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AN EVALUATION OF RESEARCH NEEDS FOR AGRICULTURAL ECONOMISTS

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An attempt will be made to indicate: (1) the future needs for social scientists, in general, and agricultural economists, in particular, for research in the land-grant institutions and the U.S. Department of Agriculture, (2) the location of these needs for agricultural economists, and (3) the types of research activities that are gaining in relative importance in the social sciences. The quantitative and qualitative information presented should provide some guidance in locating professional research workers where they are most needed.

NEED FOR SOCIAL SCIENTISTS BY TYPE OF RESEARCH ACTIVITY

Let us examine the present and prospective allocation of social scientists among the various areas of research activity, as well as the relative importance of these areas. The source of data for this section is "A National Program of Research for Agriculture," a 1966 report of a long-range study sponsored jointly by the Association of State Universities and Land-Grant Colleges and the U.S. Department of Agriculture.

One of the objectives of the task force conducting the study, was to define the goals, purposes, and scope of agricultural and forestry research to serve the future needs and values of the American people at the local, national, and international level.

The task force, also, developed a three-dimensional classification scheme. All USDA-SAES research was classified and inventoried: (1) by activity, which shows the goal and objective to which the research contributes; (2) by commodity or resource, which indicates the commodity or resource that benefits from the research investigation; and (3) by field of science, which shows the scientific disciplines (in most cases several) involved in the investigation. Thus, the report provides quantitative evidence of future needs for social scientists in various types of research activity.

For the fiscal year 1965, 662 scientist man-years were employed in social science research at the state agricultural experiment stations and 553 in the USDA, or a total of 1,195 man-years. The report estimated 300 scientist man-years in industry in the area of social science. The social science category included both the social and behavioral sciences. The report did not give a breakdown on agricultural economists, rural sociologists, and other social and behavioral scientists.

The social scientist man-years in 1965 in the USDA-SAES are distributed by goals and problem areas in Table 1. This distribution is an estimate based on the author's judgment. For example, under Goal III, in the problem area, Farm Adjustment and Management, it was very easy to put all 137 scientist man-years in the social science category. In other problem areas, such as those under Goal V, Efficiency in the Marketing System, an estimate was required. The individual estimates were forced to the total of 1,195 given in the report.

The report made recommendations for scientist man-years by goals and problem areas for fiscal years 1972 and 1977. The same procedures used for estimation of social scientist man-years for fiscal year 1965 were used by the task force to obtain an estimate of SMY's in the social and behavioral sciences for 1972 and 1977. These estimates and percentage increases are also shown in Table 1.

The recommended social scientist man-years for fiscal year 1972 were 1,993 and for fiscal year 1977, 2,524, compared to 1,195 SMY's in fiscal year 1965. This represents a 67 percent increase in SMY's for

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TABLE 3. PROJECTED GROWTH IN FULL-TIME EQUIVALENT RESEARCH PERSONNEL IN THE DEPARTMENTS OF AGRICULTURAL ECONOMICS, STATE AGRICULTURAL EXPERIMENT STATIONS BY FARM PRODUCTION REGIONS[a]

Region b/	1967		1974		Growth, 1967-74		
	Number	Number per state	Number	Number per state	Number	Percent	Rank
Northeast	96.7	8.8	126.0	11.5	29.3	30.3	2
Appalachian	88.2	17.6	97.6	19.5	9.4	10.7	10
Southeast	72.8	18.2	81.9	20.5	9.1	12.5	5
Delta States	51.0	17.0	57.3	19.1	6.3	12.4	6
Corn Belt	114.0	22.8	127.1	25.4	13.1	11.5	8
Lake States	62.3	20.8	69.6	23.2	7.3	11.7	7
Northern Plains	49.7	12.4	54.8	13.7	5.1	10.3	9
Southern Plains	37.5	18.8	44.7	22.4	7.2	19.2	3
Mountain	66.4	8.3	75.2	9.4	8.8	13.3	4
Pacific	56.4	18.8	75.3	25.1	18.9	33.5	1
U. S.	695.0	14.5	809.5	16.9	114.5	16.5	

a/ Source: Peterson, W. L., "The Allocation of Research, Teaching and Extension Personnel in U. S. Colleges of Agriculture and Experiment Stations." Accepted for publication, American Journal of Agricultural Economics

b/ States in Farm Production Regions:

Northeast: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont

Appalachian: Kentucky, North Carolina, Tennessee, Virginia, West Virginia

Southeast: Alabama, Florida, Georgia, South Carolina

Delta: Arkansas, Louisiana, Mississippi

Corn Belt: Illinois, Indiana, Iowa, Missouri, Ohio

Lake: Michigan, Minnesota, Wisconsin

Northern Plains: Kansas, Nebraska, North Dakota, South Dakota

Southern Plains: Oklahoma, Texas

Mountain: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming

Pacific: California, Oregon, Washington

1972 and a 111 percent increase for 1977. The increases for total USDA-SAES SMY's were 38 percent in 1972 and 76 percent in 1977. The percentage increase in social scientists is approximately three-fourths greater than the increase for the total program of agricultural research.

What now follows is a goal by goal consideration of the increase in social science compared to the total agricultural research program. Increases of 125 and 246 percent, respectively, for fiscal years 1972 and 1977 are called for in Goal I, Resource Conservation and Use. This compares with increases of 31 and 75 percent for the total agricultural scientist input in resource conservation. The largest percentage increase occurs in the problem area, Alternative Uses of Land, but the greatest number of SMY's occurs in the problem area, Economic and Legal Problems in Management and Watersheds.

Goal III, Efficient Production of Farm and Forest Products, shows an increase in SMY's of 34 percent and 56 percent, respectively, for fiscal years 1972 and 1977. Increases for the corresponding fiscal years for the total agricultural research effort for efficient production are 22 and 53 percent. The largest increase in absolute number of SMY's occurs in the Farm Adjustment and Management area. But, even here, the increase is not a much greater percentage than that of the total research effort in respect to this goal. One might conclude that farm management does not represent a major growth area in the profession of agricultural economics.

Goal V, Efficiency in the Marketing System, shows increases of SMY's of 21 percent and 56 percent, respectively, for fiscal years 1972 and 1977. This compares with increases of 21 and 55 percent for the same years for the total agricultural research effort for marketing. This similarity is to be expected since such a large proportion of the present work is done by social scientists. The problem area with the largest percentage increase in both 1972 and 1977 is Competitive Interrelationships in Agriculture. There was also a sizable increase in the problem area of Farmer Bargaining Power. Since the percentage increase for total work in this area of marketing is smaller than the percentage increase in agricultural research, in general, again the conclusion may be drawn that efficiency in the marketing system may not be a growth area in agricultural economics.

Goal VI, Expanding Export Markets, received increases of 171 and 239 percent, respectively, in SMY's for fiscal years 1972 and 1977. This was less than the increase of 267 and 359 percent, respectively, in SMY's for the total agricultural research effort for 1972 and 1977. The major increase in the total effort was in the problem area, Technical Assistance to Developing Countries. However, this was not included in the tabulations of the current domestic program, and since the estimating procedure was so heavily based upon the forcing of the current program to the published totals, this category was not considered. The two problem areas listed in Table 1, thus, are the two problem areas in the analysis for this goal, and would be exactly equal to that for the total agricultural research effort. A substantial percentage increase is shown for Evaluation of Food Aid Programs largely because there was such a small base in 1965. A sizable number of workers would be involved in the problem area, Expansion of Foreign Markets for U.S. Farm Products.

Goal VII, Consumer Health, Nutritition, and Well Being, involves only a few social science researchers. The increases in SMY's are 11 and 30 percent, respectively, for fiscal years 1972 and 1977. The total agricultural research increases for this goal are 59 and 90 percent, respectively, for 1972 and 1977.

Goal VIII, Raise the Level of Living of Rural People, has a percentage increase in SMY's of 135 and 167 percent, respectively, for fiscal years 1972 and 1977. This category represents the largest increase in absolute number of SMY's of any of the goals for social scientists. It contains problem areas that utilize various categories of behavioral scientists, including sociologists, communications workers, and psychologists, as well as home economists and agricultural economists. The largest percentage increase in a problem area is Causes and Remedies of Poverty among Rural People. There is also a sizable percentage increase in the SMY's assigned to Improvement of Economic Potential of Rural Youth and Adults. As the percentage increase in this goal is almost double that of social science, in general, this problem area appears to be a growth area for social scientists and agricultural economists.

