FOREST PRODUCTS RESEARCH AT U.S. UNIVERSITIES IN 1988–1989

Stephen Smulski
University of Massachusetts
Amherst, MA 01003

Jim Bowyer
University of Minnesota
St. Paul, MN 55108

Richard Thomas
North Carolina State University
Raleigh, NC 27695

and

Ali Moslemi
University of Idaho
Moscow, ID 83843

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ABSTRACT

Professional staffing, research emphasis, and funding levels for forest products research conducted in 37 programs at 35 universities in the United States in academic year 1988–1989 are presented. General trends in academic forest products research for the period 1982 to 1989 are also described.

Keywords: Forest products research, university research, research funding.

INTRODUCTION

Herein are the results of a survey of forest products research conducted in 37 programs at 35 universities in the United States in academic year 1988–1989. Data on professional staffing, graduate student enrollment, and research emphasis and funding levels were collected by the authors via a mail questionnaire and telephone interviews. The purpose of the survey was to determine the nature and extent of forest products research being conducted in academic programs across the United States.

At the time of the survey, the authors were members of the National Planning Committee on Forest Products Research, a cooperative undertaking of the USDA Forest Service and the National Association of Professional Forestry Schools and Colleges. Chaired by the Director of the U.S. Forest Products Laboratory, and composed of the authors and representatives of the USDA, the NPC functions to identify research needs of the forest products community and to assist in coordinating the efforts of governmental, industrial, and academic forest products research programs. The committee meets in conjunction with the Forest Products Research Conference held annually at the FPL.

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TABLE 1. *Number of full-time equivalent faculty, support personnel, and graduate students in forest products programs in the Northeastern Region in academic year 1988–1989.*

Program	Faculty				Support personnel*	Students	
	Teaching	Research	Extension	Total		PhD	MS
U Maine—Chemical Engineering	6.5	6.5	0	13.0	6.0	5	12
U Maine—Wood Science	2.5	2.5	1.0	6.0	3.5	4	4
U Massachusetts	2.0	0.6	0.4	3.0	0.2	0	1
U New Hampshire	0.7	0.8	2.0	3.5	3.3	1	1
State U New York—Paper Science	6.0	10.0	0	16.0	10.0	13	16
State U New York—Wood Products	5.0	5.0	0	10.0	2.0	9	7
Pennsylvania State	2.0	2.0	1.0	5.0	3.3	2	2
U Vermont	0.5	0	0.5	1.0	0.5	0	0
West Virginia U	1.9	3.9	0.5	6.3	10.0	2	7
Total	27.1	31.3	5.4	63.8	38.8	36	50

* Includes nonfaculty professionals, technicians and secretarial personnel.

NORTHEASTERN REGION

Programs

Forest products research is conducted in 9 academic programs at 7 universities in the Northeastern region:

University of Maine at Orono
University of Massachusetts at Amherst
University of New Hampshire at Durham
State University of New York at Syracuse
Pennsylvania State University at State College
University of Vermont at Burlington
West Virginia University at Morgantown

At Maine, forest products research is carried out in both the wood science and chemical engineering (pulp and paper research) programs. Similarly, New York has separate wood products and paper science programs. Forest products programs at New Hampshire and Vermont are essentially teaching and extension programs in which applied research is occasionally conducted.

Staffing

Full-time equivalent faculty and support personnel and graduate student enrollments at each program are summarized in Table 1. Forty-nine percent of faculty members' time was committed to research, 43% to teaching, and 8% to extension in the Northeast. Most graduate students received financial support in the form of a teaching or research assistantship. Only 11% of Ph.D. students and 6% of Master's students were not financially supported in any way.

