SUPPLY DEMAND

For Graduates of Higher Education In Food and Agricultural Sciences

Kyle Jane Coulter

Introduction:

A shortage of highly capable experts in the food and agricultural sciences is a potential bomb, one that could threaten the total food and agricultural system on which much of the world stability is based.

- An estimated 1 billion people in the world suffer in some degree from malnutrition.
- As many as ½ million may be dying annually from starvation.
- Tens of millions are struck down annually by disease.
- By the end of this century agriculture will be confronted with feeding twice as many people as are now living on earth.

In essence, food supply is already a crisis in many nations, and we could face a world food crisis in the not too distant future that could dim the fuel crisis into insignificance. Obviously, the development of alternatives and solutions to problems associated with the food and agricultural system demands an investment of human capital — an investment possible only to the extent to which such expertise exists.

Effective recruitment and education of the populace to participate more fully in the food and agricultural labor force necessitates a sound knowledge of the nation's employment situation — the composition of the various sectors of the labor force, which are expanding or contracting, and the related supply of graduates qualified to participate in the labor force.

Recognizing the foregoing, the Office of Higher Education, SEA, USDA, conducted a comprehensive Manpower Assessment Project to achieve the following major objectives:

1. identification of the current and future supply of graduates of higher education in the food and agricultural sciences;
2. identification of the current and future employment opportunities for graduates of higher education in the food and agricultural sciences;
3. analysis and interpretation of the extent to which higher education in the food and agricultural sciences is producing sufficient graduates to adequately respond to current and future manpower needs in food and agriculture.

Supply/Demand Overview:

Most of today's high school and college students are being told that they must lower their professional sights. The "baby boom," they are told, has saturated the job market and reduced their professional prospects. However, young people who earn college degrees in food and agriculture during the 1980's can look forward to a strong job market and vast professional challenge.

The SEA-sponsored task force studying the supply and demand for graduates through the 1980's has concluded that trained professionals will be scarce in most food and agriculture specialties through 1985-6. The demand will be espeically strong for those students who put forth the effort and investment to earn advanced degrees. Such people will be in short supply virtually across the spectrum of food and agriculture. Students who combine advanced degrees with practical experience in agriculture or related industries will be the most sought-after of all.

Basis of Supply/Demand Estimates:

Information on the supply of higher education graduates likely to enter the job market was obtained from the Higher Education General Information Surveys of the National Center for Education Statistics, U.S. Department of Education. This is the most comprehensive source of data covering the output of higher education programs in this country.

Occupational demand information came primarily from the Occupational Employment Statistics Program of the Bureau of Labor Statistics — a BLS matrix cross-classified by industry and occupation. This is based on OES-Census information plus monthly surveys.

These data bases were supplemented by other data from the Cooperative Extension Service, the American Vocational Association, and the Department of Defense.

Two special surveys were also undertaken: one by Clemson University of faculties in food and agricultural sciences in higher education institutions, and another by the Foreign Agricultural Service covering international agricultural employment opportunities for Americans. These surveys filled critical gaps in existing data.

The various data sources were synthesized into a single analytical model with the help of a panel of consul-

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tants representing the Resident Instruction Section, Division of Agriculture, National Association of State Universities and Land-Grant Colleges (NASULGC). Essentially, this panel was composed of directors of resident instruction — people who have built careers in helping students make career choices and in assisting in job placement.

The results of the study present supply/demand relationships under the following occupational employment categories: (1) scientific and professional specialists; (2) manufacturing and processing scientists and engineers; (3) sales and service representatives and purchasing agents; (4) administrators, managers, and financial advisors; (5) agricultural educators; (6) agricultural media specialists; (7) agricultural production and management specialists (primarily farming and ranching); and (8) a miscellaneous category that includes such specialties as farm implement mechanics and food service supervisors.

Let me share with you a synopsis of each category:

Scientists and Professional Specialists:

Analysis of the total supply/demand for scientific and professional specialists indicates that the average annual supply of doctoral graduates meets 4 percent of the demand; master's graduates equal 12 percent; baccalaureate graduates equal 76 percent.

