

AGRICULTURAL EMPLOYMENT IN THE ILLINOIS FOOD AND FIBER SYSTEM

Jerry D. Pepple, Visiting Assistant Professor
 Constanza M. Valdez, Graduate Research Assistant
 Dale A. Law, Assistant Professor
 University Of Illinois

Illinois Department of Employment Security (IDES) is the official agency for collecting and reporting state employment trend data. IDES uses a nationally recognized system of defining occupations, the Standard Industrial Classification (SIC) code. This employment data is made available to vocational program planners through a coordinating committee (National Occupational Information Coordinating Committee/State Occupational Information Coordinating Committee, NOICC/SOICC), as specified in the Carl D. Perkins Vocational Education Act of 1984. Unfortunately, the SIC definition includes only a fraction of what agriculturists refer to as the food and fiber system (FFS). This mismatch in the definition of agriculture is perceived to be a problem of national importance. As recently noted in the American Vocational Association newspaper Update (1989, December), the Carl D. Perkins reauthorization legislation recently approved by the House of Representatives (H.R.7) and the Senate bill recently passed by the Senate Committee on Labor and Human Resources (S. 1109), both retain the NOICC/SOICC provision and add a requirement that information be available on employment demand for agribusiness. Currently the NOICC/SOICC data does not separate and report agribusiness employment, which would more accurately represent what is referred to by the United States Department of Agriculture (U.S.D.A.) as the FFS. The FFS can be defined around input and output industries in relation to production agriculture.

As noted in figure 1, agricultural production is the centerpiece around which other agriculturally related industries form their services and products. Therefore, the total size of FFS is determined by the types of industries which are considered to be necessary contributors as either input or output industries.

Food and Fiber System

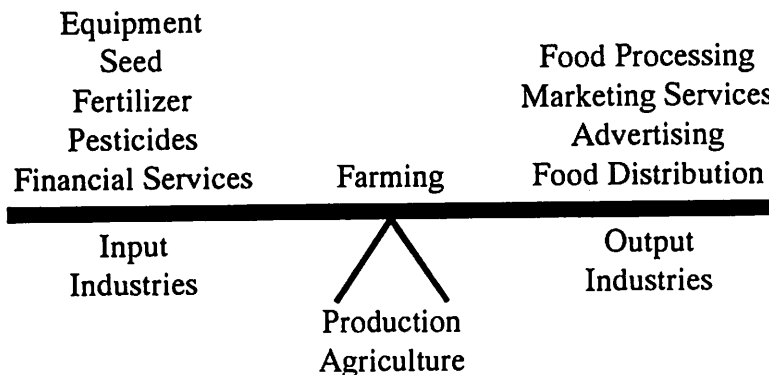


Figure 1. The Food and Fiber System.

The problem of using existing IDES data reports for program planning purposes has become more of an issue within the last decade as vocational programs have expanded their mission and attracted a more diverse student population. A recent study sponsored by the Illinois State Board of Education/Department of Adult, Vocational and Technical Education (ISBE/DAVTE, 1989)

reported that since 1987, the percentage of non-farm students has increased from 56% of total agricultural education enrollment to 69% of the total enrollment in 1989. According to the ISBE (1988), female enrollment in secondary agricultural education programs increased 18% between 1972 and 1986. The majority of students studying agriculture today do not plan to pursue a career in production agriculture, but instead plan to work in an agribusiness. To address the needs of these students, vocational program planners are encouraged to collect and review labor market information (LMI) on industries and occupations which relate to the program areas.

The agricultural data traditionally collected and reported by IDES does not adequately isolate the off-farm portion of the food and fiber industry. Several factors contribute to the inadequacy of the data: (1) many agricultural jobs are not reported through "standard" channels, (2) in many compilations of LMI, "agriculture" is narrowly defined as farming, fishing and forestry (3) self-employed, small businesses, and entrepreneurial situations are often deleted from reports due to the confidential nature of the data, and (4) many agricultural jobs outside of production, forestry, and fishing are compiled as nonagricultural (Law, Smith, and Herbst, 1985).

Over the last 10 to 15 years numerous attempts have been made at the state and national levels to identify and report the number of persons employed in occupations related to agriculture (USDA, 1975; Copa, 1980; Sands, Swanson, and Herbst, 1980; Pepple, Law, and Smith, 1986; ISBE/DAVTE, 1986; Zurbrick, 1986; Coulter, Stanton, and Goecker, 1986; Schluter, Lee, and Edmondson, 1986; and Edmondson and Schluter, 1986). These last two studies represent the first systematic quantification of employment originating in the U.S. Food and Fiber System. In general, however, these efforts have met with varying degrees of success and in some cases have caused a great deal of misunderstanding in defining agricultural employment.