Research

Pulp and paper dominated the region's forest products research effort. Of 100 active projects, 31% were in pulp and paper. Solid wood products (11%), reconstituted wood (8%), basic research (8%), energy related (7%), and economics/marketing (7%) rounded out the region's research emphases (Table 2). In reflection of the mixed composition of the Northeast's forests, hardwood projects outnum-

TABLE 2. *Number of research projects by emphasis and species group for the Northeastern, North Central, Southern, and Western regions in academic year 1988–1989.*

	Northeastern	North Central	Southern	Western	Total
Products	55	48	82	76	261
Solid wood products	11	11	26	18	66
Reconstituted wood	8	27	18	24	77
Pulp and paper	31	7	19	16	73
Adhesives	2	2	12	10	26
Plywood	0	0	5	5	10
Residues	3	1	2	3	9
	21	24	103	37	185
Processes	5	0	14	8	27
Milling					
Preservation/biodeterioration	6	13	35	14	68
Chemistry	6	8	40	7	61
Drying	4	2	12	8	26
Finishing	0	1	2	0	3
Purposes	24	18	71	43	156
Energy related	7	4	2	9	22
Environmental	2	2	7	4	15
Basic research	8	6	31	21	66
Economics/marketing	7	6	31	9	53
Total	100	90	256	156	602
Species group					
Hardwood	54	45	90	1	190
Softwood	21	24	124	155	324
Total	75*	69*	214*	156*	514*

* Species group not specified for each project reported.

bered softwood projects by 2.5 to 1. Seventy-one percent of the $3.8 million spent on forest products research in the region came from outside grants and contracts (Table 3). The balance was provided by the parent institution or state (21%) or through McIntire-Stennis or other formula funds (8%).

NORTH CENTRAL REGION

Programs

Ten academic programs at 9 universities conduct forest products research in the North Central region:

University of Illinois at Urbana
Iowa State University at Ames
Michigan State University at East Lansing
Michigan Technological University at Houghton
University of Minnesota at St. Paul and Duluth
University of Missouri at Columbia
Purdue University at West Lafayette, Indiana
Southern Illinois University at Carbondale
University of Wisconsin at Madison

TABLE 3. *Research funding by sources for the Northeastern, North Central, Southern and Western regions in academic year 1988–1989.*

Region	State ($)	McIntire-Stennis and other formula funds ($)	Grants and contracts ($)	Total ($)
Northeastern*	775,933	325,774	2,671,200	3,772,907
North Central**	1,217,483	353,883	1,994,333	3,565,699
Southern	4,882,060	915,262	3,116,619	8,913,941
Western	2,431,199	283,029	2,925,649	5,639,877
Total	9,306,675	1,877,948	10,707,801	21,892,424

* Data for 7 of 9 respondents.
** Data for 8 of 10 respondents.

Staffing

Forest products faculty members in the region allocated 56% of their time to research, 28% to teaching, and 17% to extension activities (Table 4). North Central programs enrolled the highest percentage of unsupported graduate students. Thirty-eight percent of doctoral students and 25% of Master's students received no financial support.

Research

Judged on the number of active projects, forest products research in the region focused on reconstituted wood (30%), preservation/biodeterioration (14%), solid wood products (12%), and chemistry (9%) (Table 2). Nearly two-thirds of all projects involved hardwoods. Of the $3.6 million used to support forest products research, 56% derived from grants and contracts, 34% was provided by the parent institution or state, and 10% came from McIntire-Stennis or other formula funds (Table 3).

SOUTHERN REGION

Survey responses were received from 10 programs engaged in forest products research in the Southern region:

TABLE 4. *Number of full-time equivalent faculty, support personnel, and graduate students in forest products programs in the North Central Region in academic year 1988–1989.*

Program	Faculty				Support personnel*	Students	
	Teaching	Research	Extension	Total		PhD	MS
U Illinois	0.9	1.1	0	2.0	1.5	0	4
Iowa State U	1.2	0.9	0.9	3.0	0.7	2	2
Michigan State U	0.9	1.4	0.7	3.0	2.0	4	6
Michigan Tech U	4.0	8.0	0	12.0	8.0	8	4
U Minnesota–St. Paul	3.3	7.6	4.6	15.5	7.3	11	4
U Minnesota–Duluth	0	5.0	0	5.0	3.0	0	0
U Missouri	1.1	0.5	0.3	1.9	0	1	0
Purdue U	1.0	2.2	1.0	4.2	3.3	1	1
Southern Illinois U	0.5	0.5	0	1.0	4.0	0	2
U Wisconsin	1.0	1.0	1.0	3.0	2.0	2	1
Total	13.9	28.2	8.5	50.6	31.8	29	24

* Includes nonfaculty professionals, technicians and secretarial personnel.