Public consciousness and national priorities for the 1980's reflect a concern for greater productivity in agriculture, more energy efficient food production and delivery systems, and environmental quality, as well as more nutritious and safer food supply. Therefore, a sustained and expanding demand for scientific and professional specialists in food and agriculture is anticipated for several decades. It is important to note that many such specialists must possess the highest level of expertise in the food and agricultural sciences. An adequate supply of such human capital capable of responding to national priorities and public concern related to food, agriculture, and natural resources is critical to national and world progress, perhaps even human survival.

Higher education in food and agriculture must be encouraged to attract and graduate more students in such disciplines as the following: Agricultural Engineering; Animal Sciences; Food Sciences; Natural Resources (master's and doctoral levels)[1]; Plant Sciences; and Soil Sciences.

Scientists and Engineers:

The total average annual supply of graduates qualified for employment as manufacturing and processing scientists and engineers meets approximately 82 percent of the demand. Graduates with agriculture degrees equal 74 percent of the demand; agriculture-related graduates satisfy an additional 8 percent of employment demand. When graduates at the different degree levels are related to total demand, the data indicate that doctoral and D.V.M. graduates satisfy 6 percent of employment demand; master's satisfy 14 percent; baccalaureate equal 61 percent of average annual demand.

Emphasis on energy efficiency, quality control, and improved alternative food sources as they relate to agricultural production, processing, and natural resources are expected to escalate. Consequently, the 1980's should afford substantial employment opportunities for manufacturing and processing agriculturists, food scientists, and forest engineers. Employment demand should be particularly strong for graduates with advanced degrees.

Specific educational backgrounds which appear to be especially needed include: Agricultural Engineering; Food Sciences (food development, processing, and quality control); Forest Engineering; Veterinary Medicine (biological Research and regulatory medicine); Forest Products Utilization (lumber, plywood, and wood-composition or particle board as related to the pulp and paper industries) — primarily master's and doctoral degree levels.

Sales and Service Representatives and Purchasing Agents:

Essentially all phases of the food delivery system require the procurement of raw materials and the marketing of products. Therefore, an extensive number of representatives and agents are needed in the marketing process. The supply/demand data for sales and service representatives and purchasing agents suggest an annual shortage of almost 2,000 graduates, or 12 percent unmet demand.

Sales occupations, buying positions, and technical services directly impacting on farming and ranching are strongly correlated to the level of agricultural production. With anticipated increases in agricultural output in the 1980's, there should be an associated modest increase in the number of retailing positions. Graduates with a technical subject matter understanding as well as business and marketing training should be in the strongest position to compete for employment. Graduates from the plant sciences, animal sciences, agricultural mechanization and agricultural business curricula should continue to attract substantial interest from employers seeking sales representatives to serve farmers and ranchers.

It is anticipated that Americans will continue the trend of the 1970's and consume an increasing proportion of meals outside the home. Consequently, there should be a continuing high demand for food sales representatives, food buyers, and retail food service managers. Primary candidates for these positions will be individuals with associate and baccalaureate degrees in food technology and food science.

Two factors might tend to restrict the market for sales representatives, buyers, and technical service representatives during the coming decade. Restricted foreign markets could result in decreased agricultural production. A general economic recession could result in reduced demand for agricultural products, especially those intended to enhance the quality of life (e.g., ornamental plants).

[1]**The supply of graduates with baccalaureate degrees appears adequate to meet the employment demand for scientific and professional specialists.**

Administrators, Managers, and Financial Advisors:

The data indicate a strong employment market for graduates trained as administrators, managers, and advisors. Qualified doctoral graduates are available to fill only 1 percent of the estimated demand. Master's and baccalaureate graduates equal 17 and 52 percent, respectively, of the estimated annual average demand. In essence, the total annual average supply of new graduates satisfies only 70 percent of the estimated employment demand.

Increased emphasis on alternative land use and the related need for economic impact analyses require trained estimators and appraisers. Maintenance of a high quality environment further expands the demand for investigators and appraisers with expertise in soils, plants, and natural resource utilization.

