Introductory Soils	4	Chem 302 (3-3) Organic Chemistry	4
Chem 301 (3-3) Organic Chemistry	4	Gen 301 (3-2) Genetics	4
P.P.P. 313 (2-3) Intro. to Plant Physiology	3	P.P.P. 314 (3-3) Prin. of Plant Physiology	4
Elective	7	Elective	6
Total	18	Total	18

Senior Year

First Semester		Second Semester	
Engl 301 (3-0) Writing for Professional Men	3	Engl 403 (1-2) Speaking for Professional Men	2
P.P.P. 301 (2-3) Plant Pathology	3	Gen 304 (3-2) Plant Breeding	4
Elective	12	OR	
		Geol 201 (3-0) General Geology	3
		Elective	12 or 13
Total	18	Total	18

Table 9.

TEXAS TECHNOLOGICAL COLLEGE

CURRICULA AND COURSES IN THE SCHOOL OF AGRICULTURE

Freshman Year

First Semester	Credit	Second Semester	Credit
Ag. Ed. 111 - Orientation	1	Biol. 134 - Zoology	3
Agron. 131 - Fund. of Agron.	3	Chem. 142 - Gen. Chem.	4
A. H. 131 - Gen. Anim. Husb.	3	Eng. 132 - College Rhet.	3
Biol. 133 - Botany	3	D. I. 131 - Prin. of Dairying	3
Chem. 141 - Gen. Chem.	4	Hort. 131 - Prin. of Hort.	3
Eng. 131 - College Rhet.	3	P. E., Band, or Basic ROTC	1-2
P. E., Band, or Basic ROTC	1-2		
	18-19		17-18

AGRONOMY MAJOR
Soils Option

Sophomore Year

First Semester	Credit	Second Semester	Credit
Ag. Eco. 235 - Fund. of Ag. Eco.	3	Ag. Eco. 236 - Mktg. Ag. Prod.	3
Agron. 241 - Soils	4	Agr. Engr. 222 - Survey & Land Map	2
Bact. 231 - Bacteriology	3	Eng. 234 - Tech. Writing	3
Chem. 341 - Org. Chem.	4	Hort. 231 - Veg. Gard.	3
Govt. 233 - Amer. Govt. Org.	3	Govt. 234 - Amer. Govt., Func.	3
P. E., Band, or Basic ROTC	1	Math 230 - Ag. Math.	3
		P. E., Band, or Basic ROTC	1
	18		18

Junior Year

First Semester	Credit	Second Semester	Credit
Agron. 331 - Forage Crops	3	Agron. 341 - Genetics	4
Agron. 435 - Soil Genesis	3	Agron. 342 - Crop Ident. Judg. Grad.	4
A. H. 331 - Anim. Nutr.	3	Bot. 331 - Plant Physiol.	3
Bot. 332 - Plant Path.	3	Ento. 231 - Intro. to Entomol.	3
Hist. 3321 - Heritage of Amer.	3	Hist. 3322 - Heritage of Amer.	3
Electives	4		
	19		17

Table 9. (continued)

Senior Year

First Semester	Credit	Second Semester	Credit
Ag. Eco. 433 - Farm Mgt.	3	Agron. 410 - Seminar	1
Ag. Engr. 335 - Irrig. Princ.	3	Agron. 423 - Soil Fertil.	2
Agron. 422 - Dry Farm Soils	2	Agron. 431 - Plant Breeding	3
Agron. 439 - Soil Microbiol.	3	Agron. 434 - Soil Cons.	3
Ento. 321 - Field Crop Insects	2	Agron. 436 - Soil Chem.	3
Electives	6	Electives	6
	19		18

Hours required for graduation exclusive of P. E., Band, or Basic ROTC - 140.

Table 10.

THE UNIVERSITY OF WISCONSIN

APPLIED SCIENCE

(Soils Majors)

Freshman Year

First Semester		Second Semester	
Course	Credit	Course	Credit
English 1a	3	English 1b	3
Chemistry 1a or 5	3-5	Chemistry 1b	5
Entomology 3	2	Crop Science	4
Agricultural Concepts & Problems	1	Mathematics 1 *	4
Botany 1	5		
	14-16		16

Sophomore Year

Social or Animal Science	4	Geology 1a	5
Economics 1 or History (Univ. Req.)	3-4	Social or Animal Science	4
Soils 1 or Bacteriology 1	4	Soils 1 or Bacteriology 1	4
Technical Writing	3	Economics 1 or History (Univ. Req.)	3-4
Speech 1 or 7	2		
	16-17		16-17

Junior Year

Soils 26	2	Soil 125	3
Soils 115	3	Agronomy 106	3
Social Science or Humanities	3-4	Forestry and Wildlife 118	3
Agricultural Economics 10	3	Soils 106	3
Animal Husbandry 126	4	Physics 65a	3
	15-16		15

Senior Year

Agronomy 120	3	Agricultural Economics 114	3
Social Science or Humanities	3-4	Soils 121	4
Agricultural Economics 117	3	Agricultural Engineering 1 or 5	3 or 4
Soils 127	2 or 3	Botany 24	2
Soils 128	1	Geography 128	3
Genetics 6	3		
	15-17		15-16

* If proposed requirements are met, one may substitute Zoology 1 or Geology 1a.