TABLE 5. *Number of full-time equivalent faculty, support personnel, and graduate students in forest products programs in the Southern Region in academic year 1988–1989.*

Program	Faculty				Support personnel*	Students	
	Teaching	Research	Extension	Total		PhD	MS
Auburn U	1.5	2.3	1.3	5.0	5.0	1	2
Clemson U	2.2	3.4	0.2	5.8	2.7	2	5
U Georgia	0.5	2.5	0	3.0	2.0	0	0
U Kentucky	1.0	1.8	1.4	4.2	3.6	0	0
Louisiana State U	1.3	1.7	1.0	4.0	3.7	2	1
Mississippi State U	1.6	17.6	0	19.2	50.5	6	13
North Carolina State U	8.1	5.9	6.0	20.0	23.0	12	10
U Tennessee	1.1	1.9	1.0	4.0	7.8	1	3
Texas A&M U	1.5	1.0	1.0	3.5	6.0	4	1
Virginia Tech	3.9	6.5	4.4	14.8	23.0	27	23
Total	22.7	44.7	16.3	83.5	127.3	55	58

* Includes nonfaculty professionals, technicians and secretarial personnel.

Auburn University at Auburn, Alabama
Clemson University at Clemson, South Carolina
University of Georgia at Athens
University of Kentucky at Lexington
Louisiana State University at Baton Rouge
Mississippi State University at Mississippi State
North Carolina State University at Raleigh
University of Tennessee at Knoxville
Texas A&M University at College Station
Virginia Tech at Blacksburg

Limited research in forest products is also conducted at the University of Florida at Gainesville, at Louisiana Technical University, Ruston, LA, and at Stephen F. Austin State University in Nacogdoches, TX. The Institute for Paper Science and Technology, Inc. in Atlanta, GA, conducts pulp and paper research.

Staffing

Fifty-four percent of faculty members' time is devoted to research in the region, with the balance in teaching (27%) and extension (19%) (Table 5). Virtually all Ph.D. students (93%) and Master's students (95%) in Southern programs received financial support.

Research

Active projects in chemistry (16%), preservation/biodeterioration (14%), basic research (12%), economics/marketing (12%), and solid wood products (10%) comprised the bulk of the Southern research effort (Table 2). Surprisingly few projects in pulp and paper (7%) were in progress, given the economic might of the region's pulp and paper industry. About 1.4 times as many projects involved softwoods than involved hardwoods (Table 2). Parent institutions or states supplied 55% of the $8.9 million spent on forest products research in the region. Grants and contracts accounted for 35%, and McIntire-Stennis or other formula funds for 10% (Table 3).

TABLE 6. *Number of full-time equivalent faculty, support personnel, and graduate students in forest products programs in the Western Region in academic year 1988–1989.*

Program	Faculty				Support personnel*	Students	
	Teaching	Research	Extension	Total		PhD	MS
Northern Arizona U	0.8	0.2	0	1.0	0	0	2
U California	1.2	4.1	0	5.3	14.8	16	1
U Colorado	2.1	1.3	0.1	3.5	0.2	3	5
U Idaho	2.7	4.5	0.8	8.0	2.0	8	8
U Montana	0.5	0.2	0	0.7	0	1	0
Oregon State U	2.4	12.7	0.9	16.0	20.5	16	15
U Washington	9.0	2.0	0	11.0	7.0	21	14
Washington State U	1.2	2.8	0	4.0	8.5	2	4
Total	19.9	27.8	1.8	49.5	53.0	67	49

* Includes nonfaculty professionals, technicians and secretarial personnel.

