Trends in Baccalaureate Graduates

Richard P. Thompson and Joseph G. Massey

Introduction

Recent declines in graduates in the agricultural and natural resource sciences have raised concerns over the prospect of a significant shortage of these scientists and professionals in the near future (NRC, 1988). For a number of years the NACTA Journal has covered this emerging problem, publishing reports on enrollments and degrees awarded on an annual basis. A primary source of data for these NACTA reports has been the Food and Agricultural Education Information System (FAEIS).

It is important to place trends in the decline in number of agricultural and natural resource (AGNR) graduates within the larger higher education context and to view these trends in light of the structural changes occurring within the AGNR sciences. FAEIS, housed in the Department of Forest Science at Texas A&M University, maintains a broad database of information on higher education programs in the food and agriculture sciences in the United States. It is sponsored by the USDA's office of Higher Education Programs in support of a Congressional mandate to strengthen higher education programs in the food and agricultural sciences (P.L. 95-113 and 97-98).

This paper presents a comparative analysis of agriculture and natural resource baccalaureate (BS) degrees awarded for the period 1975 to 1987. First, BS graduates in the AGNR sciences are compared to graduates in the other primary academic fields. Next, specific academic areas within the AGNR sciences are dissagregated to examine how trends for females and minorities compare with the whole.

Background

No single source of data is adequate in order to present the desired comparative analyses for the 11 year period. Data from the Department of Education (USED) is the most complete but is unavailable for 1986 and 1987. Data collected by FAEIS (through RICOP, AASCARR and NAPFSC[1]) is current but was not collected to the necessary degree of specificity prior to 1983.

Integrating and synthesizing data from many sources to provide information on the food and agricultural sciences is one of the primary objectives of FAEIS. For this paper, USED data on degrees awarded was used as the primary data source but updated by more recent FAEIS data to extend the trend data to 1987. Due to slight differences in survey population and response rates between the USED and FAEIS/associations surveys, rates of change in FAEIS data were applied to 1985 USED data in order to complete the trends. The degree program taxonomy used by FAEIS is the Classification of Instructional Programs System (CIPS) established by USED in 1981.

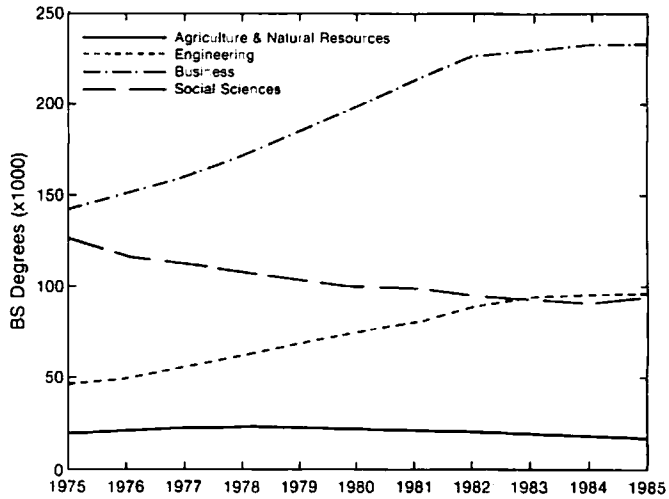

Figure 1. Baccalaureate degrees awarded in business, engineering, social sciences, and agriculture/natural resources between 1975 and 1985.

Undergraduate Supply Trends

Figure 1 illustrates the trend in BS graduate supply from 1975 to 1985 by comparing essentially all BS degrees awarded in engineering/engineering technology (CIPS 14.0101 through 15.9999), business (CIPS 06.0101 through 06.9999), social sciences (CIPS 45.0101 through 45.9999), agriculture/natural resources (FAEIS, 1985). While engineering and business graduates have increased markedly during the period (up 107% and 64%, respectively), the AGNR and social sciences have declined (down 13% and 25%, respectively). It is important to note that despite the much talked-about decline in agricultural graduates during this period, the social sciences have experienced higher poroportionate losses. Also significant is the fact that all the trends are leveling off.

From the perspective of higher education as a whole, the AGNR sciences have been treated as a single field due in part to institutional structures in colleges of agriculture. But the issues faced by each science within AGNR are different in many respects, though strongly related through their shared biological foundation. The decline in natural resource BS graduates has been significantly higher than that in the

Thompson and Massey are research associate and associate professor in the Department of Forest Science, the Texas Agricultural Experiment Station, Texas A&M University System. The study was funded in part by the USDA/CSRS Higher Education Program. Texas Agricultural Experiment Station manuscript TA-23627.

[1]The Resident Instruction Committee on Organization and Policy (RICOP) of the National Association of State Universities and Land Grant Colleges (NASULGC), the American Association of State Colleges of Agriculture and Renewable Resources (AASCARR), and the National Association of Professional Forestry Schools and Colleges (NAPFSC).

rest of AGNR (figure 2). Declines in BS graduates in the natural resource sciences have occurred almost monotonically between 1975 and 1987 (down 53%); whereas the graduate declines in the agricultural sciences have occurred only since the early 1980's (down only 7% since 1975, but 24% since 1982).