Goal IX, Improve Community Service and Environment, shows a percentage increase in SMY's of 120 percent and 205 percent, respectively, for fiscal years 1972 and 1977. The 205 percent for fiscal year 1977 represents the largest absolute increase in SMY's for any of the goals. Large increases are recommended for the problem areas, Improving Income Opportunities in Rural Communities and Improving Rural Community Institutions and Services. Again, this goal may be considered to be one of the growth areas of social science research and agricultural economics research.

By way of summary and in a slightly different perspective, a total increase of 1,329 SMY's was called for by 1977. Of this number of SMY's 360 were in Goal VIII, Level of Living of Rural People (Table 2). Goal V, Efficiency in Marketing, would require an increase of 302 SMY's. The three goals, VIII, V, and

TABLE 2. ABSOLUTE AND RELATIVE CHANGES IN NEEDS FOR SOCIAL SCIENTISTS, 1965 to 1977

Goal	Increase in SMY's	
	Number	Percent
VIII. Level of Living - Rural People	360	27.1
V. Efficiency in Marketing	302	22.7
IX. Community Services and Environment	269	20.2
I. Resource Conservation and Use	160	12.1
VI. Expand Export Markets	141	10.6
III. Efficient Production	89	6.7
VII. Consumer Health, Nutrition, etc.	8	.6
Total	1,329	100.0

IX, Level of Living, Efficiency in Marketing, and Community Services and Environment, accounted for over 70 percent of the increases in SMY's by 1977. Even though Goal VI, Expand Export Markets, was recommended to increase 2,400 percent by 1977, an increase of only 141 SMY's or 10.6 percent of the total increase in SMY's would be required.

Within Goal VIII, Level of Living, the problem area, Causes and Remedies of Poverty Among Rural People, has the largest increase (89 SMY's). Next is the problem area, Improvement of Economic Potential of Rural Youth and Adults (62 SMY's).

Within Goal V, Efficiency in Marketing, the problem area with the largest increase is Supply, Demand and Price Analysis (66 SMY's). The problem area with the second largest increase is Competitive Relationships in Agriculture (58 SMY's).

Under Goal VIII, Community Services and Environment, the problem area, Improved Rural Income for Rural Communities, has the largest increase (140 SMY's).

Although the increase in SMY's for Goal III, Efficient Production, is relatively low and constitutes a small proportion of the total increase in SMY's, an increase of 63 SMY's is recommended for the problem area, Farm Adjustment and Management.

The conclusion may be drawn that the traditional areas of farm management and marketing will not grow as rapidly as some of the newer areas. However, due to this sizable starting base, these problem areas will offer opportunities for employment of additional workers.

NEEDS FOR AGRICULTURAL ECONOMISTS BY GEOGRAPHIC REGIONS

This section deals with the geographic distribution of current (1967) and projected number of agricultural economists engaged in research at the agricultural experiment stations.

The basic source of data for this section is a study by Peterson.[1] Peterson made a "head count" of all research and teaching personnel in the departments of agricultural economics at the land-grant colleges. The count was made at ten-year intervals but also includes the year 1967. Peterson used regression analysis to measure the trends in numbers of personnel and to project the number for the year 1974. The data was adjusted to reflect the full-time equivalent research component, and the adjustment was made by

[1] Peterson, W.L., "The Allocation of Research, Teaching, and Extension Personnel in U.S. Colleges of Agriculture and Experiment Stations." Accepted for publication in American Journal of Agricultural Economics.

multiplying the total number of research and teaching personnel by the average percentage of time that each professional devoted to research in the 1946-47 period. Two assumptions are involved in the adjustment method. First, the average percentage of time devoted to all research by the station was assumed to be the average for the department of agricultural economics. Second, the average for the 1964-67 period was assumed to hold true for 1974. The fact that annual averages during this period were fairly uniform supports the assumption that the value would hold true for the future.