Schluter, Lee, and Edmondson (1986) presented a procedure for estimating employment and income by defining the FFS to include "all businesses which contribute economic activity which results in the eventual delivery of food, clothing, and shoes, tobacco, and flowers to domestic consumers and which helps support agricultural exports...(the FFS) also includes the effects of imported food and fiber products and farm capital expenditures." They used the 1977 U.S. input-output (I/O) transaction table as the base for their estimation of income and employment due to final demands for food and fiber products. Their results reported that the FFS, at the national level, employed 21.4 million full-time equivalent workers in 1985. It accounted for 17.5% of total GNP and employed 18.5% of the available civilian work force.

In a study at the state level, Edmondson and Schluter (1986) estimated a total of 1,044,200 workers as being employed in the FFS in Illinois. However, neither study indicated the type of occupations and particular industries where these workers were employed. This led to a need for more complete and accurate data in order to identify the occupations (using OES and DOT descriptions) in which the Illinois labor force was employed related to agriculture, and to identify the specific types of industries (by SIC Code) making up the Illinois food and fiber system.

Objectives

The objectives of this study were to:

1. Identify the Standard Industrial Classification (SIC) manual Divisions where agricultural related merchandise/service functions exist in the Illinois food and fiber system by using input/output analysis procedures.
2. Identify the employment base in the agricultural related industries, using IDES data, which make up the Illinois food and fiber system.

Methodology

Identifying the Food and Fiber System: To ascertain the importance of the agricultural related employment in Illinois, the authors followed the estimating procedure of employment used in a USDA study by Lee, Schluter, Edmondson, and Wills (1987).

In this procedure, I/O analysis is used to trace the direct and indirect linkages among economic activities. The U.S. I/O transaction tables (U.S. Department of Commerce) disaggregate all economic activities into an industry classification of 79 economic sectors, including the range of activities from farming, food processing, transportation, to wholesaling and retailing. Individual jobs within these categories include a range of activities, specified in the Dictionary of Occupational

Classifications (DOT) manual. All directly or indirectly support the food and fiber system, the output of which in turn satisfies the final demand in the economy.

The authors updating procedure used the sectoral state share distribution of employment derived from the USDA national level estimates of employment in the food and fiber system (Lee, Schluter, Edmondson, and Wills, 1987). This sectoral state share distribution served as the basis for the base year estimates of employment supporting final demands for food and fiber products in each sector of I/O industries. In the 1987 USDA study, the state employment share distribution for the farm sector was derived from total manhours required for production of crops and livestock and state cash receipt data. The nonfarm and government shares were derived from output per employee hour in selected industries.

Research Procedures: IDES made available a copy of their 1988 employment data file and the researchers downloaded the employment file into the University of Illinois VMD computer system. A program file was developed using SAS (Statistical Analysis System) software to read and analyze the data file.

A review of the SIC manual by a panel of experts revealed a total of 40 SIC industry groups in Illinois as having a percentage of their establishments associated with the food and fiber system (this number does not include Agricultural Production and Agricultural Services Industries, which by definition are already within the FFS). This panel of experts selected SIC industries where agricultural related merchandise/services were identified and matched with occupations (by DOT titles) which might require agribusiness competencies. All identified occupations were aggregated into eight main Occupational Employment Statistics (OES) classification categories –managers and owners, professional and technical occupations, machine operative occupations, mechanics and repairers, production and maintenance occupations, construction and repair occupations, sales and services occupations, and a last category of clerical occupations.

To measure the impact of food and fiber employment in Illinois, the researchers made use of the state and sectoral contribution to the total employment using the 79-sector U.S. input/output industry categories and their composition in terms of the SIC codes. The 79-sector US input-output table were aggregated into ten main categories related to the Illinois food and fiber system employment covering all SIC industries in the economy. These ten categories were to include: three categories of farm production of goods and services (agricultural production, agricultural services, and forestry); two categories of farm product manufacturing (food processing and textiles); one category of direct distribution of processed products to consumers (eating places); trade (wholesale and retail); transportation; one category of supporting manufactured inputs (such as farm machinery and construction); and one category which included service industries and all others not previously included. These ten categories were then recombined into the eight sectors shown in table 1.