Financial managers should continue to be in strong demand during the 1980's because of trends toward larger firms, restricted money supplies, smaller operating margins, more extensive use of credit, increased use of tax management strategies and more complex organizational structures in conducting farming and agribusiness operations. Individuals with a master's degree in agricultural economics emphasizing financial analysis and management skills are particularly in short supply as compared to demand.

Managerial decisions in food, agriculture, and natural resources should increasingly require technical expertise in problem solving as well as in economic and social impacts of strategies adopted. Consequently, individuals with a degree in a technical field combined with a business emphasis should be in a strong position to advance to an advisory or managerial role in food or agricultural industries, as well as public administration.

Educators:

Several observations are pertinent when reviewing the supply/demand data for food and agricultural educators in the 1980's. Various sources suggest regional differences in higher education enrollment patterns with projected increases in some areas and projected declining enrollments in other areas. Despite NCES enrollment projections which are based largely on the growth of agricultural colleges in the early 1970's, many leading educators predict stable or declining student enrollments in the food, agricultural, and natural resources programs during the 1980's. Hopefully, the adjustments of the 1980's will not result in fewer courses taught and fewer professors needed, but rather will result in a return to more optimum class size and teaching load.

In response to an expanded need for teaching and research, many agricultural colleges increased their faculties during the post-World War II period of the late 1940's and early 1950's. It is expected that a greater than average number of Ph.D. graduates will be needed as replacements during the late 1980's as an above average number of current faculty members reach retirement age. Recent changes in the normal retirement age from 65 to 70 may have some impact on this matter.

The data serving as the basis for this report indicate present chronic shortages of college/university faculty in several areas which warrant attention. These areas include: agronomy, animal sciences (general), agricultural economics, horticulture (fruit and vegetable), agricultural engineering, wildlife biology/management, water resources, aquaculture, forest management, forest engineering, wood science technology and industry, and veterinary medicine (pathology, internal medicine, microbiology, and anatomy).

During the next ten year period, the most critical needs for additional agricultural educators at the college level appear to be for doctoral graduates in agricultural engineering, agricultural business/management (particularly agricultural economics), animal sciences (particularly dairy and livestock production), aquaculture, fisheries, wildlife biology and management, forest engineering, forest management, wood science technology and industry, plant sciences (agronomy, fruit and vegetable horticulture, and plant pathology), and veterinary medicine (anatomy, internal medicine, microbiology, pathology, preventive medicine, and surgery).

An expanding need for dissemination of new knowledge and technology related to agricultural production, natural resource utilization, and rural development substantiates a significant demand for Cooperative Extension Service personnel based in local areas and on university campuses.

A recent report conducted by the agricultural education staff of The Ohio State University and published by the American Vocational Association indicates an annual deficiency of 600-750 secondary school vocational agriculture teachers.

In the aggregate it appears that the supply of educators exceeds the demand. Yet, it is important to note the aforementioned shortages which are apparently the result of (1) competition for trained educators by business and industry, and (2) inadequate supplies of graduates of certain fields. Simply stated, in many instances educational institutions are apparently being outbid by business and industry for trained educators. In other instances, the supply is far short of the demand.

Media Specialists:

The total annual average supply of new graduates with food/agriculture/natural resource degrees qualified for employment as media specialists approximates 87 percent of the estimated demand. When graduates with agriculture-related degrees are considered, the total supply exceeds demand annually by almost 200 graduates. Hence, there is no apparent shortage of food/agriculture media specialists.

Agricultural communicators are employed primarily as editors, writers, reporters, and public relations specialists for government agencies, agri-business firms, commodity organizations, and publishing houses. Graduates with multidisciplinary backgrounds in food, agriculture, or natural resources, and communications would appear to be best qualified for these types of occupations. Non-agricultural journalists and media

specialists should continue to be a significant competitive factor in the market and should buffer the expansion of career opportunities for food and agricultural media specialists.