WESTERN REGION

Eight academic programs in the Western region perform forest products research:

Northern Arizona University at Flagstaff
University of California at Berkeley
University of Colorado at Fort Collins
University of Idaho at Moscow
University of Montana at Missoula
Oregon State University at Corvallis
University of Washington at Seattle
Washington State University at Pullman

Forest products at Montana is essentially a teaching and extension program in which some research is conducted. At Arizona, graduate students receive an M.B.A. degree with a wood products option.

Staffing

The bulk of the region's faculty members' time was dedicated to research (56%) and teaching (40%) (Table 6). Extension activities accounted for less than 4% of faculty effort. As in the North Central region, a significant percentage of Ph.D. (30%) and Master's (22%) students received no financial assistance.

Research

Fifteen percent of 156 active projects in the West centered on reconstituted wood. Investigations in the region also concerned basic research (14%), solid wood products (12%), pulp and paper (10%), and preservation/biodeterioration (9%) (Table 2). Virtually all research in the region involves softwoods. Funds from grants and contracts (52%) and the parent institution or state (43%) fueled the region's forest products research effort (Table 3). McIntire-Stennis and other formula funds amounted to less than 5% of the $5.6 million committed to research.

GENERAL REMARKS

Programs

With some exceptions, forest products and wood science and technology academic units at U.S. universities exist as a program, major, or option within a larger forestry department. Those contacted in this survey are listed in the Society of Wood Science and Technology's *Directory of North American Schools Offering Baccalaureate and Graduate Programs Of Study In Wood Science And Technology.* That relevant research is also conducted in nonforest products programs and at institutions not included in this survey is acknowledged.

Staffing

While some faculty members held teaching- or research-only appointments, most had joint teaching/research assignments, with 10% to 20% more time committed to the latter. Those at land grant institutions often had a small extension obligation as well. Most programs reported that secretarial and technical support staffing levels were sufficient to meet programmatic needs. Though corroborating historical data are incomplete, the consensus opinion was that graduate student enrollment in forest products is declining.

Research funding

Dollar amounts for research funding by source presented in Table 3 should be considered only as approximations. Many respondents indicated that in-house accounting procedures did not facilitate the reporting of exact figures. In a few cases, funding data were not available.

Research laboratory space

Though laboratory space devoted to forest products research varied widely among programs, most indicated that they possessed sufficient space in-house to carry out their projects. Few programs had field facilities dedicated to forest products research.

Research capabilities

Research capabilities varied widely among programs, reflecting differences in laboratory equipment, in-house fabrication abilities, number of technical support personnel, faculty expertise, and regional problems and priorities. Virtually all programs reported in-house light microscopy, mechanical testing, hot pressing, physics, and moisture conditioning facilities. A large number had sawmilling, kiln-drying, machining, nondestructive testing, chemistry, and wood treating and biodeterioration facilities as well. Only a few programs possessed the specialized equipment for fatigue testing, finishing research, and plywood manufacture. Most programs indicated that additional instrumentation and facilities were accessible elsewhere on campus. Access to main frame computers was generally excellent; virtually all faculty had a personal computer at their disposal.

TRENDS IN FOREST PRODUCTS RESEARCH: 1982 TO 1989

A similar survey of forest products research was conducted by the forerunner of the NPC in 1982 (Wood and Fiber Science, 1985, 17(4):568–584). Included among the 40 programs with relevant research activity in that effort were all 37 of those that responded to the present survey. Because of nonresponses and differences in the way some raw data were reported, the results of the two surveys do not exactly correspond. However, comparison of the two is useful in identifying general trends in forest products research over the last seven years.

Survey data indicate that 47 persons joined forest products faculties since 1982 (Table 7). Based on the authors' personal knowledge, the statistic is suspect, and was attributed in part to inconsistencies in the way research-only faculty and nonfaculty professionals were counted in each survey. The authors believe that faculty numbers have indeed increased, perhaps by 10 to 20, given the significant growth of some programs over the past 7 years (Virginia Tech, West Virginia University, and University of Minnesota at St.. Paul, for example).