The statistical procedure for calculating estimated employment for a specific OES occupation at the 3-digit SIC level in one estimating cell sector for an area i, is as follows:

Food and Fiber Sectors	eki	pki	wki
1			
Through			
10	M		

where:

- E = occupational estimate
- ek = employment for a specific occupation reported by industry k
- pk = summed total employment reported by industry k
- wk = weight for industry as reported by the state share distribution coefficient (a bridge table by USDA (1987) study).
- M = benchmark employment for the cell as of the end of 1988, reported at the 3-digit SIC level
- n = number of industries within each sector of the food and fiber system in Illinois.
- i = area indicator derived from the Illinois State Board of Education Regions.

Occupational Estimate:

$$E = \left[\left(\frac{w_i M}{\sum_{k=1}^n p_k} \right) \sum_{k=1}^n e_{ki} \right]$$

Results

Using IDES data which reported a civilian work force of 5,648,000 in Illinois (representing all workers, including unpaid family workers and the self-employed which account for a total of 350,000 workers), this study identified 1,153,798 workers in the Illinois FFS. This included workers involved in producing, assembling, marketing, and processing raw farm products and distributing those products to domestic and foreign consumers. Therefore, agricultural-based employment was determined to account for 20.4 percent of Illinois civilian employment. These results were very similar to the Edmondson and Schluter (1986) survey.

Table 1
Agribusiness Employment in Selected Sectors of the Food and Fiber System in Illinois

Sectors	Total Employment	Percent of Employment
1. Agricultural Production	104,273	9%
2. Agricultural Services	24,183	2%
3. Forestry	3,569	1%
4. Food Processing	95,578	8%
5. Other Manufacturing and Non-Manufacturing	385,982	33%
6. Trade	356,561	31%
7. Transportation	35,726	3%
8. Rest of the Economy	147,925	13%
Total	1,153,797	100%

As shown in Table 1, 1988 employment in the Illinois FFS was dispersed throughout the SIC industry groups. Agricultural Production had 104,273 employees (9%), Agricultural Services had 24,183 employees (2%), Food Processing had 95,578 employees (8%), Other Manufacturing and Non-manufacturing had 385,982 employees (33%), Trade had 356,561 employees (31%), Transportation had 35,726 (3%), Forestry had 3,569 employees (less than 1%), and the Rest of the

Illinois Employment Within Eight Sectors
of the Food and Fiber System

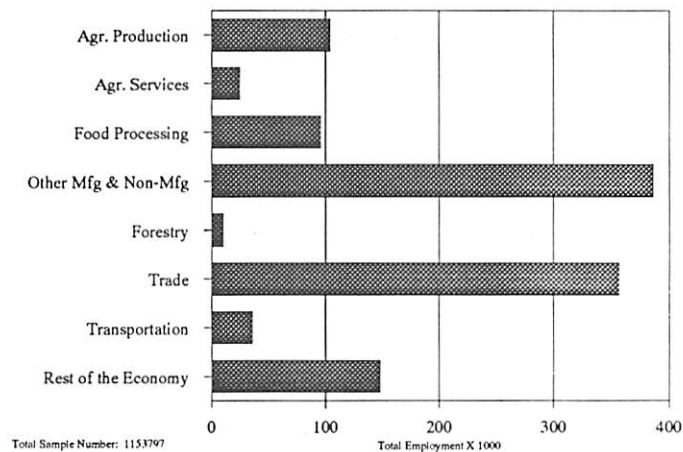


Figure 2. Illinois Employment within Eight Sectors of the Food and Fiber System.

Table 2

Estimated Total Employment in the Food and Fiber System in Illinois

OES Occupational Classification	A	B	C	D	E	F	G	H
Managers and Owners (13%)	136,435	2,009	246	6,546	75,162	28,478	4,036	19,958
Professional and Technical (10%)	106,114	2,633	2,215	5,982	44,052	28,959	52	22,221
Machine Operative (9%)	97,382	1,987	308	21,973	12,393	38,476	20,108	2,137
Mechanics and Repairers (7%)	74,957	377		6,234	6,639	14,431	1,674	45,602
Production and Maintenance (10%)	118,328	12,648	431	35,215	20,560	29,899	6,173	13,402
Construction and Repairers (5%)	47,455	407		5	46,699			344
Clerical Occupations (25%)	258,756	2,772	246	13,341	125,634	83,452	3,047	30,244
Sales and Service (20%)	210,119	1,350	123	6,282	54,844	132,866	637	14,017
Total	1,049,526	24,183	3,569	95,578	385,983	356,561	35,727	147,925

Note: A = Total Employment; B = Agricultural Services; C = Forestry; D = Food Processing; E = Other Manufacturing and Non-Manufacturing; F = Trade; G = Transportation; H = Rest of the Economy

Economy had 147,925 employees (13%). A review of Figure 2 suggests that employment in the more "traditional" agricultural sectors (agricultural production, agricultural services, food processing, and forestry) accounts for about 20 to 25 percent of the jobs in the food and fiber system. The vast majority (75 to 80%) of the jobs are to be found in other sectors, namely Other Manufacturing and Non-Manufacturing, Trade, and the Rest of the Economy.