Agricultural Production and Management Specialists:

Farming, ranching, and other related production occupations should afford significant employment opportunities for college graduates in agriculture and natural resources through the mid-1980's. However, it is anticipated that the trend will continue toward larger and more complex production units with adoption of labor-saving technology. If so, somewhat fewer farmers, ranchers, and production workers may be required in the 1980's as compared to the previous decade.

The intensification of animal production units, including more confined swine and cattle feeding operations, requires highly trained production managers. Also, the expanding size of production units, in general, and the introduction of more complex technology to farming and ranching increasingly require expertise gained through higher education in agriculture and natural resources.

Currently, between one-half and two-thirds of the students who enroll in agricultural colleges do not have a farm or ranch background or significant agricultural production experience. The strongest demand for agricultural production and management occupations in the 1980's should be for individuals with practical experience as well as academic credentials in the following fields: Agricultural Mechanization; Agriculture Production; Agronomy; Animal Sciences; Dairy Management; Farm and Ranch Management; Horticulture and Ornamental Plants; Poultry Management; and Range Management.

Miscellaneous Agricultural Specialists:

The nature of this occupational employment category limits the demand for workers primarily to recipients of associate and baccalaureate degrees. The largest annual employment demand is that for 2,675 animal caretakers. However, this is a highly diverse type of occupational employment such that associate degree graduates are frequently as qualified as baccalaureate graduates. Furthermore, it is believed that there may presently exist numerous individuals with animal/biological sciences associate and baccalaureate degrees who may strongly compete with new graduates for employment as animal caretakers.

The strongest employment demand in relationship to supply is that for farm implement mechanics. The data indicate that annually some 353 associate degree graduates are available to fill an estimated 1,936 job openings.

The estimated demand for meat cutters (including meat specialists, meat supervisors, and meat department managers) exceeds supply by a sizable margin as does the estimated demand for food service workers. Increased demand for convenience foods and for meals which are consumed outside of the home should continue to augment the need for associate and baccalaureate degree recipients in the food technology programs during the early 1980's. Increased interest in maintaining a high quality and nutritious food supply should sustain the need for graders and inspectors as food products move from producers to consumers.

While occupations associated with wildlife and recreation enterprises are not specifically identified in this employment aggregation, it should be noted that the present supply of qualified associate and baccalaureate graduates is believed to be ample. A depressed market for additional, new graduates may develop over the coming decade.

During the 1980's the demand for miscellaneous agricultural specialists should strongly correlate to levels of agricultural production. With some expansion of agricultural production anticipated, a continuing healthy demand for these workers also is expected.

International Food and Agriculture:

The American agricultural education system is highly regarded. Therefore, the demand for food and agricultural scientists graduating from American colleges and universities extends beyond the borders of the U.S. A special survey by the USDA's Foreign Agricultural Service indicated some expected growth with regard to employment abroad of American citizens in food and agriculture positions, but the numbers are not large. Total expected needs in 1985-6 are less than 2,000 workers. The current and future areas of greatest need appear to be agricultural business and management, agricultural education, agricultural engineering, plant sciences, and natural resource management.

Conclusion:

Andre and Jean Meyer wrote in 1974, "Few scientists think of agriculture as the chief, or the model science. Many, indeed, do not consider it a science at all. Yet it was the first science — the mother of sciences; it remains the science which makes life possible, and it may well be that before the century is over the sucess or failure of science as a whole will be judged by the success or failure or agriculture."

We in the Science and Education Administration wholeheartedly agree with this statement. We are convinced that higher education in food and agriculture will continue to be a rewarding endeavor in the years ahead. And we challenge you as concerned educators further to convey this message to the public and, particularly, to today's young people who are facing critical education and career decisions.

Authors Sought for Soil Courses

Interest in the development and implementation of collegiate courses in soil taxonomy and soil interpretations was expressed in a recent study conducted by a North Central Regional Committee of the National Cooperative Soil Survey.

One university has indicated an interest in sponsoring these courses as part of its continuing education program in which a royalty arrangement would be arranged.

Interested persons should contact Dr. Gerald Miller, Department of Agronomy, Iowa State University, Ames, Iowa 50011.