



# Development of Standard Procedures for Contribution Analysis of Agriculture and Forestry

NARSC 2016 Pre-Conference Workshop Proceedings

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## ACKNOWLEDGEMENTS

The organizers would like to thank:

Wayne Miller and Steven Deller for moderating the workshop.

Neil Reid, executive director of NARSC, for helping to put the event together.

Jenny Thorvaldson and Jimmy Squibb of IMPLAN Group, LLC

Greg Alward and David Kay of the Alward Institute for Collaborative Science

And everyone who contributed and participated in the workshop.



**Center for Agricultural  
and Rural Sustainability**



Report compiled by:

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Division of Agriculture, University of Arkansas System

## EXECUTIVE SUMMARY

The *Development of Standard Procedures for Contribution Analysis of Agriculture and Forestry Workshop* provided the opportunity for a diverse group of stakeholders to come together and discuss issues concerning contribution studies of the agriculture and forestry sectors. Those invited included university researchers, private research firms, members of government agencies, and university administrators. The objective was to assess current practices in contribution of agriculture and forestry research, with the goal of opening discussion toward the development of a standardized procedure for researchers conducting future studies.

Presentations were given by government and university stakeholders to discuss the importance of contribution studies within their fields. This was followed by an overview and comparison of published contribution of agriculture and forestry studies. These presentations further emphasized the need for a standardized protocol for contribution analysis to aid in transparency and reliability of such studies.

Members of IMPLAN and the Alward Institute for Collaborative Science were invited to discuss methods for conducting contribution analysis. They also offered insights concerning related issues such as data concerns, negative value added, and proper reporting.

Workshop participants expressed interest in the development of guidelines to be utilized and cited when conducting contribution analyses for agriculture and forestry. The need was expressed for a quick reference guide, with the ultimate goal being the production of a more expansive document, delving more deeply into the complex issues confronted by researchers performing contribution of agriculture and forestry analyses.

A DropBox file has been created, allowing researchers and other individuals to share documents relating to contribution of agriculture and forestry analysis. To access this DropBox file, email the University of Arkansas, Division of Agriculture, Center for Agricultural and Rural Sustainability at [cars@uark.edu](mailto:cars@uark.edu). There are also plans for the development of a resource website which would be periodically updated as new research and studies become available.

## ABOUT THE WORKSHOP

In 2015, a survey of academics across the U.S. was conducted to provide a baseline on how analysts conduct contribution of agriculture analysis. Independently, forestry researchers held a meeting that same year to discuss methods for conducting these analyses within the forestry sector. Responses from both groups showed much variation in methodologies between researchers, revealing a need for the development of standard procedures for conducting contribution analyses of the agriculture and/or forestry sectors. Differences in definitions of agriculture, methodological and reporting approaches make cross-state comparisons of studies difficult, if not impossible. These inconsistencies across states have created significant confusion amongst state agricultural policy makers.

To address these issues, the Center for Agricultural and Rural Sustainability (CARS) with the University of Arkansas System, Division of Agriculture organized a workshop titled **“Development of Standard Procedures for Contribution Analysis of Agriculture and Forestry”**, featured as a pre-conference workshop at the 63<sup>rd</sup> Annual North American Meetings of the Regional Science Association International.

Hosted by CARS, the Alward Institute for Collaborative Science and IMPLAN, the purpose of this workshop was to discuss current methods used in economic contribution analysis, as well as identify standard procedures for conducting contribution of agriculture and/or forestry analyses. Input from agriculture and forestry economists, as well as other stakeholders utilizing these studies was highly encouraged.

The workshop was held on Tuesday, November 8, 2016 at the Minneapolis Marriot City Center in Minneapolis, Minnesota. Twenty-six people attended the workshop, ranging from academic economists, to applied foresters, to private consultants.

