encompass all aspects of agriculture, while giving students new insights on their field of study in other parts of the world.

The course material was divided into 12 sections, each presenting a dual topic: agriculture in a particular French-speaking country, and one special facet of agricultural production. For example, students learn about food production in France during the first two weeks of classes, while mastering the basic vocabulary of vegetable and animal production; they are familiarized with the Common Market agricultural economy while getting acquainted with terms of agricultural economics; soil science terminology is part of the study of North African and Sahel countries; words pertaining to veterinary science are introduced while students hear about problems associated with cattle raising in Africa, and so on.

During the last two weeks of lectures, the focus is placed on Canadian agriculture, with a special emphasis on Quebec and a general review of all vocabulary sections previously studied. The course concludes with pointers on letter, job application and resume writing in French.

Each module is followed by a vocabulary test, with some elements of technical translation. Short oral presentations, relating to the students' special fields of interest as well as to the topics studied, form part of the oral work. Comparisons between Canada and the countries studied are encouraged. An original paper on the last presentation topic is handed in at the end of the course.

Needless to stay, material for this course was not easy to come by. However, many sources proved remarkably helpful: some excellent material on French speaking Africa, for instance, was available through UNESCO; French embassy services were very willing and able to provide up-to-date information, while current French magazines and periodicals often carry articles on European agriculture.

The size of the classes has been small, not exceeding 25 students. As an optional course, Agricultural Vocabulary has attracted highly motivated students with the result that a high level of verbal participation has provided stimulation for both students and instructor, as well as — hopefully — adequate career preparation.

The Representation of Women Scientists in Land Grant Colleges of Agriculture

Janet L. Henderson and
Barbara E. Cooper

Introduction

Women entering scientific fields have made significant progress during the last two decades. Recent statistics show that more women are entering scientific professions (Hyer, Eastman, Hrezo, & Malebranche, 1983; Ekstrom, 1979). Women Ph.D.s in science and engineering numbered only 9% in 1970, but that figure rose to 21% in 1979 (Vetter, 1984). From 1960 to 1985, women earned more than 57,000 doctorates in science and engineering, increasing their share of Ph.D.s awarded to 30% in 1984 (Vetter, 1986). Now, women constitute one-fifth of the youngest, more-recently trained scientists in their disciplines (Hornig, 1984).

Women scientists and engineers have made strides in employment in every field, including academia. The number of women scientists and engineers employed in academia rose 6% between 1980 to 1981, compared to only a 2% rise reported for their male counterparts (National Science Foundation, 1982). From 1973 to 1983, the number of women in all academic areas who were tenured, full professors increased from 10 to 11%; female lecturers increased from 35 to 48% (Vetter, 1986).

Despite these advances, the number of women employed as agricultural scientists at the university level remain very low (Hyer, 1983). In addition, for women educated in the agricultural sciences, unemployment rates are significantly higher than their counterparts in the physical sciences and engineering (Vetter, 1984). However, for women working in the agricultural sciences in academia, actual employment figures are unavailable because most recent research concerns the women employed in the physical sciences and engineering (Ekstrom, 1979; Hyer, 1984). Other information regarding the number of women employed in specific agricultural disciplines (e.g., animal science, agronomy, agricultural engineering) would be useful but is also concurrently unavailable.

Purpose of Study

The goal of this study is to gether statistics on women employed as agricultural scientists with academic rank in colleges of agriculture at U.S. Land-grant universities. The study has four specific objectives:

(1) to determine the number of women employed in the agricultural sciences at U.S. Land-grant universities, as reported by deans of resident instruction at colleges of agriculture.
(2) to determine the representation of women scientists in agricultural academic disciplines.
(3) to determine the representation of women agricultural scientists in small versus large college of agriculture faculties.
(4) to determine the representation of women agricultural scientists in eastern, central, western and southern regions.

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Procedures

The design for the study is descriptive in nature. The researchers are interested in determining the number of women scientists in colleges of agriculture at U.S. land-grant universities and identifying their academic disciplines.

For purposes of this study, women scientists are defined as female faculty with academic, tenure-accruing appointments (instructor, assistant professor, associate professor and professor) in the following agricultural disciplines: animal science, agronomy/-plant science, agricultural economics/rural sociology, agricultural engineering, natural resources/forestry, biological sciences, horticulture, agricultural and extension education, and food science/animal nutrition. The biological sciences category includes microbiology, zoology, entomology, biochemistry and genetics.