Table 10. (continued)

SOILS

1. OPPORTUNITIES FOR STUDY:

1. Soil Chemistry	Studying the chemical composition of soils, the availability of nutrients, fertility changes, and soil testing.
2. Soil Classification . .	Identifying and classifying soils, preparing soil maps and reports, and conducting land use surveys.
3. Soil Conservation . . .	Determining causes of soil erosion and means of controling soil erosion on crop and pasture lands and forested areas.
4. Soil Physics	Investigating problems in soil structure, tillage, irrigation drainage and other physical factors in crop production.

2. OPPORTUNITIES

1. Graduate Study	An advanced degree raises the horizons in each of the catagories below.
2. Education	Extension soils specialist, county agent work, and college teaching in soils.
3. Farm Operation	Managing a farm or working for canning companies and land management concerns.
4. Industry	Producing, testing, or selling such materials as lime, fertilizer, soil fumigants, legume inoculants, and tillage machinery.
5. Public Service	Soil testing, inspection work, and land appraising for banks, railroads, and insurance companies.
6. Research	In colleges; on experimental stations; for federal, state, and public agencies; or for private industry to study the physical, chemical and biological processes and responses in soils to management procedures for the purpose of crop production.

3. FOR FURTHER INFORMATION on admission requirements, courses to be taken and scholarships write Department Chairman, Lincoln E. Engelbert, or Associate Dean, V. E. Kivlin, College of Agriculture, Madison 6, Wisconsin.

Table 11.

NAMES OF COURSES OFFERED BY THE TEN INSTITUTIONS IN THE UNITED STATES AND AVERAGE CREDIT HOURS

Courses	Institutions * 1	2	3	4	5	6	7	8	9	10	Average Credit Hours
	Credit Hours										
Agricultural Engineering	6	--	--	--	--	--	4	--	5	4	4.8
Agricultural Orientation	--	--	--	2	1	--	1	--	--	1	1.3
Agr. Seminar, Problems and/or Topics	--	--	--	1	--	--	--	9	10	--	5.0
Air Science, Military Trng. and/or Physical Ed.	3	3	8	8	--	11	8	4	6	--	6.4
Animal Science	6	7	4	--	4	--	7	--	9	4	5.9
Biology, General	--	--	--	8	--	--	--	--	--	--	8.0
Botany and Plant Physiology	8	9	6	6	10	7	12	16	9	7	9.0
Chemistry	10	19	10	21	26	15	18	24	12	10	16.5
Communications, incl. English	9	8	9	9	8	11	7	15	9	11	9.6
Crops	3	7	4	--	4	6	9	3	11	10	8.1
Economics, Agricultural	8	3	5	6	12	6	6	3	9	17	7.5
Electives	8	12	--	33	3	8	8	35	18	--	15.6
Entomology	3	--	--	--	3	--	3	--	5	2	3.2
Forestry	--	--	--	--	--	--	--	--	--	3	3.0

Table 11. (continued)

Courses	Institutions * 1	2	3	4	5	6	7	8	9	10	Average Credit Hours
	Credit Hours										
Genetics	--	3	--	--	4	--	3	7	7	3	4.5
Geography	--	--	--	--	--	--	--	--	--	3	3.0
Geology	--	3	2	4	6	5	4	--	--	5	4.1
History and Government	4	--	--	6	--	--	6	--	--	--	5.3
Horticulture	5	--	--	--	--	--	--	--	--	--	5.0
Humanities	--	8	8	6	--	10	--	--	--	8	8.0
Mathematics	8	18	12	6	9	10	3	9	3	4	8.2
Meteorology	--	--	--	--	3	--	--	--	--	--	3.0
Microbiology	3	3	3	7	6	--	4	3	6	8	4.8
Natural Science	--	8	--	--	--	--	--	--	--	--	8.0
Physics	--	8	6	6	8	10	5	8	--	3	6.8
Psychology	2	3	--	--	--	--	--	--	--	--	2.5
Scientific Report Writing	--	2	--	--	--	--	--	--	--	--	2.0
Social Science	--	--	8	3	6	10	8	--	--	4	6.5
Soils	32	13	11	21	8	27	21	13	20	26-27	18.7

Table 11. (continued)

Courses	Institutions * 1	2	3	4	5	6	7	8	9	10	Average Credit Hours
	Credit Hours										
Statistics	--	3	--	--	6	--	--	--	--	--	4.5
Zoology	--	5	3	--	--	7	3	3	3	--	4.0
Farm Records	2	--	--	--	--	--	--	--	--	--	2.0

*Names of institutions corresponding to numbers above:

1. California State Polytechnic College
2. Kansas State College
3. Michigan State University
4. Rutgers University
5. Cornell University
6. Ohio State University
7. Oklahoma State University
8. Texas Agricultural and Mechanical College
9. Texas Technological College
10. University of Wisconsin

Each subject matter area considered mandatory for soil science majors is discussed briefly under a separate heading as follows:

Agricultural Engineering:

Out of the ten institutions selected for the survey, only four included agricultural engineering in their soils curricula. The average hours' credit designated for this was 4.8, with a range from 4 to 6 hours.

