



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**What is Agriculture and Its
Contribution to the U.S. Economy?**

by

Elizabeth Hornbrook and Dana Hoag *

Submitted for consideration for presentation at the 1997 WAEA Meeting, July 13-16

* Elizabeth Hornbrook is a research assistant and Dana Hoag a professor in the Department of Agricultural and Resource Economics, Colorado State University, Fort Collins.

What is Agriculture and Its Contribution to the U.S. Economy?

Abstract

Agriculture is evolving and changing and efforts to define it create ambiguities. Its definition and measurement are influenced by factors including the data, timing, audience and financial support for its study. The purpose of this paper is to discuss how the impact of agriculture can be and has been measured.

What is Agriculture and Its Contribution to the U.S. Economy?

A 1994 survey found over thirty state reports estimating agriculture's economic contribution to local economies (Fulton et al.). These reports are requested and prepared by State Departments of Agriculture, Land Grant Universities, Cooperative Extension and others and distributed widely to legislators and others in positions to impact agriculture. But why are these reports written and what do they accomplish? Often they are a response to the perception of a rapidly shrinking power base. Currently, less than 2 percent of the U.S. population is involved with production agriculture and less than 0.2 percent produce more than \$40,000 of commodities in a given year.

Agriculture may not be shrinking so much as it is evolving and changing, and our efforts to define it create ambiguities. On one hand, supporters describe agriculture broadly to maximize its importance. Others portray it narrowly as a small group whose power base is dwarfed by an increasingly global economy. Overtime, the concept of agriculture has evolved from strictly *production agriculture* into *agribusiness* which includes input suppliers, processors and marketers of agricultural commodities, as well as production agriculture. These businesses also serve non-agricultural clientele. To some people, agriculture pertains to the entire "farm and food system" or "food and fiber system", which aggregates wholesaling, retailing and "agribusiness".

While there are many reasons to measure and communicate agriculture's contributions, little will be gained without confronting what agriculture is and how to appropriately measure each of its unique contributions. The definition of agriculture and

the measurement of its impact are influenced by several factors including the data, timing, audience and even who provides financial support for its study. Furthermore, researchers may choose from several methods to measure the economic contribution such as sales, income, employment and value added, which widens the scope of potential conclusions.

The purpose of this paper is to discuss how the impact of agriculture can be and has been measured. The discussion begins by addressing the nuances in the definition of agriculture followed by a cursory examination of how the motivation for preparing a report influences its composition. The third section examines how the contribution of agriculture can be and has been measured. Measurement methods, influences of data, the data sources available for measuring agriculture, and the affect specific data sources have on the definition and measurement of agriculture are discussed . A report from Colorado State University is used to illustrate how data is collected, analyzed and communicated.

WHAT IS AGRICULTURE?

Agriculture must be defined before its contribution to the economy can be measured. Standard Industrial Classifications (SIC) define industries by major category and sub-categories and are commonly used as the building blocks for definitions. Industrial data is collected by SIC, which can be aggregated into desired economic sectors such as agriculture. The more digits a SIC code has, the more detail it provides. A "major category" under manufacturing is SIC 35 (Industrial machinery and equipment). Further detail in that category is SIC 355 (Special industry machinery) and even further is SIC 3556 (food products machinery). The level of detail of SIC codes is important because some data sources only provide detail to the two and three digit SIC code level.

Researchers have wide latitude to include what they wish in definitions of agriculture. The size and scope will vary greatly by what is included in these definitions. In most definitions, industries are sorted into agricultural or non-agricultural groups. In agricultural sectors, all of the employment, income, and output for that sector is considered agricultural even though some of the firm's activities may not be related to agriculture. It is common for an irrigation supplier to have both agricultural and non-agricultural clients. Definitions can be broad vertically spanning from input suppliers to wholesalers and retailers as well as broad horizontally, stretching to include many non-traditional agricultural sectors such as horse tracks, and lawn and garden supplies. Some state reports include natural resource based industries such as forestry, fisheries, and mining which can greatly increase the reported size of agriculture. Definitions will also vary with the region. For example, in Colorado, apples are produced and in Florida, oranges are produced and included in each state's definition. Colorado and Florida do not include oranges and apples respectively, because they are not produced in their regions. Such differences are sensible, but, consistency is affected if Colorado does and Florida does not include orchards as part of their definition. The definition will depend on the objective of the report, who the report is for, and who produces it. But the wide latitude in defining agriculture introduces potential problems with consistency and scientific neutrality as efforts are made to convey a desired message.