The Midwest (Corn Belt and Lake States) currently has the largest number of workers per state, about 22, and approximately one-fourth of the agricultural economists in research are located in this region (Table 3). The South (Appalachian, Delta States, Southeast, and Southern Plains), with an average of about 18 research agricultural economists per state, has about one-third of the agricultural economics researchers.

An increase of 114.5 agricultural economics researchers in the U.S. is projected for 1974. The percentage increase between 1967 and 1974 is greater for the Pacific, Northeast, and Southern Plains regions than for the total U.S. In the South, the Southern Plains ranks first in percentage increase, the Delta States second, and the Southeast third. The average number of workers per state in 1974 in the Southern region will range from 19 to 22. The Corn Belt and Pacific regions will have an average of about 25 workers per state in 1974.

The region projected to have the largest increase in agricultural economics researchers by 1974 is the Northeast. The Pacific region ranks second in increase in number of researchers and the Corn Belt third. The regions in the South will increase by 7 to 9 workers by 1974. A total increase of 32 research economists is projected for the South by 1974. This is slightly less than one-third of the total increase of researchers in the U.S.

A somewhat different perspective of the geographic distribution of the increase in agricultural economists is provided by a comparison of the growth in number of agricultural economists per state between 1967 and 1974. The increase in number of workers per state in the various regions will be: the Pacific Region, 6.3; the Southern Plains, 3.6; the Northeast, 2.7; the Corn Belt, 2.6; the Lake States, 2.4; the Southeast, 2.3; the Delta States, 2.1; Appalachia, 1.9; the Northern Plains, 1.3; and the Mountain States, 1.1. The rankings by growth in the average number of agricultural economists per state are somewhat different from those for the growth in total number for each region. For example, the Corn Belt ranks fourth in growth in number per state, but ranks eighth in percentage increase for the region, and the Mountain region ranks tenth in growth per state and fourth in percentage increase for the region.

An implication of this analysis is that opportunities for placement of graduate students will be the greatest in the Pacific, Northeast, and Southern Plains regions and the lowest in the Appalachian, Northern Plains, and Mountain regions on a department by department basis.

DEMAND AND SUPPLY

One can conceptualize a single demand curve for agricultural economists. The number of agricultural economists now actually employed by the USDA and the state agricultural experiment stations would represent a given point on the demand curve. Some index or average price would be required for this conceptualization. In reality, there are many demand curves, perhaps, one for each state agricultural experiment station and each USDA agency or location. In addition, the general demand curve could be disaggregated by degrees of experience represented by the ranks of professorship or USDA grades. However, we will deal with the aggregate national demand curve in this paper. The present situation could be considered to be Point A in Figure 1 on the existing demand and supply curves, D_1S_1.

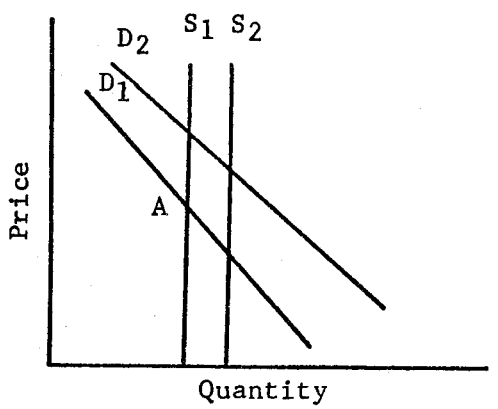

FIGURE 1. CHANGES IN DEMAND FOR AND SUPPLY OF AGRICULTURAL ECONOMISTS

A change in supply to, say, S_2 without a change in demand would move the price down. With an increase in demand, D_2, and without a change in supply the price would rise. With changes in both supply and demand the price may be either above, the same, or below the present situation depending upon the magnitude of the changes and the shape of the new curve compared to the old.