Agricultural Orientation:

Again, only four institutions required agricultural orientation, and 1.3 was the average credit hours required, with a range of 1 to 2 hours.

Agricultural Seminar, Problem, and/or Topics:

Agricultural seminar, problem, and/or topics are required by four of the institutions, with an average credit hours of 5.0, and a range from 0 to 10. This appears to be an unusually wide range.

Air Science, Military Training, and/or Physical Education:

In some of the institutions, the physical education requirement was compensated by air science or military drill. Eight of the ten institutions required physical education, air science or military training. The average credit hours for these was 6.4, and the range was from 3 to 11. This range would also appear to be rather wide.

Animal Science:

This subject was required by seven of the ten institutions. The average credit hours was 5.9, and the range was from

4 to 9 hours. This would indicate that some institutions emphasized animal science twice as much as did others, credit wise.

Biology (General):

General biology is considered a requirement only by Rutgers University, and soil science majors are required to take 8 hours of this subject.

Botany:

All ten institutions required botany and/or plant physiology--the average credit hours being 8.0, and the range was from a minimum of 6 to a maximum of 16. The importance of this subject to soil science majors is reflected by the fact that the institutions required it unanimously. This subject also shows a remarkably wide range in credit hours allotted to it.

Chemistry (Organic and Inorganic):

Chemistry is another basic science considered indispensable to soil science by all ten institutions. A high average of 16.5 hours and a very wide range of 10 to 26 credit hours is given this subject.

Communications, including English:

Considered as required by all ten institutions, this phase of study received an average of 9.6 hours with a relatively wide range of 7 to 15 credit hours.

Crops:

Nine out of the ten schools selected considered crops as a requisite. There was an average of 8.1 hours required with a range of 3 to 11 hours' credit.

Economics:

Basic and/or agricultural economics is required of soil science majors by all ten schools with an average credit hours of 7.5 and a range of 3 to 16 hours. This would indicate that some institutions placed five times more emphasis on this subject than others.

Electives:

The opportunity to elect subjects was wide. Eight of the ten schools emphasized electives. There was an average of 15.6 hours of electives offered with a range of 3 to 35 credit hours. In almost all cases, the electives were offered starting at the sophomore level. Very obviously and startlingly enough, the range is very wide. This provides for a large selection based upon individual student needs and interests.

Entomology:

One-half or five of the institutions selected required entomology. These five institutions had an average of 3.2 hours required with a range of 2 to 5 credit hours.

Forestry:

The University of Wisconsin was the only institution that required a course in forestry for soil science majors. An average of 3 credit hours is given this course.

Genetics:

The number of institutions that required genetics was six. The average credit hours for this subject was 4.5, and the range, 3 to 7 hours.

Geography:

Geography is required only by the University of Wisconsin, with an average of 3 credit hours designated.

Geology:

This subject received attention by seven of the ten institutions. The average credit hours required was 4.9, and the range was from 2 to 5 hours.

History and Government:

This course appeared in the soils curricula of three of the ten schools. Soil science majors are required to take an average of 5.3 hours. The range shown is from 4 to 6 hours for those schools requiring these two subjects.

Horticulture:

The California State Polytechnic College required an average of 5 hours in horticulture. Since this institution is located on the west coast of the United States where there is specialization in fruit, the reason for the inclusion of this course in the soil science curriculum seems to be obviously justified.

Humanities:

Humanities are included in the soil science curricula of five of the ten schools, with an average of 8 hours and a range of 6 to 10 credit hours.

Mathematics:

This is one of the few basic science courses required by all institutions alike. The average credit hours was 8.2 with a range from 3 to 12 hours--a range indeed very wide.

Meteorology:

This course is required only by Cornell University, with an average of 3 credit hours.

Microbiology:

Nine of the ten sampled schools required microbiology. The average credit hours permitted was 4.8, and the range was from 3 to 8 hours.

Natural Science:

Undergraduate soil science majors are required to take 8 hours of natural science only by Kansas State College.

Physics:

The number of schools which included physics in the soils curricula was eight--the average credit hours being 6.8, and the range, 3 to 10.

Psychology:

Two schools made psychology a requirement. The average credit hours was 2.5, and 2 to 3 hours was the range.