Some reports focus on *production agriculture*, which is the production of agricultural products on farms and ranches. However, most people recognize that the impact of agriculture on the economy is much broader. Therefore, the is often expanded

backwards to include input suppliers such as chemical, seed, fertilizer and fuel suppliers and forward to include agriculture processing and marketing businesses such as grain elevators and meat packing houses. These three sectors; inputs, production, and processing and marketing, together are referred to as *agribusiness*. An often controversial definition is when the wholesale and retail sectors are included, known as the *food and fiber* or *farm and food sector*. Some contend that the wholesale and retail of agriculture products are too excessively influenced by exports and imports between states to be attributed to local economies. Additionally, it is questionable if the grocery store clerk or casino waiter, which is a part of retail food distribution, should be included in the definition.

Recently, other related industries have been considered for inclusion in the definition of agriculture. Tourism related to agriculture ("Dude Ranches"), horse tracks, and "green industry" businesses are occasionally included. Sometimes industries that are not directly included are often discussed as a special component. Many of these industries have their roots in agriculture where they continue to do business. As the agriculture sector continues to change and diversify, a strict definition becomes even more difficult to maintain.

Finally, politics often influence industry studies. Those funding or performing a study may have a motivation for portraying agriculture as large (small) as possible. Industries may be included whose agriculturally related transactions make up a small percent of their total business activity. Researchers have the challenge of presenting accurate information while at the same time juggling pressure from officials to present the economic impact of agriculture as important as possible. This balance may lie in keeping

definitions, measures, and objective consistent and by learning how to better interpret and communicate their results.

To analyze the role of agriculture in an economy between years and across states, a consistent definition of agriculture is important. That is not to say that newly developed industries cannot be included, rather, if textile manufacturing is included, it should be included every year to avoid false signals about changes in the agricultural sector. Interstate or inter-temporal comparisons are also difficult to make unless the states use the same definitions. Possibly, a common normalizing function could be developed for cross state purposes, since states will likely want to maintain autonomy in their internal reports to meet local needs.

As part of an organized symposium presentation at the American Agricultural Economic Association Annual Meeting, August 7-10, 1994, all agricultural economics departments in the United States were requested to send a copy of any studies they had done on the contribution of agriculture, to Colorado State University. Thirty State or sub-state reports were collected. Although they were unable to compile a list of specific industries, they were able to amass the sectors each state included in their definition. All thirty reports included agricultural production and 87% of them included processing, marketing, and transportation. Two-thirds of the reports include agricultural inputs and only a little over half include agricultural wholesaling and retailing. Indirect economic activities (multipliers) were used in 53% of the reports and "other" indicators such as mining, tourism, fisheries and forestry are included in 46% of the reports.

The lack of a common definition and the variety of sectors included in the various reports is somewhat surprising due to the maturity of the agriculture industry. The diversity among definitions reflects differences between state economies and linkages believed to exist between sectors. It also reflects the differences in the purposes of these studies and possible "political" pressures. It is beyond the scope of this paper to offer a common definition of the agricultural industry, but understanding the options for defining agriculture and the implications for measuring it based on available data will be a factor.

PURPOSES FOR CONDUCTING IMPACT REPORTS

It is emphasized here that the definition of agriculture and the method by which it is measured depends a great deal on data limitations, purpose and audience of the report, who sponsored the research and underlying political pressures. This section briefly discusses the purposes, audiences, and sponsors for the reports and some underlying political pressures. The survey conducted by Fulton and Hoag (1994) requested information concerning the audience, distribution and use, and the financial support for the studies.

The purposes for the reports varied across states but could be placed in three categories. First, it is important to understand where and how the industry is moving. State departments of agriculture, producer organizations, and economic development institutes are interested in identifying new avenues the industry may take. These constituents may also be interested in promoting agriculture or any of its sectors, especially if the study has been funded by a producer group. Second, the university and college administrators request the studies to justify support for agricultural departments and programs at Land Grant universities/colleges. Additionally, the agricultural departments are interested in the

research to aid in creating programmatic priorities. Finally, these studies are often motivated by curiosity or the intent to familiarize the public with the significance and connection of agriculture to the economy. (Fulton et al.).