Further delineating these trends by gender provides additional information indicating that the conditions that determine enrollment in agriculture are distinctly different from those in natural resources (figure 3). Women are increasingly representing a greater proportion of BS graduates in both fields, to the point of nearly half in the natural resource sciences. In fact, the declines in BS graduates have been predominantly male in the agricultural sciences, and almost entirely in the natural resources.

Dissagregating the agricultural sciences into its component sciences provides a view of trends that differ within the broad area. Figure 4 presents BS graduates since 1977 in four major agricultural degree areas: agriculture economics and related sciences, animal sciences, plant and soil sciences, and the food and related biological sciences. Agricultural economics and related sciences is the only area that has increased since 1977 (up 14%). The food and biological science BS graduates are nearly the same as in 1977, having lost the gains made in the late 1970's and early 1980's. While BS graduates have declined sharply in animal sciences (down 30%) and most especially in the plant and soil sciences (down 46%). What may explain these divergent trends is a shift away from what may be called the "traditional" agriculture sciences in favor of the business and "high-tech" fields. This explanation is consistent with the broad trends observed in higher education (figure 1).

Dissagregating natural resources reveals that the decline in graduates occurred at different rates among the four component sciences (figure 5). Of these parks and recreation graduates have declined the least since 1977 (down 16%). Moreover, this field has experienced a fairly well-defined upturn in BS graduates in recent years. Natural resource management and forestry graduate trends are similar, declining roughly 56% and

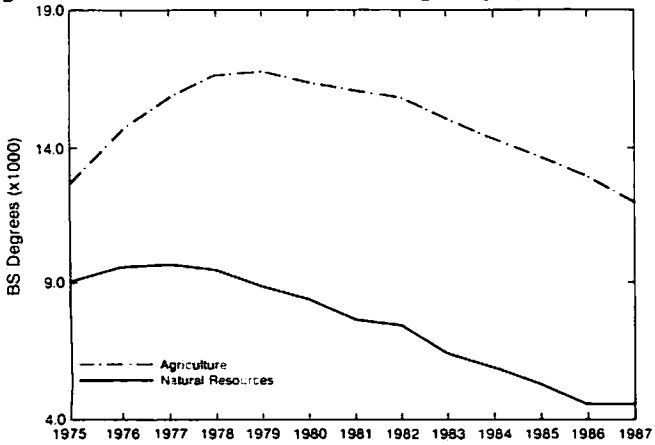

Figure 2. Baccalaureate degrees awarded in agriculture and natural resources from 1975 and 1987.

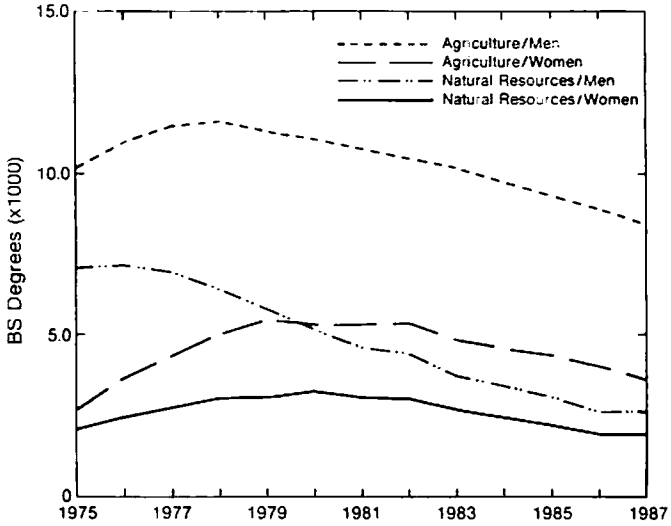

Figure 3. Baccalaureate degrees awarded to males and females in agriculture and natural resources between 1975 and 1987.

71%, respectively, since 1977. A third fairly distinct group in the natural resources are the wildlife sciences. Baccalaureate graduates in wildlife have declined 51% over the last 11 years. These three natural resource fields show signs of having reached their minimum in annual BS graduates.

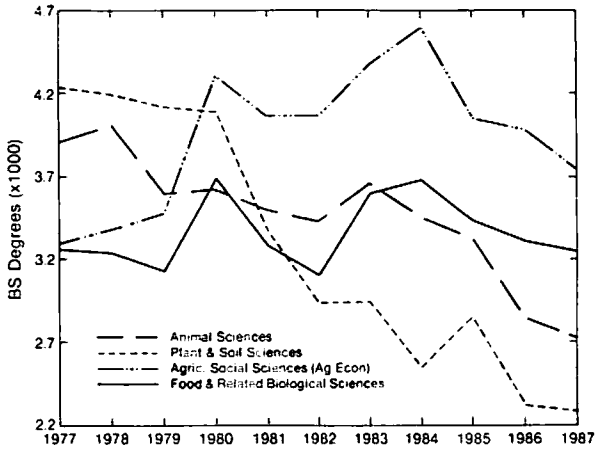

Figure 4. Baccalaureate degrees awarded in animal sciences, plant & soil sciences, agricultural social sciences (e.g. agric. economics), and food & related biological sciences between 1977 and 1987.