Scientific Report Writing:

Kansas State College was the only one to require this course. It was offered for 2 hours' credit.

Social Sciences:

Social sciences are required by six of the institutions. There was an average of 6.5 credit hours and a range of 3 to 10 hours in the soils curricula of these six institutions.

Soils:

Naturally, all ten institutions selected for the study required soils courses. The average in credit hours for

soils was 18.7, the range being from 8 to 32 hours. This range is impressively wide, like the range for the electives. Although some schools did not include as many credit hours in soils as others, most of the electives for these schools consisted of soils courses.

Statistics:

Two of the schools made statistics a requirement for soils majors. Here, the average in credit hours appeared to be 4.5, and the credit hours ranged from 3 to 6.

Zoology:

Zoology was included in the requirement list by six of the institutions. An average of 4 hours and a range of 3 to 7 hours in credit was given zoology.

Farm Records:

Again, the California State Polytechnic College was the only one to require farm records of soil science majors.

Some of the above subjects are apparently considered more important than others by a few of the institutions selected for the study. Nevertheless, it can be seen that each course is invaluable to the study of soil science. The wide range of the electives gives the students an opportunity to be at liberty to take more of their popular choices as well as to enable them to have varieties in their election of subject matter. Although the range in soils was very wide, actually the figure appeared to be exceptionally high for California State Polytechnic College--which was 32. The range in credit hours for the remainder of the nine institutions was from 13 to 19 hours. Some of the institutions which did require a relatively narrow number of credit hours in soils did, however, require a larger number of hours in the basic sciences.

Range and Average of Credit Hours in Soils and Related Courses Required for a B.S. Degree in Soil Science in Ten Institutions Surveyed in the United States

TITLES OF SOILS COURSES OFFERED BY YEARS AND CREDIT HOURS

Freshman Year		Sophomore Year		Junior Year		Senior Year	
First Semester	Second Semester	First Semester	Second Semester	First Semester	Second Semester	First Semester	Second Semester
			CORNELL UNIVERSITY				
		Agron. 1 - Nature and Properties of Soils (5)			Agron. 101 - Soil Class. & Survey (3)	Agron. 106 - Soil Microbiology (3)	Agron. 90 - Undergraduate Seminar (1)
			RUTGERS UNIVERSITY				
		Soil Mg. (3)		Land Planning and Util. (3)	Soil Microbiology (3) Soil Classification and Survey (3)	Soil Physics (3)	Soil Fert.(3) Chemical anal. of soils, plants, and fert. (3)
			OKLAHOMA STATE UNIVERSITY				
		Agron. 224 - Fund. of Soil Science (4)		Agron.Elec. (Soils)(3)	Agron.Elec. (Soils)(3)	Agron. 471 - Soil Sem.(1) Agron.Elec. (Soils) (5)	Agron.Elec. (Soils) (5)
			TEXAS TECHNOLOGICAL COLLEGE				
		Agron. 241 - Soils (4)		Agron. 435 - Soil Genesis (3)		Agron. 422 - Dry Farm Soils (2) Agron. 439 - Soil Microbio. (3)	Agron. 423 - Soil Fert. (2) Agron. 434 - Soil Cons. (3) Agron. 436 - Soil Chem. (3)

Table 12. (continued)

Freshman Year		Sophomore Year		Junior Year		Senior Year	
First Semester	Second Semester	First Semester	Second Semester	First Semester	Second Semester	First Semester	Second Semester
UNIVERSITY OF WISCONSIN							
		Soils 1 or Bact. 1 (4)	Soils 1 or Bact. 1 (4)	Soils 26(2) Soils 115 - Soil Morphology, class. & mapping (3)	Soils 125 - Soil Gen.(3) Soils 106 - Soil & Water Cons. (3)	Soil 127 - Soil Sci.& Plant Morphology (2-3) Soils 128 - Pro. Sem.(1)	Soils 121 - Soil anal.(4)
OHIO STATE UNIVERSITY							
		Agron. 501 - Soils (4)		Agron. 611 - Soil Fert. (3)		Agron. 608 - Soil Physics (5) Agron. 712 - Chemistry of Soils and Fert. (5) Agron. 603 - Origin and Class. of Soils (5) Agron. 601 - Organ. of Soils & Crops Mgmt. Systems (5)	
CALIFORNIA STATE POLYTECHNIC COLLEGE							
SS 121 - Soils (4) SS 122 - Soil Mgmt. (4) SS 123 - Soil Mat. (3)		SS 221 - Fert. (4) SS 202 - Soil Cons. (3) SS 222 - Range Mgmt. (4)		SS 321 - Soil Class. (4) SS 322 - Soil Fert. (3) SS 332 - Range Tech. (3)		SS 461 - Senior Proj. (2) SS 462 - Senior Proj. (2) SS 463 - Undergrad. Sem. (2) SS 422 - Soil Micro. (2) SS 423 - Soil Chem. (3) SS 422 - Soil Physics (4)	