TABLE 1. CURRENT AND RECOMMENDED SOCIAL SCIENTIST MAN YEARS ON GOALS AND PROBLEM AREAS ESTIMATED FROM A NATIONAL PROGRAM OF RESEARCH FOR AGRICULTURE[a]

Goal and Problem Areas	Social Scientist-Man-Years				
		Recommended for			
	FY 1965	FY 1972		FY 1977	
		SMY	Percent Incr.	SMY	Percent Incr.
I. Resource conservation and use					
Alternative uses of land	11	40	264	40	264
Economic and legal problems in management and watersheds	50	100	100	175	250
Weather effects, probabilities, and agricultural decision making	4	6	50	10	150
Total	65	146	125	225	246
III. Efficient production of farm and forestry products					
Economics of timber production	18	30	67	40	122
Systems analysis in production of fruits and vegetables	1	2	100	2	100
Systems analysis in production of field crops	2	4	100	5	150
Farm adjustment and management	137	175	28	200	46
Total	158	211	34	247	56
V. Efficiency in the marketing system					
Improvement of grades and standards	39	50	28	64	64
Development of markets and more efficient marketing of timber products	26	30	15	44	69
Physical and economic efficiency in marketing fruits and vegetables	49	52	6	70	42
Physical and economic efficiency in marketing field crops	47	47	-	57	21
Physical and economic efficiency in marketing livestock	84	96	14	112	33
Supply, demand, and price analysis	99	120	21	165	67
Competitive interrelationships in agriculture	32	75	134	90	181
Development of domestic markets for farm products	71	71	-	100	41
Marketing firm and system efficiency	72	72	-	90	25
Farmer bargaining power	21	40	90	50	138
Total	540	653	21	842	56
VI. Expand export markets					
Expansion of foreign markets for U. S. farm products	57	125	119	150	154
Evaluation of food aid programs	2	35	1650	50	2400
Total	59	160	171	200	239
VII. Consumer health, nutrition and well-being					
Food choices, habits, and consumption	27	30	11	35	30
Total	27	30	11	35	30
VIII. Raise the level of living of rural people					
Housing needs of rural families	24	50	108	60	150
Family decision making and financial management	26	55	112	70	169
Causes and remedies of poverty among rural people	11	100	809	100	809
Improvement of economic potential of rural youth and adults	13	75	477	75	477
Communication processes in rural life	25	35	40	45	80
Individual and family adjustment to change	20	50	150	60	200
Structural changes in agriculture	60	90	50	105	75
Government programs to balance farm output and market demand	36	50	39	60	67
Total	215	505	135	575	167
IX. Improve community services and environment					
Forest land recreation	2	8	300	10	400
Multiple use potential of forest land and evaluation of forestry programs	13	30	131	60	362
Improved income opportunities in rural communities	60	150	150	200	233
Improvement of rural community institutions and services	56	100	79	130	132
Total	131	288	120	400	205
Grand Total	1195	1993	67	2524	111

a/ National Program of Research for Agriculture, October 1966.

It appears impossible to estimate the demand curve for research workers. Due to the numerous and erratic historical shifts in supply and demand, empirical measurement of demand is hindered by identification problems. Also, there are problems of definition of supply. Should supply increase greatly, people who might normally be called economists could well move into statistical or other categories. With a significant shortage of economists, people who would normally not be called economists would move into economist jobs.

In spite of the difficulties discussed above, it may be interesting and useful to consider the recommendations in the National Program report as an estimate of current and future demand for social scientists. The recommendations were made in light of the possible number of new scientists trained and the needs for research in various disciplines. Thus, they probably represent some equilibrium on a new demand curve. The magnitude of the increase appears sufficiently large not to represent a movement downward to a lower price on the current demand curve.

Social scientists will be needed by the USDA and the state agricultural experiment stations not only for new programs but also for replacements to fill openings due to resignations, retirement, and death. The national study estimated that for agricultural research, an increase of 14 percent of the present SMY's would be required for replacements by 1972 and 28 percent by 1977.

A total of 965 social scientist man-years would be required by 1972. New and expanded programs would require 798 SMY's (Table 1) and replacements would require 167 SMY's. Of the total 1,664 SMY's required by 1977, 1,329 SMY's would be for new and expanded programs and 335 SMY's for replacements.