In most cases, the studies were produced by an agricultural economics department at a Land Grant University with support from the State's Cooperative Extension Office, State Department of Agriculture, local utility company, or economic development institution. Certainly all of the institutions supporting and requesting the reports have vested interests in agriculture which presents a challenge and sometimes causes controversies between the researchers and the constituents requesting the reports.

HOW TO MEASURE CONTRIBUTION

The Colorado study reported economic measures for three definitions of agriculture; production agriculture, agribusiness, and the farm and food system. Several methods were used for measuring the importance of an industry to an economy. The primary measures include: income, employment, sales, value added and economic multipliers. There are benefits and drawbacks for using each method. Most often the purpose of the study dictates the method of analysis used. Data availability and timing and computational difficulty will also influence how agriculture is defined and measured. The results of the Colorado report are presented in Table 1, and each measure is discussed below.

Employment

Employment is defined as full and part-time employees and proprietor employment in a specific industry. Historically, the generation of new employment has been a significant

measure for the contribution of an industry to an economy. However, as an industry becomes less labor intensive, or more efficient, employment measures may understate the significance of that sector. Another difficulty using employment as a measure, is converting part-time employment into full time equivalents. This is especially complex in the agricultural production sector where part-time and seasonal labor is very common.

Income

Total personal income includes wages, salaries, other labor income and proprietor income. It can be measured in absolute or relative terms. Several analysts use the definitions *agribusiness dependent* and *agribusiness important* in their reports which are relative terms. Agribusiness dependent communities are those which derive greater than 20% of their income from agribusiness industries and agribusiness important are those which derive between 10% and 20% of their income from agribusiness. The dilemma with using the dependent/important measurement is that counties with large agribusiness sectors may not be categorized dependent or important due to their relative size in the county. In Colorado, Jefferson County has the largest agribusiness sector with over \$400 million in annual income. However, agribusiness income only comprises 3.9% of the total county income which ranks it 34th for dependence in the state.

Income is also a difficult measure to use due to data availability. Sources do not exist that provide both labor and proprietor income at more than a two digit SIC level. The Regional Economic Information System (REIS) provides both at the two-digit level and County Business Patterns provides four-digit detail for labor only.

Sales

Sales are defined as gross sales from an industry. Sales is a measure that is easily understood but it counts values multiple times. Sales values of goods will include the values of all of its inputs or all of its previously produced components. For example, a product is sold to a processor for \$1.00. The processor adds value to the product and sells it for \$1.50. While only \$.50 of value has been created by the processor, the sales measure reports a value of \$1.50. The further along the production cycle, the larger the problem becomes because the number of total components becomes larger. The retail sales sector is the most over inflated by multiple counting and production agriculture the least over inflated. The Census of Manufacturing is the only census that considers this issue. It lists values of the cost of materials, shipments, new capital expenditures, and the value added by manufacturing.

Inputs which are imported to and exported from a state are an additional controversy with using sales values. States which process grain or meat often receive those inputs from other states but include them as part of their total sales. Retail outlets are the largest concern because several imports are included as part of their total sales. Imports could solely support retail sales within a county or state (Walden).

Value-added

Value-added, also referred to as gross state product, is often considered the best measure of economic importance. Value-added is derived by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments. This value is then adjusted by the addition of value added by merchandising

operations (sales value - cost of good sold). Stated another way, value added is calculated as labor and proprietor income plus indirect business taxes and non tax liability plus capital charges.

The advantage of using value-added is that it avoids the drawbacks of the other methods. Since the cost of materials are not included, multiple counting is avoided. Additionally, imports are not an issue because the cost of materials are not included. Worker productivity is reflected in value added and in fact is the largest component. Only the “value-added” to a product during a process will be accredited to that process.

Economic Multipliers

The impact of agriculture is not limited to its own activities. Regional multipliers can be used to estimate the impact of one industry on another industry, on the entire economy, or on a particular region. Every dollar earned or person employed has the potential to stimulate more income and more jobs. The impact can be in terms of output (sales), value added (incomes), or employment.