Table 12. (continued)

Freshman Year		Sophomore Year		Junior Year		Senior Year	
First Semester	Second Semester	First Semester	Second Semester	First Semester	Second Semester	First Semester	Second Semester

KANSAS STATE COLLEGE

Agron. 149 - Soils (required) (4)
Agron. 160 - Soil Mgmt. (3)
Agron. 170 - Dryland Soil Mgmt. (2)
Agron. 502 - Mgmt. of Irrigated Soils (2)
Agron. 509 - Development and Classification of Soils (2)

MICHIGAN STATE UNIVERSITY

SS 101 - Introductory Soil Sci. (3)
SS 330 - Soil Mgmt. (4)
SS 332 - Soil Mgmt. for Green Houses (4)
SS 380 - Soil Geography and Land Use (3)
SS 390 - Soil Cons. and Land Use (3)
*SS 410 - Special Soil Problems (1-3)
*SS 429 - Advanced Soil Mgmt. (3)
*SS 430 - Soil Fertility and Fertilizers (5)
*SS 440 - Soil Physics (4)
*SS 450 - Soil Chemistry (4)
*SS 470 - Soil Classification and mapping (4)

*Approved also for graduate credit

TEXAS AGRICULTURAL AND MECHANICAL COLLEGE

*Agron. 301 - Introd. Soils (4)
Agron. 310 - Soil Morphology (2)
Agron. 318 - Soil Cons. (4)
Agron. 413 - Soil and Crop Mgmt. (3)
Agron. 422 - Soil Fertility (4)
Agron. 426 - Fertilizer Tech. (2)
Agron. 445 - Soil Physics (3)

*Required during third year, first semester

A PROPOSED COURSE OF STUDY IN SOIL SCIENCE FOR THE IMPERIAL ETHIOPIAN COLLEGE OF AGRICULTURAL AND MECHANICAL ARTS

Since over eighty-five percent of the people in Ethiopia are engaged in farming, any marked improvement in a major segment of agriculture would result in a great increase in the wealth of that country.

The Imperial Ethiopian College of Agricultural and Mechanical Arts was opened in December 1956, and offered a four-year course in general agriculture with a B.S. degree. The establishment of this institution was the result of the patronizing effort of H. I. M. Haile Selassie I, which effort led to a cooperative agreement between the Ethiopian government and the United States government to make the establishment of the college possible.

In the beginning, the institution offered only a B. S. degree in general agriculture. This was due to the limited enrollment and the unusually high cost of offering training except in the broad area of agriculture. After four years, the enrollment has increased, facilities have been improved, and there is, no doubt, a felt need that there should be training provided in specific areas. Soils and farm mechanics may be cited as two areas for consideration. Plant and animal science were added for the school year of 1959-60.

For this particular study, soils has been considered because any improvement in the fertility of the soil or reclaiming a part of the vast area of arid soil as a result of irrigation would greatly increase the total production of agricultural products. Thus, with a greater

total production, there would be an increased amount of taxable exports and imports to provide for functions of government, improve the standard of living, as well as social and educational benefits.

The course of study in soils has therefore been prepared for such time as it is felt justified to include it as another curriculum.

In reviewing the wide range of required and elective subjects offered by the ten institutions studied in the United States, it should be understood that only a limited number of electives may be offered in either soils or other subject matter areas at the Imperial Ethiopian College of Agricultural and Mechanical Arts. This is due to the amount of funds available, small enrollment, the size of the staff and the available facilities. From the various subjects which are included in the present agricultural curriculum, those which are most appropriate to round out the curriculum for soils majors may be selected. (See appendix for the present curriculums for the Imperial Ethiopian College of Agriculture.)

In studying the courses of study in soils for the ten institutions in the United States, it is found that two offer their first soils course in the first year, while eight offer their first course in soils in the second year. Not more than one to two courses are usually offered even in the second year. Thus, the plan followed by a majority of these institutions is to offer the basic sciences, humanities, social studies, etc., in the first two years and provide for a concentration of core subjects in the major field in the third and fourth years. This plan has a distinct advantage in that it provides an opportunity for the students during their first two years to become acquainted, either through an introductory or orientation course, visiting with teachers in other subject matter areas, talking with advanced students, or through self-discovery, to make their own selection based upon interest and value to them.

In establishing educational criteria for planning the course of study in soils, the following guiding principles were chosen:

1. Relative importance

The relative importance of the subject matter taught to the large soil types of Ethiopia.

The importance of its ultimate value in increased productivity when taught.

The importance in relation to the number of people who may benefit from the practice or practices taught.

Importance is determined in the last analysis by use, and all values are determined by the effect they have on need.