The major industry groups making up the Other Manufacturing and Non-Manufacturing sector were: SIC 154 General Building Contractors, SIC 769 Miscellaneous Repair Shops & Related Services, SIC 352 Farm and Garden Machinery & Equipment, SIC 611 Federally Sponsored Credit Agencies, SIC 615 Business Credit Institutions, SIC 616 Mortgage Bankers & Brokers, SIC 622 Commodity Contracts-Brokers & Dealers, SIC 623 Security and Commodity Exchange, SIC 633 Fire, Marine and Casualty Insurance Carriers, and SIC 651 Real Estate Operators and Lessors.

The major industry groups making up the Wholesale and Retail Trade sector were: SIC 508 Machinery, Equipment and Supplies-Wholesale, SIC 514 Groceries and Related Products-Wholesale, SIC 515 Farm Product-Raw Materials-Wholesale, SIC 519 Miscellaneous Nondurable Goods-Wholesale, SIC 526 Retail Nurseries, Lawn and Garden Supply Stores, SIC 542 Retail Fish and Meat Markets, SIC 543 Retail Fruit and Vegetable Markets, and SIC 596/9 Miscellaneous Retail.

Once the SIC industry groups were defined for the FFS and placed into I/O categories estimated employment could be determined. The IDES data file allowed the researchers to divide total employment into the eight occupational categories as shown in Figure 2.

The total OES occupational employment distribution (excluding Agricultural Production and Agricultural Service Industries) was found to be 10% Professionals, 13% Managers, 20% Sales, 9% Machine, 7% Mechanics, 10% Production, 5% Construction, and 25% Clerical. This employment distribution was broken out by the I/O categories to better identify areas of employment. Table 2 presents the estimated employment in these sectors except in Agricultural Production. The employment structure in this sector does not lend itself to this type of analysis.

Data were also generated using the eight Labor Market Regions identified by the Illinois Department of Employment Security. This substate data can be used to assist program planners in determining local and regional employment opportunities in agriculture. The level of occupational detail in the data files allowed the researchers to define occupational titles found under each of the eight major categories. For example, Mechanics and Repairers Occupations were classified and reported as supervisors and manager/supervisors, small engine specialists, electricians, and welders and cutters.

Conclusions

It is possible to obtain accurate and detailed agricultural labor market information. To successfully obtain accurate Ag Labor Market Information requires a cooperative effort by individuals representing several entities, especially the State Occupational Information Coordinating Committee (SOICC), the State Department of Employment Security (DES) and the State Department of Education.

The data can be used for several purposes including identifying trends and making projections if replicated over time. The data has definite implications for state-wide program planning in agricultural education especially if a state requires that program and course offerings be tied to present and future job opportunities.

The data will be controversial because of overlap with jobs and occupations claimed by the other vocational program areas such as business, health, home economics, and industrial. In addition, the data should not be interpreted to mean that every employee in the food and fiber system needs formal training in agriculture.

The procedures are standardized based on a USDA model and, therefore replicable in any state with a SOICC and state DES. A study such as this requires someone in each state to define agriculture and/or the food and fiber system.

Recommendations

The study should be replicated every three years as the SOICC and state DES update their labor market data bases, thus providing insights into trends and future projections. It should be conducted in additional states because journey to work information suggests that some individuals travel up to 50 miles one way to work and often this is across state borders.

All concerned entities should be in agreement as to how the information will be used before data analysis begins. Because of the implications for vocational program planning, and the overlap in classifying jobs among the vocational program areas, the study should be conducted from the vantage point of each program area.

Policy makers must define the term agriculture and/or food and fiber system at an acceptable place along the continuum somewhere between production only on one end and the other end where it might include everyone who eats, wears clothes, and likes flowers. Lack of agreement regarding a precise definition of agricultural employment exists. The National Occupational Information Coordinating Committee should be encouraged to respond favorably to legislation which would require this type of data collection nationally.