Total funding for forest products research increased from $11.9 million in 1982 to $21.9 million in 1989. After 1982 figures were adjusted upwards at an assumed 4% annual inflation rate for each of 7 years, forest products research funding showed a real growth of about $6 million by 1989. Significant shifts in the source of funds for forest products research have occurred since 1982. The contribution made by McIntire-Stennis and other formula funds in 1989 was less than half of what it was in 1982. Since 1982 funding from states or parent institutions has significantly outpaced inflation, resulting in substantial real increases in their share of financial support of research. Salaries paid to newly hired faculty and associated "start-up" monies likely accounted for a large part of this. The most dramatic real increases in research funding came in the form of outside grants and contracts. Outside funds, unadjusted for inflation, for the North Central, Southern, and Western regions totaled $1.6 million in 1982. By 1989 that figure had more than quintupled to over $8 million. Fee-for-service arrangements with industry (especially in pulp and paper), and the USDA Competitive Grants Program in Improved Utilization of Wood and Fiber (fiscal years 1985–1988, 1990) likely accounted for the enormous rise. The number of active research projects rose as well. Regional research emphases changed little since 1982. For the nation as a whole, more projects in economics/marketing, preservation/biodeterioration, and reconstituted wood, and fewer in wood energy, environmental effects, and wood drying were underway in 1989 than in 1982.

SUMMARY

In academic year 1988–1989, 37 academic units at 35 universities in the United States had active forest products research programs (Table 8). Faculty size ranged from 1 to 20, with 247 total faculty members nationwide. One hundred eighty-seven Ph.D. students and 181 Master's students were enrolled in U.S. forest products programs in 1988–1989.

Research emphases varied among programs, and depended upon owned and available equipment, technical support personnel, faculty expertise, and regional problems and priorities. Nationwide, forest products research focused on recon-

TABLE 7. *Selected statistics for forest products research at academic units in the United States in academic years 1981–1982 and 1988–1989.*

	Northeastern		North Central		Southern		Western		Total	
	1982	1989	1982	1989	1982	1989	1982	1989	1982	1989
Programs	9	9	11	10	14	10	6	8	40	37
Faculty (FTE)*	47.5	63.8	18.8	50.6	70.6	83.5	63.7	49.5	200.6	247.4
Research funding ($1,000)	2,378	3,773**	940	3,566***	4,378	8,914	4,258	5,640	11,953	21,892
State	n.a.	755	442	1,212	2,101	4,903	1,703	2,425	n.a.	9,295
Formula	n.a.	339	432	357	1,751	891	1,575	282	n.a.	1,869
Grants and contracts	n.a.	2,679	66	1,997	525	3,120	979	2,933	n.a.	10,729
Projects	84	100	n.a.	90	153	256	n.a.	156	n.a.	602

Notes: n.a. = not available; sum of figures may not equal total due to rounding.
* Includes teaching, research and extension faculty. See explanatory comments in text.
** Data for 7 of 9 respondents.
*** Data for 8 of 10 respondents.

TABLE 8. *Summary of forest products research at academic units in the United States in academic year 1988–1989.*

	Northeastern	North Central	Southern	Western	Total
Programs	9	10	10	8	37
Faculty (FTE)*	63.8	50.6	83.5	49.5	247.4
Support personnel (FTE)	38.8	46.8	127.3	53.0	265.9
Students					
PhD	36	29	55	67	187
MS	50	24	58	49	181
Research funding ($)	3,772,907**	3,565,699***	8,913,941	5,639,377	21,892,424
Projects	100	90	256	156	602

* Includes teaching, research and extension faculty.
** Data for 7 of 9 respondents.
*** Data for 8 of 10 respondents.

stituted wood, preservation/biodeterioration, solid wood products, chemistry, basic research, pulp and paper, and economics/marketing.

Funding for forest products research totaled $21.9 million in 1988–1989. Outside grants and contracts were the single largest source of research monies. States and parent institutions also provided significant financial resources for research. McIntire-Stennis and other formula funds made a minor contribution.