2. Relationship

The course of study in soils should be a series of guided experiences so related and so arranged that what is learned in one experience serves to enrich and make more valuable the experiences that follow.

"Subject matter should be selected on the basis of the intimacy of its relationship with the other elements of subject matter used in the development of a unit, job, problem or project" (5). The relationship of the unit of soils studied to the crops, grasses, etc., that are grown or produced in Ethiopia is an example.

The relationship of the practice or techniques studied to the need for and value of improving the soils.

The relationship of the science taught to the needs, importance and use for soil majors should bring about a greater understanding and appreciation. Where possible, a particular science course should be taught in the same semester with a course in soils so that this relationship may be developed and a greater value derived by the students.

3. Doing ability

"Situations are dynamic when they provide for participation in relation to useful employment or management" (4).

Real experience with actual materials is an essential of learning.

"One's success in meeting the various situations that arise depends largely upon his training in and through activities typical of those situations" (5).

Finally, in developing and teaching the various soils courses, doing ability should be given consideration in the training program; i.e., how to take soil samples, how to test soils, run drainage lines, construct terraces, lay out a site for a pond, build a dam, construct an irrigation ditch, and other important skills.

4. Difficulty

"Certain subject matter may be of interest or of use, but also so difficult to learn that if it is presented, interest is killed and use will be prohibited. In general, material must be graded so that a unit shall not be presented before the learner has reached the level of ability where he may reasonably hope to master it, and then the instruction must be continued until he has mastered it to a satisfactory degree. If a unit is both difficult and important, it should be delayed until the time when the ability of the student is equal to mastering it" (3).

5. Proved superior merit

There are standard methods and practices among farmers in a given area and there are also superior or better practices than the standard. In Ethiopia, as in any other country where agriculture is important, some farmers will be found who are superior to others in the practices they use. The improved or better practices that pertain to soils should be included in the course of study.

The practices and knowledge from other countries that may be of practical value to Ethiopia should be included in the soils course of study.

Research work that has been developed, tested and proved useful at the agricultural experiment stations in Ethiopia should also be used in the course for soils majors.

Finally, in planning the courses in soils, each one should be developed only after a careful analysis of the subject matter involved. This means that a detailed outline for each course should be planned, reviewed, revised where necessary and finally completed so that each unit of instruction has real value and lasting benefits to the students majoring in that field.

Using the information secured from the subjects in soils for soil science majors from the ten institutions and revising the standard curriculum recommended by the Soil Science Society of America, the following suggestions are being made for the agricultural college in Ethiopia:

> In the first semester of the second year, the first course in soils should be offered for two hours' credit. This course should be planned as an introduction or orientation into soils. The major purpose should be to acquaint students with the major soil types of Ethiopia and their relation to certain crops. Instruction should also be included on soil deficiencies, high fertility soils, areas where irrigation must be introduced if the soils are to produce to their maximum, coffee soils in relation to altitude and climate, soils best suited for producing timber, and other broad aspects of the subject as it concerns Ethiopia.

The following courses are proposed for the Imperial Ethiopian College of Agricultural and Mechanical Arts on the bases of the examination made of all soils courses offered by the various institutions, the recommendation of the Soil Science Society of America, revised, and the information secured from Murphy's investigation (9) on Ethiopian soils:

The Importance of Soils (Sophomore Year, First Semester):

An introductory course in soils covering the major soil types and their role in nature, with particular emphasis on Ethiopian soils--forest soils, soils suited for coffee production and other crops, soils useful in ceramic industry, engineering (including road construction), etc. Lecture and discussion, 2 hours; credit 2 hours.

The Fundamentals of Soils (Junior Year, First Semester):

Introductory courses in soils covering the origin, formation, composition, classification, physical, chemical, and biological properties of soils. Lecture and discussion, 2 hours; laboratory and field trips, 2 hours; credit 3 hours.

Soil Management, Fertility, and Conservation (Junior Year, Second Semester):

Practices used in the management of soils, including those necessary to conserve the fertility, to control erosion, to minimize drouth and drainage problems, e.g., tillage, rotation, use of fertilizers, farm manure, irrigation, and drainage. Lecture and discussion, 2 hours; laboratory and field trips, 2 hours; credit 3 hours.

The three courses in soils listed above are to be required of all agricultural students. Plant or soil science majors will need to take the following in addition:

Soil Morphology (Senior Year, First Semester):

Introduction to the genesis and classification of soils, soil-forming

factors, and the concept of soil surveys and soil mapping. Lecture and discussion, 1 hour; laboratory and field trips, 2 hours; credit 2 hours.

Soil Chemistry and Plant Nutrition (Senior Year, Second Semester):

Chemical processes of soils, dynamics of soil reaction, chemical weathering of soil minerals, ion exchange, base saturation, availability of plant nutrients, and chemical analysis of soil materials. Lecture and discussion, 3 hours; laboratory and field trips, 2 hours; credit 4 hours.