To develop a census, the reseachers secured a list of the deans of resident instruction in colleges of agriculture at the 70 land-grant universities in the United States. The deans were contacted by letter in September 1985 and asked to identify women scientists with academic, tenure-accruing appointments in the nine disciplines in their colleges of agriculture. A 100%

Table 1. Number and Percent of Women Scientists in Land-Grant Colleges of Agriculture

University	No. of Women Scientists[a]	Total No. of College Faculty[b]	% of Women Scientists on Faculty
Alabama A&M University	3	31	.09
Auburn University	1	229	.004
Tuskegee Institute	1	17	.05
University of Alaska	6	36	16.6
University of Arizona	11	140	7.8
University of Arkansas, Fayetteville	4	152	2.6
University of Arkansas, Pine Bluff	0	15	0
University of California, Berkeley	18	132	13.6
University of California, Davis	27	370	7.2
University of California, Riverside	10	161	6.2
Colorado State University	4	210	1.9
University of Connecticut	6	77	7.7
Delaware State College	0	7	0
University of Delaware	4	54	7.4
University of the District of Columbia	10	17	58.8
Florida A&M University	2	25	8.0
University of Florida	24	382	6.2
Fort Valley State College	0	15	0
University of Georgia	3	295	1.0
University of Guam	2	15	13.3
University of Hawaii	4	100	4.0
University of Idaho	3	63	4.7
University of Illinois, Urbana-Champaign	11	340	3.2
Purdue University	16	316	5.0
Iowa State University	11	312	3.5
Kansas State University	9	288	3.1
University of Kentucky	7	204	3.4
Louisiana State University	2	187	1.0
Southern University	3	8	37.5
University of Maine, Orono	8	94	8.5
University of Maryland	8	163	4.9
University of Maryland, Eastern Shore	3	7	42.8
University of Massachusetts	7	140	5.0
Michigan State University	20	385	5.1
University of Minnesota	17	320	5.3
Alcorn State University	0	21	0
Mississippi State University	4	190	2.1
Lincoln University	4	9	44.4
University of Missouri System	9	262	3.4
Montana State University	4	95	4.2
University of Nebraska	5	231	2.1
University of Nevada, Reno	4	45	8.8
University of New Hampshire	2	64	3.1
Rutgers, The State University	23	152	15.1
New Mexico State University	0	118	0
Cornell University	23	366	6.2
North Carolina A&T State University	2	26	7.6
North Carolina State University	23	511	4.5
North Dakota State University	2	151	1.3
Ohio State University	7	304	2.3
Oklahoma State University	4	223	1.7
Oregon State University	14	288	4.8
Pennsylvania State University	22	297	7.4
University of Puerto Rico	12	29	41.3
University of Rhode Island	0	63	0
Clemson University	11	199	5.5
South Dakota State University	6	174	3.4
Tennessee State University	0	13	0
University of Tennessee	3	184	1.6
Prairie View A&M University	0	15	0
Texas A&M University System	8	379	2.1
Utah State University	0	192	0
University of Vermont	0	74	0
College of the Virgin Islands	0	1	0
Virginia Polytechnic Institute and State University	8	270	2.9
Virginia State University	0	14	0
Washington State University	19	131	14.5
West Virginia State University	4	119	3.3
University of Wisconsin, Madison	25	459	5.4
University of Wyoming	1	93	1.0
Total	514	11,069	

[a] As reported by Deans of Resident Instruction at the 70 U.S. Land-Grant Universities.

[b] As reported in the *1984-85 Directory of Professional Workers in State Agricultural Experiment Stations and Other Cooperating State Institutions.*

response rate from the deans was achieved, resulting in a list of 514 women faculty in the agricultural sciences. To determine the number of faculty in colleges of agriculture at each of the land-grant universities, the current **Directory of Professional Workers in State Agricultural Experiment Stations and Other Cooperating State Institutions** was used. This directory lists agricultural professionals by university, discipline, and academic rank.

Findings

Number of Women Scientists Within Colleges of Agriculture. As shown in Table 1, 12 (17%) deans report that their colleges of agriculture have no women scientists. Thirty-nine (56%) of the college deans report having one to 10 women scientists on their faculties. Ten (14%) deans report having 11 to 20 women scientists on their faculties and nine (13%) deans report having more than 20 women scientists on their faculties. The highest number of women scientists employed at any one college of agriculture is 27.