References

Copa, G.H. (1980). Assessing the employment and further education effects of secondary vocational agriculture programs. Keynote address to the Central States Research Conference on Agricultural Education, July, 1980. Kansas City, Missouri.

Coulter, K., Stanton, M., & Goecker, A. (1986). Employment Opportunities for College Graduates in the Food and Agricultural Sciences (Texas A & M University Publication EIS 86-174 7/86). Washington, DC: U.S. Department of Agriculture.

Edmondson, W., and Schluter, G. (1986). How To Tell How Important Agriculture is to Your State Rural Development Perspectives. June, pp. 32 - 34.

Executive Office of the President - Office of Management and Budget. (1987). Standard Industrial Classification Manual. Washington, DC: U.S. Government Printing Office.

Executive Office of the President - Office of Management and Budget. (1980). Standard Occupational Classification Manual. Washington, DC: U.S. Government Printing Office.

Illinois Department of Employment Security. (1988, May). Occupational Projections 1984 - 1995. Chicago, Illinois.

Illinois State Board of Education, Department of Adult, Vocational and Technical Education (1987). Illinois Handbook for Secondary Vocational Education Program Planning. Springfield, Illinois.

Illinois State Board of Education, Department of Adult, Vocational and Technical Education. (1986). Determining employment opportunities in Illinois agriculture. Springfield, Illinois.

Illinois State Board of Education, Department of Adult, Vocational and Technical Education. (1988). Education and career opportunities in agriculture: A non-traditional approach to success. Springfield, Illinois.

Illinois State Board of Education, Department of Adult, Vocational and Technical Education (1989). The good news survey agriculture education 1989. Springfield, Illinois.

Illinois Department of Employment Security. Occupational Employment Statistics for Illinois Industries, various publications and computer tapes, 1986, 1987, and 1988 employment by SIC code. Chicago, Illinois.

Law D.A., Smith, J.E., and Herbst, J.H. (1985). Employment trends in Illinois agriculture: 1985 update. Special Research Project conducted by Vocational Education Service. Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Vocational Education Program Improvement Section, Springfield, Illinois.

Law, D.A. and Pepple, J.D. (1989). Illinois Plan for Agricultural Education: A Planning Guide. (Report OT-IO-688). Urbana, IL: University of Illinois, Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Vocational Education Program Improvement Section, Springfield, Illinois.

Lee, C., G. Schluter, W. Edmondson, and D. Wills. 1987. Measuring the Size of the U.S. Food and Fiber System. Agriculture and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 566, March.

Pepple, J.D., Law, D.A., and Smith, J.E. (1986). Regional survey of agricultural occupations: Champaign and Macon counties, Illinois. Vocational Agriculture Service, College of Agriculture, University of Illinois.

Pepple, J.D., Valdes, C.M., and Helgesen, C.E. (1989). Statewide Occupational Employment Study in Agriculture: Agricultural Service Industries. (Report OT-IO-709). Urbana, IL: University of Illinois. Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Vocational Education Program Improvement Section.

Pepple, J.D., Valdes, C.M., Law, D.A., and Helgesen, C.E. (1989). 1988 agricultural employment data for the Illinois food and fiber system. (Report-OT-IO-709). Urbana, IL: University of Illinois. Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Vocational Education Program Improvement Section, Springfield, Illinois.

Sands, C., Swanson, B.E., and Herbst, J.H. (1980). Employment trends in Illinois agriculture. Research Series, Agricultural Education Division, Department of Vocational and Technical Education, University of Illinois.

Schluter, G., C. Lee, and W. Edmondson (1986). Income and Employment Generation in the Food and Fiber System. Agribusiness. 2:143-58.

Update (1989, December). Reauthorization bills compared. American Vocational Association. 12(3), 5-8.

U.S. Department of Agriculture (1975). The Food and Fiber System: How it Works. National Economics Analysis Division, Economic Research Service, Agricultural Information Bulletin 383, March.

U.S. Department of Labor, Employment and Training Administration (1977). Dictionary of Occupational Titles (4th ed.). Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor, Employment and Training Administration (1988). Occupational Outlook Handbook. Washington, DC: U.S. Government Printing Office.

White, W.C. and Collins, D.N. (1988). Opportunities in Agricultural Careers. VGM Career Horizons, National Textbook Company, Lincolnwood, Illinois.

Zurbrick, P.R. (1986, May). 1985 agricultural employment in Arizona. Agricultural Experiment Station Research Report No. 290. Department of Agricultural Education, The University of Arizona, Tucson, Arizona.