Soil Seminar (Senior Year, Second Semester):

Topics of investigations. Oral and written reports and discussion; credit 2 hours. (Elective)

The above soils courses are proposed for the Imperial Ethiopian College of Agricultural and Mechanical Arts, based on the information secured from the ten institutions in the United States selected for the study. As has been mentioned heretofore, consideration was also given to the standard pattern of courses in soils recommended by the Soil Science Society of America. What is more, particular needs in Ethiopia were taken into account; and as a result, the first course to be offered in soils is suggested as an emphasis on the "importance of soils." The units of instruction under this subject will give particular attention to Ethiopian soils and will provide an opportunity for the utilization of information strictly of immediate value. The intent in orienting such a course is to increase an interest in soils by students so that what is taught will be justifiably appreciated and understood. As more information on Ethiopian soils will be obtained in the future by way of research, there will constantly be more accumulated material for teaching, and the number of credit hours will accordingly be appropriately increased.

In developing the teaching plans in this connection, it is useful to employ the methods that would suit the particular purposes, such as

listed by Angerer (2). For instance, lectures may be appropriate in some cases, but discussions may be better in other cases. As this thesis does not dilate upon the question of methods, this needs separate attention.

SUMMARY AND CONCLUSIONS

This study deals with a proposal of a workable group of courses for soil science majors in the Imperial Ethiopian College of Agricultural and Mechanical Arts in Alem Maya, Ethiopia. A survey of ten institutions in the United States with close typicalities in conditions of areas of their respective locations to the conditions in Ethiopia was made. The standard pattern of soil science curriculum adopted and recommended by the Soil Science Society of America was also reviewed. In addition, the particular needs in Ethiopia were taken into account mainly from the report on the fertility status of soils in Ethiopia by Murphy (9). On the basis of the study made, courses for soil science majors at the agricultural college in Ethiopia are proposed. The introductory course in soils to be offered is suggested to be termed "The Importance of Soils," and it comprises an orientation of the relative values of soils in Ethiopia.

The text books in soils used in teaching the subject do not, currently, deal with Ethiopian soils in a direct way. Until such time when such materials can be developed, it is believed that the utilization in classrooms of research reports and similar materials available is likely to make the teaching more meaningful and, therefore, of greater value to the students. The separate treatment of the importance of soils in nature is believed to create more interest in soils on the part of the students to the extent that what is taught will be more appreciated.

The proposal made here closely agrees with courses offered in most of the institutions selected for the study, and the average in credit hours

deviates but insignificantly from that calculated for the ten institutions surveyed. It is felt that this is reasonably close enough to the minimum credit hours required for soil science majors as recommended by the Soil Science Society of America.

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APPENDIX

Questionnaire for obtaining information

Head, Department of Soils

_____

_____

Dear Sir:

We have a young man from Ethiopia (Dawit Deguefu) attending this institution, who is particularly interested in making a study of the soils courses required for a B.S. Degree from _____.

From the information secured from states as nearly typical of conditions in his country, he plans to outline a four-year course of study in soils for the Imperial Ethiopian College of Agricultural and Mechanical Arts, Alam Maya, Ethiopia. In addition to outlining the four-year course of study, he also plans to prepare a series of topics (units of instruction) for each particular course to be taught.

Your cooperation in giving us the information requested on the survey form will be greatly appreciated.

Sincerely,

H. F. Murphy, Professor
Agronomy Department

HFM:xx

P. S. The above institution was planned and is now being operated by a staff from Oklahoma State University under a contract with International Cooperation Administration. At present a B.S. Degree in general agriculture is offered, but it is expected that special departments will be established as the institution expands.

NAME OF INSTITUTION: _____

Department of Soils

The following courses in Soils are recommended for a B. S. Degree in this department:

Please star (*) those courses recommended as electives.

First Year

Title of Course	Course Number	Hours Credit	Description

Second Year

Title of Course	Course Number	Hours Credit	Description

Third Year

Title of Course	Course Number	Hours Credit	Description

Fourth Year

Title of Course	Course Number	Hours Credit	Description

Total hours Soils courses required for B. S. Degree _____

Signed _____

Please return to Dr. H. F. Murphy, Professor of Soils, Department of Agronomy, College of Agriculture, Oklahoma State University, Stillwater, Oklahoma.

CURRICULUM AT THE IMPERIAL ETHIOPIAN COLLEGE OF AGRICULTURAL AND MECHANICAL ARTS

The curriculum shown below is followed by all students during their Freshman and Sophomore years.

The scheduling committee may transfer some courses from one semester to another to avoid conflicts, but in general the first number of the course indicates when it is given.