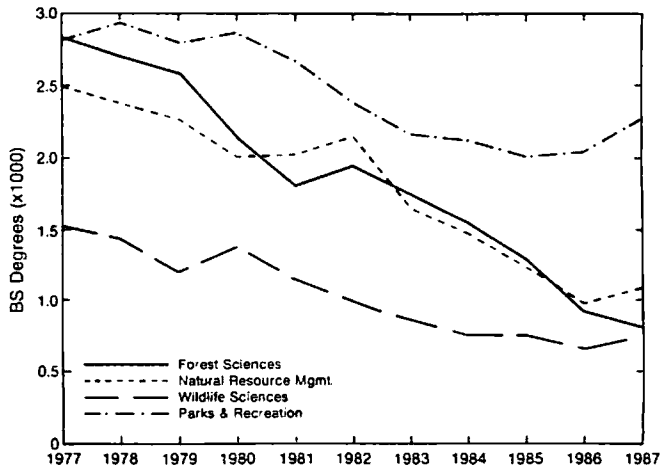

Figure 5. Baccalaureate degrees awarded in forest sciences, natural resource management, wildlife sciences, and parks & recreation between 1977 and 1987.

Undergraduate Minority Trends

Recruitment of minorities has been a particular focus of higher education in recent years. It has only been overshadowed by the need for increased overall enrollment. The minority designation includes Black, Asian/Pacific Islander, American Indian, and Hispanic individuals. Historically, minorities have represented a very small fraction of the graduates in agriculture and natural resources.

Race/ethnicity data from USED is only available biennially (1976, 1978, etc.). (FAEIS has collected annual minority data since 1983, not long enough for use in this study.) USED race/ethnicity data for 1986 is not yet available.

The overall percent of minority graduates remained fairly constant at about 11% for the period. Agriculture and natural resources were at the bottom averaging about 5 percent, but showing modest increases. (Blacks and American Indians are the least represented of all minorities granted bachelor degrees in agriculture and natural resources.) The only dramatic increase was in engineering, in which minority percentages rose from 7% in 1976 to 13% in 1984. Between 1982 and 1984, minority BS graduates in engineering increased sharply from 10% to 13%. The proportion of minority BS graduates in the other major academic areas has remained fairly constant during this period (ranging from 10 to 12 percent).

Conclusions

From the above information, we can draw several conclusions:

- Increasingly, students have directed their higher education to those career areas where it is perceived that more job opportunities exist. Currently, business and enginering, even when applied within agriculture, have been attracting students probably to the detriment of the social and life sciences. However, the laws of economics provide a rationale for doubting a continuation of these trends, assuming normal demand constraints. Even so, significant impacts in the future supply of agricultural and natural resource expertise are inevitable, given the recent reduction in graduates and the lag between changed perceptions and holding a degree.
- The number of women graduates have increased dramatically in the past ten years in nearly all fields of study. So profound has been this trend in agricultural and especially natural resources that the loss of bachelor level graduates since 1975 can be accounted for almost entirely by the loss of male students.
- Minority recruitment into the agricultural and natural resource professions has grown modestly but remains at a comparatively low level. At the same time, degrees awarded to minorities have increased somewhat when combining all higher education. They seem particularly attracted to engineering and business fields. In light of the overall effort to increase enrollment, it will be a particular challenge in the coming years to the agricultural and natural resource professions to attract these students.

References

Food and Agricultural Education Information System. (1985/86). U.S. graduates with scientific/professional expertise in agriculture, natural resources, forestry, veterinary medicine and allied fields by degree level and type of institution. Texas A&M Univ., College Station.

National Association of Professional Forestry Schools and Colleges. Annual survey data. (Unpublished computer printout).

National Research Council. (1988). Educating the Next Generation of Agricultural Scientists. Committee on Evaluation of Trends in Agricultural Research at the Doctoral and Postdoctoral Level. National Academy Press. Washington, D.C.

Society of American Foresters. (1985). 1985 forestry school enrollment and degrees granted survey tables. Unpublished report. Bethesda, MD.

U.S. Department of Education. Higher education general information survey. Center for Education Statistics. (Magnetic tapes of annual degrees awarded by academic year), Washington, D.C.

U.S. Department of Education. (1981). A classification of instructional programs. National Center for Education Statistics. NCES 81-323, Washington, D.C.