By Percentage of College Faculty. As shown in Table 2, the proportion of women scientists in colleges of agriculture at the 70 U.S. land-grant universities is 4.6%. The agricultural and extension education discipline has the highest proportion of women (12.5%). The agricultural engineering discipline has the lowest proportion of women scientists (0.8%). The proportion of women in the physical sciences is 4% and 6% in the social sciences.

By Academic Disciplines. As illustrated in Table 2, women scientists are represented in all nine academic disciplines. In relation to the total population of women agricultural scientists (N=514), the agronomy/plant science discipline has the highest number of women scientists (19.2%). However, the agronomy/plant science discipline has a low proportion of women scientists in comparison to the total number of faculty in the discipline (3.8%). The agricultural engineering discipline has the fewest number of women scientists (1.1%). Eighty-one percent of the women are employed in the physical sciences (agronomy/plant sciences, animal sciences, biological sciences, horticulture, food science/animal nutrition, natural resources/forestry, agricultural engineering) and 19% are employed in the social sciences (agricultural and extension education, agricultural economics/rural sociology).

Table 2. Number and Proportion of Women Scientists by Academic Disciplines in Land-Grant Colleges of Agriculture

Discipline	Total No. of Women Scientists	% of Total Women Scientists	Total No. of College Faculty	% of Women Scientists on Faculty
Agronomy/ Plant Science	99	19.2	2,587	3.8
Biological Sciences	89	17.3	1,878	4.7
Agricultural Economics/Rural Sociology	71	13.8	1,410	5.0
Animal Sciences	67	13.0	1,668	4.0
Horticulture	63	12.2	914	6.9
Food Science/ Animal Nutrition	50	9.7	538	9.3
Natural Resources/ Forestry	42	8.1	1,154	3.6
Agricultural and Extension Education	27	5.2	216	12.5
Agricultural Engineering	6	1.1	704	0.8
Totals	**514**		**11,069**	**4.6**

Table 3. Number of Women Scientists by Size of Agriculture Faculty

Size of College Faculty	No. of Land-grant Universities	Total No. of Women Scientists	Total No. of College Faculty	% of Women Scientists on Faculty
0-35	18	42	285	14.7
36-125	14	46	1,095	4.2
126-249	20	149	3,545	4.2
250+	18	277	6,144	4.5
Totals	70	514	11,069	4.6

By Size of College Faculty. Table 3 shows that the smallest colleges of agriculture (fewer than 36 faculty members) have the highest proportion of women agricultural scientists. In the 0-35 size category, 22 (52%) of the 42 agricultural scientists come from only two universities (University of the District of Columbia and University of Puerto Rico). Seven universities in the 0-35 size category are 1890 Land-grant institutions, and they have no women agricultural scientists on their faculties. Five other universities with no women agricultural scientists are University of Guam (0-35 size category), New Mexico State University, University of Rhode Island, University of Vermont (36-125 size category) and Utah State University (126-249 size category).

For colleges of agriculture with faculty numbers ranging from 36 to over 250, the proportion of women scientists varies little.

By Region. Table 4 shows a low presentation of women agricultural scientists in all geographic regions. The southern (3.1%) and central (3.9%) regions have the lowest representation of women scientists in colleges of agriculture. The southern region has the highest

Table 4. Number of Women Scientists in Colleges of Agriculture by Region

Region Members	No. of Land-grant Universities	Total No. of Women Scientists	Total No. of College Faculty	% of Women Scientists on Faculty
Eastern - CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT, WV	15	120	1,694	7.1
Central - IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI	13	142	3,551	3.9
Western & Islands - AK, AZ, CA, CO, GU, HI, ID, MT, NM, NV, OR, PR, UT, VI, WA, WY	18	139	2,219	6.2
Southern - AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VI	24	113	3,605	3.1
Totals	**70**	**514**	**11,069**	**4.6**

number of land-grant universities but the lowest representation of women agricultural scientists.

Precautions to Interpreting Findings

The focus of the study is directed toward women scientists in colleges of agriculture at U.S. land-grant universities; non-land-grant universities have not been studied. The research is not a comprehensive study of all women agricultural scientists with academic rank.