FRESHMAN YEAR

First Semester		Second Semester	
Botany	114	Zoology	173
General Chemistry	124	General Chemistry	184
English	133	English	193
Econ. Geography	142	Physics	1G4
Agri. Mathematics	154	Intro. Animal Hus.	113
Physical Education	161	Physical Education	1H1
	18		18

SOPHOMORE YEAR

First Semester		Second Semester	
Bacteriology	214	Entomology	253
English	223	Report Writing	263
Soils	213	Farm Shop	223
Agri. Economics	233	Horticulture 2/3	
Field Crops	223	Forestry 1/2	233
Agri. Mechanics	211	Organic Chemistry	275
Physical Education	241	Physical Education	281
	18		18

Total lower division academic hours (exclusive of Physical Education): 68.

REQUIRED UPPER DIVISION CURRICULA

General Upper Division Requirements:

Plant or Animal Science Major

General required courses.	6 hrs.
One major area (of which 25 hrs are required courses).	30 hrs.

One minor area (to be earned in courses from either required or elective liste in the area).	12 hrs. minimum
Other courses (to be earned in area outside the major fields but in an area in which a major or minor can be earned).	6 hrs. minimum
Electives (to be earned in any area).	10 hrs.
Total upper division credits required for degree.	64 hrs. minimum
Total lower division credits required for degree.	68 hrs. minimum
Total credits required for degree (exclusive of Physical Education).	130 hrs.

Each student must be enrolled in at least 15 but not more than 19 hours in any semester.

General Agricultural Major

General required courses.	6 hrs.
Plant Science (to be earned in courses on required list).	18 hrs. minimum
Animal Science (to be earned in courses on required list).	18 hrs. minimum
Agricultural Mechanics (to be earned in any upper division courses offered).	9 hrs. minimum
Electives (to be earned in any area).	13 hrs. minimum
Total upper division credits required for degree.	64 hrs. minimum
Total lower division credits required for degree.	68 hrs. minimum
Total credits required for degree (exclusive of Physical Education).	130 hrs. minimum

Plant Science Major

JUNIOR YEAR

First Semester		Second Semester	
General Genetics*	333	Plant Pathology	333
Vegetable Production	313	Plant Breeding	343
Cereal, Fiber & Oil Crops	312	Plant Physiology	353
	9		9

*General required courses which do not count toward major or minor.

SENIOR YEAR

First Semester		Second Semester	
Plant Sciences Project and Seminar	412	Farm Management*	433
Forage Crops and Pasture	423	Coffee Spices	443
Soils Management	432		
	7		6

Animal Science Major

JUNIOR YEAR

First Semester		Second Semester	
General Genetics	333	Production of Meat Animals	333
Poultry Production	324	Animal Breeding	343
Feeds and Feeding	313	Animal Breeding Physiology	
		Animal Anatomy and	354
	10		10

SENIOR YEAR

First Semester		Second Semester	
Animal Science Project and Seminar	412	Farm Management*	433
Animal Nutrition	423		
Animal Diseases	433		
	8		3

*General required courses which do not count toward major or minor.

UPPER DIVISION ELECTIVES

PLANT SCIENCE

Junior Year		Senior Year	
Fruit Production	363 (I)*	Forestry	453 (I)
Soils & Plant Nutr.	373 (II)	Principles of Plant Identification	462 (I)
		Senior Project & Seminar	472 (II)
		Crop Judging	382 (II)

ANIMAL SCIENCE

Parasitology	363 (I)	Hatchery Management	442 (I)
Poultry Selection	373 (II)	Livestock Judging	452 (I)
		Senior Project	462 (II)
		Poultry Feeding	472 (II)
		Farm Meats	482 (II)

AGRICULTURAL MECHANICS

Agri. Engineering	313 (I)	Farm Buildings	412 (I)
Agri. Electricity	322 (II)	Farm Machinery	423 (I)
		Farm Power	433 (II)

ARTS AND SCIENCES

Psychology	313 (I)	Teaching Methods	412 (II)
Meteorology	322 (II)	Marketing Farm Products	423 (II)

*The Roman Numerals I and II indicate the semester in which the course is offered.

VITA

Dawit Deguefu

Candidate for the Degree

of

Master of Science

Thesis: A PROPOSED PROGRAM IN SOIL SCIENCE FOR STUDENTS IN THE IMPERIAL ETHIOPIAN COLLEGE OF AGRICULTURAL AND MECHANICAL ARTS

Major Field: Agricultural Education

Biographical:

Personal Data: Born October 7, 1936, at Gamou Gofa, Ethiopia.

Education: Received elementary education at Haile Selassie I Elementary Schools in Gore, Lekempti, and Addis Ababa, Ethiopia; attended high school at Ambo Agricultural School and Jimma Agricultural Technical School; undergraduate study completed at Imperial Ethiopian College of Agricultural and Mechanical Arts, Alem Maya, 1958; graduate study at Oklahoma State University, Stillwater, Oklahoma, 1960.

Member: PHI DELTA KAPPA, Honorary Professional Education Fraternity.

Date of Final Examination: July, 1960