Multipliers are based on linkages or effects within the economy. Sales, employment and income created by the agricultural industry are known as direct effects. Indirect effects are the needs that a regional economy must provide to sustain one additional dollar of output from a particular industry. For example, the farming industry needs to purchase inputs from the seed and fertilizer industries. In turn, the seed and fertilizer industries will need to make purchases on their own and a succession of impacts throughout the economy will result. When the direct and indirect employees spend their earnings, they generate

activity within the local consumer services sector of the economy. Higher incomes in the region will increase the sales of unrelated items such as clothing and homes. This impact on the economy is referred to as induced effects.

In Colorado, multipliers from the agribusiness sector for sales, value added and employment range from 1.5 to 2.8. These multipliers indicate that .5 to 1.8 new jobs, dollars of sales or dollars of value added would be created by each of these economic impacts. A larger multiplier indicates that the sector directly and/or indirectly purchases a larger proportion of its inputs from within the region instead of importing them.

It is important to use care when using multipliers. Multipliers are relevant only for new activities, such as new sales from a new agricultural firm. A sales multiplier of 1.5 means that adding a \$100,000 industry would add an additional \$50,000 in final sales.

The state survey completed by Fulton and Hoag inquired as to the method(s) of analysis employed in estimating the contribution of agriculture. Of the thirty reports surveyed, employment and sales were the most popular measures being used in 24 and 23 of the reports respectively. Value added was reported in over half of the studies and income was utilized in less than half of the reports. Multiplier analysis was applied to measure agriculture's impact in half of the reports.

CONCLUSION

The economic impact of agriculture is measured in as many ways as there are reports. Why they are written and what they accomplish vary from report to report. Agriculture is evolving and changing, and consequently our efforts to define it are becoming more difficult. Supporters define agriculture broadly so its importance is maximized and

others portray agriculture narrowly. What is true, is that the concept of agriculture has changed from strictly *production agriculture* and has evolved to also include input supplier, processors, and marketers and often wholesalers and retailers of agricultural products.

The definition of agriculture and the measurement of its impact are understandably influenced by several factors including the data, timing, the purpose of the report, political pressure behind the report, and financial support for its study. Regardless, the question for researchers is, how can agriculture be defined to convey the facts in a neutral and consistent way?

Table 1: Agribusiness and the Farm and Food System Contribution to Colorado's Economy in 1992

Economic Sector	Employment	Income (\$ mil)	Value Added (\$ mil)	Gross Sales (\$ mil)
Farm Production:	46,424	\$873.0	\$937.3	\$4,115.6
<i>Percent of State Total</i>	3.4%	1.2%	1.2%	N.A.
Agribusiness:				
Agricultural Inputs	12,199	\$453.5	\$481.7	\$1,045.9
Farm Production	46,424	\$873.0	\$937.2	\$4,115.6
Processing/Marketing	27,668	\$969.0	\$2,259.4	\$8,470.0
Total Agribusiness	86,291	\$2,295.5	\$3,678.4	\$13,631.5
<i>Percent of State Total</i>	6.3%	3.2%	4.7%	N.A.
Farm & Food System:				
Agribusiness	86,291	\$2,295.5	\$3,678.4	\$13,631.5
Wholesale and Retail	168,843	\$2,720.3	\$3,286.3	\$16,189.8
Total Farm & Food	255,134	\$5,015.7	\$6,964.7	\$29,821.3
<i>Percent of State Total</i>	18.5%	7.0%	8.9%	N.A.
State Totals:	1,375,810	\$71,600	\$78,430	N.A.

REFERENCES

- Fulton, J. and D. Hoag, *Agriculture's Impact on the Economy: A survey of State Reports*, Presented at a Symposium at the 1994 AAEA Annual Meetings.
- Leones, Julie, Gerald Schuler, and George Goldman. *Redefining Agriculture in Interindustry Analysis*, Presented at a Symposium at the 1994 AAEA Annual Meetings.
- Walden, Michael L, *Valuing Agriculture: Economic Precision*, Presented at a Symposium at the 1994 AAEA Annual Meetings.