It is difficult to obtain an estimate of the number of social scientists trained. As mentioned above, there are problems of determining who is a social scientist. However, the National Program report quoted an Office of Education study which estimated that in 1975 3,500 Ph.D.'s would be earned in all social science areas. Social science graduate students at state agricultural experiment stations in 1965, number 1,792 according to the report. A large number of these students are foreign students and will not become a part of the available manpower pool in the U.S. Also the group includes both master's and doctor's degree candidates. If we assume that an average of two years is required for completion of the degree and remove foreign students from potential supply, an estimated 700 students would be available annually from the 1,792 students.

The annual requirement for new programs and replacements in the state agricultural experiment stations and the USDA is 138 SMY's between 1965 and 1972 and 139 SMY's between 1965 and 1977. Thus, about one-fifth of the social science degree recipients will be required for agricultural research in these agencies. Despite the sizable requirements for social science degree holders in teaching, extension, industry, and other government agencies, it seems possible to obtain something more than one-fifth of the degree recipients for agricultural research if both master's and doctor's degree holders are included. If only doctor's degree holders are included, the market might be tighter.

Peterson's data, and our analysis of them, are not viewed as an estimate of demand. The basic "head count" data represented an interaction between supply and demand. The projected increase in agricultural economics researchers by 1974 may be a shift in the demand curve or a movement along the same demand curve with equilibrium at a lower price. However, since salaries of agricultural research economists have been increasing, the significant increase in number of workers probably reflects a shift in the demand curve. Even if it does represent a shift in the demand curve, nothing definitive can be said about price since the projections represent supply and demand interactions.

This exploration into the interaction of supply and demand is far from satisfying. The data are not precise, the analysis crude, and the results inconclusive. It is difficult to tell what will be the trend in price for agricultural economists and other social science workers. From the evidence presented and the analysis made, the price may rise, drop, or remain the same.

GENERAL COMMENTS

The National Program report which provided much of the data for this paper was published in 1966. Although it is now 1969, the program has not yet had the desired effect of obtaining a substantial increase in appropriations for agricultural research.

Poverty programs, the war in Viet Nam, and government farm programs, as well as other competing demands, appear to have had a higher priority for federal funding. What priorities will be set by the new administration and whether the new administration will be able to convince the Congress of these priorities is yet to be determined. The report has had some impact in certain states on state funding for agricultural research. However, the results here are extremely spotty, depending to a substantial degree upon how successful the state is in financing its governmental activity.

Thus, there is no clear evidence to indicate whether the recommendations in the report will or will not be followed by the directors of research in the agricultural experiment stations and the USDA should funds become available.

The report indicates a relative shift toward community and rural poverty problems and away from commercial agricultural problems. It is our observation that there has been more of a shift among individual agricultural economists than among administrators of research. Increased interest has been shown in community and poverty problems, perhaps because the President of the American Agricultural Economics Association two years ago was Ed Bishop, who was also Director of the Rural Poverty Commission. It is our judgment that if funds should become available for increased research in community service and poverty areas, agricultural economists would be willing to undertake such research.

Some speculation on what determines the areas of emphasis and priorities in research may be of use and interest. It is our hypothesis that a change in emphasis occurs when there is a change in the environment and problems as perceived by society and research administrators. The current emphasis on poverty is largely such a change in perception. The absolute poverty gap, that is, the amount of funds required to increase per family income above, say, $3,000 is becoming smaller as Lampman pointed out in 1964.[2] Yet we are more concerned about poverty because our perception as a society has changed a good deal.

A change in priority and emphasis may also occur when the prospective payoff of work in an area increases due to new and promising techniques or theories for problem solving. Production economics appears to have enjoyed the benefit of such a phenomenon in the fifties. The application of modern production theory to farming problems along with new techniques such as regression analysis and later linear programming improved prospects for problem solving in production economics and led research administrators and economists to shift emphasis to this area.

The Current Research Information System (CRIS) which is now in operation will yield a continuous inventory of the distribution of research efforts among social science and other disciplines as well as among goals and problem areas. An analysis of these results should prove helpful in determining trends and priorities in agricultural research.

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[2] Lampman, Robert J., "Approaches to the Reduction of Poverty," *American Economic Review*, Vol. LV, No. 2, pp. 521-529, May 1965.