Because of the diverse nature of academic departments at land-grant universities, all women scientists in agricultural disciplines may not be located in colleges of agriculture. For example, an entomologist may be housed in the college of life sciences at one university and in the college of agriculture at another university.

Implications

This study provides needed answers to questions about the employment of women in the agricultural sciences. The initial findings indicate a need for the recruitment of qualified women scientists in agricultural colleges. The findings provide benchmark data that can be used for the on-going study of women agricultural scientists. The data can be helpful to agricultural college administrators for comparative analysis of universities and academic disciplines.

The study raises additional questions: How do the women perceive their positions as agricultural scientists in academia? Why did they enter an agricultural field? Do they have successful publishing and grant records? What is their level of involvement in professional organizations? Answers to these important questions will provide valuable information to university and college administrators for the recruitment of women into academic careers in the agricultural sciences. In addition, answers to these questions will provide a description of the role models now available to young women entering undergraduate and graduate programs in the agricultural sciences.

Reference List

1984-85 Directory of Professional Workers in State Agricultural Experiment Stations and other Cooperating State Institutions. (July 1984). United States Department of Agriculture, Agriculture Handbook Number 305, U.S. Government Printing Office, Washington, D.C.

Ekstrom, R.B. (1979). *Women Faculty: Development, Promotion, and Pay.* Princeton, NJ: Educational Testing Service. (ERIC Document Reproduction Service No. ED 209 963)

Hornig, L.S. (1984). "Professional Women in Transition." In Haas, V.B. & Perruci, C.C. (eds.) *Women in Scientific and Engineering Professions* (pp. 43-58), Ann Arbor: The University of Michigan Press.

Hyer, P., Eastman, A.H., Hrezo, M., & Malebranche, A. (1983). *The Status of Women Faculty at Virginia Polytechnic Institute and State University: A Five-year Progress Report.* Blacksburg, VA: Women's Network of Virginia Technical University. (ERIC Document Reproduction Service No. ED 234 707)

National Science Foundation (1982). *Academic Science/Engineering Employment Increased 3% between 1980 and 1981.* Washington, D.C.: Science Resources Studies Highlights. (ERIC Document Reproduction Service No. ED 219 247)

Vetter, B.M. (1984). "Changing Patterns of Recruitment and Employment." In Haas, V.B. & Perruci, C.C. (eds.) *Women in Scientific and Engineering Professions* (pp. 59-74). Ann Arbor: The University of Michigan Press.

Vetter, B.M. (1986). "The Last Two Decades." In *Science 86, 7* (6), 62-63.

Form and Content: Theses and Dissertations

Martha Davis and Duane Wolf

Abstract

Modifications of thesis requirements by graduate programs have led us to examine the purpose of a thesis and to propose changes for the agricultural sciences. Our objectives are to (1) make the thesis serve the student by developing skills in scientific communication and (2) aid the advisory committee in evaluating the student's performance. To accomplish these objectives in the agricultural sciences, a thesis should demonstrate the thinking and writing ability of the student as well as his/her research competence. The writing exercises should be similar to those the student will encounter professionally. Our thesis format would first present a thorough literature review based upon a given hypothesis. The second part would be a proposal outlining an original research problem. Following the research, the student would write one or more manuscripts styled as publishable articles. Reports on experiments or data not publishable, discussion of ideas, and commentary on scientific theories can also be included. The proposed format will give the advisory committee a realistic basis for evaluation and will allow the student to acquire practical training in scientific communication concurrent with the research.

Introduction

As a part of the requirements for a graduate degree, the thesis has remained essentially unchanged during a time when science has undergone dramatic changes (Porter et al., 1982). (The term thesis in this paper will refer to both master's theses and doctoral dissertations.) In a survey of ten graduate schools in the United States, Heiss (1970) reported that 88% of faculty members questioned approved the thesis as it was then required, 9% thought it should be modified, and less than 1% thought it should be dropped. The survey included faculty from disciplines in humanities and social sciences as well as natural sciences. However, several educators have questioned the validity of the requirement of a thesis for a graduate degree (Gilman, 1974; Tronsgard, 1963; Williams, 1971). Reid (1978) stated that the traditional thesis does not make a substantial contribution to graduate education because it fails to develop skills in scientific

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