## WORKSHOP AGENDA

8:00 am	<p style="text-align: center;"><b>OPENING REMARKS</b></p> <p><b>Wayne Miller</b>, Cooperative Extension Service, Division of Agriculture, University of Arkansas System</p> <p><b>Jennie Popp</b>, Professor and Area Director, Center for Agricultural and Rural Sustainability, Division of Agriculture, University of Arkansas System</p> <p><b>Steven Deller</b>, Professor, Agricultural and Applied Economics, University of Wisconsin - Madison</p>
<p style="text-align: center;"><u><b>TOPIC I</b></u></p> <p>8:05 am - 9:00 am</p>	<p style="text-align: center;"><b>IMPORTANCE AND USE OF CONTRIBUTION ANALYSES</b></p> <p><b>Stakeholder Perspectives:</b></p> <ul style="list-style-type: none"> <li><b>University Administrator</b> - Mark Cochran, Vice President for Agriculture, Division of Agriculture, University of Arkansas System</li> <li><b>Forest Economists</b> - Larry Leefers, Associate Professor, Forest Economics and Planning, Michigan State University; Henry Eichman, Economist, US Forest Service</li> <li><b>USDA Agricultural Economists</b> - Mark Peters, Agricultural Economist, Resource Economic, Analysis and Policy Division, Strategic Planning and Accountability, NRCS; Bruce McWilliams, Economist, Farm Service Agency</li> </ul>
9:00 am - 9:15 am	<p><b>Overview of Issues Concerning Contribution of Agriculture and Forestry Analyses:</b></p> <ul style="list-style-type: none"> <li><b>Leah English (Agriculture)</b> - Research Associate, Center for Agricultural and Rural Sustainability, Division of Agriculture, University of Arkansas System</li> <li><b>James Henderson (Forestry)</b> - Associate Extension Professor, Mississippi State University</li> </ul>
<p style="text-align: center;"><u><b>TOPIC II</b></u></p> <p>9:15 am - 9:45 am</p> <p>9:45 am - 10:00 am</p> <p>10:00 am - Noon</p>	<p style="text-align: center;"><b>DEFINING AGRICULTURE AND FORESTRY</b></p> <p><b>Introduction to Current Practices for Defining Agriculture and Forestry:</b></p> <ul style="list-style-type: none"> <li><b>Leah English (Agriculture) and James Henderson (Forestry)</b></li> </ul> <p><b>BREAK</b></p> <p><b>Group Discussion of Industry Definitions</b> - which sectors should be included as part of:</p> <ul style="list-style-type: none"> <li>Agricultural and Forestry Production</li> <li>Agricultural and Forestry Processing</li> <li>Ag Related</li> <li>Retail</li> </ul>
Noon - 1:00 pm	<p><b>LUNCH</b></p>

**TOPIC III**

**DISCUSSION OF POSSIBLE METHODOLOGIES TO BE USED IN CONDUCTING CONTRIBUTION OF AGRICULTURE AND FORESTRY ANALYSES**

1:00 pm – 1:30 pm

**IMPLAN Recommendations for Performing a Single/Multi-Sector Contribution of Ag/Forestry Analysis**

- **Jenny Thorvaldson** - Regional Economist and Director of Data Development, IMPLAN Group LLC
- **Jimmy Squibb** - Data Creation Specialist and Regional Economist, IMPLAN Group LLC

1:30 pm – 2:00 pm

**Alward Institute - Economic Base Contribution Method**

- **Greg Alward** - Senior Researcher, Policy Analysis Group, College of Natural Resources, University of Idaho
- **David Kay** - Senior Regional Economist, Alward Institute for Collaborative Science

2:00 pm – 2:30 pm

**Open Discussion**

2:30 pm – 3:00 pm

**Discussion of Various Issues:**

- Agricultural Employment and Wage Values - review of IMPLAN's methods for calculation and challenges facing agriculture
- Negative Value Added - causes and potential improvements
- Trade Flows
- Closing the Model

3:00 pm – 3:15 pm

**BREAK**

3:15 pm – 4:00 pm

**Discussion of Various Issues (continued)...**

**TOPIC IV**

**REPORTING OF RESULTS**

4:00 pm – 4:30 pm

**Discussion of Proper Reporting Techniques and Common Problems in Reporting**

- IMPLAN and Alward Institute

**TOPIC V**

**NEXT STEPS AND RECOMMENDATIONS**

4:30 pm – 5:00 pm

- Taxonomy - when to use different methods
- Definition standardization and reporting transparency
- Working paper
- Feedback and comments

## WORKSHOP PARTICIPANTS

Greg	Alward	Alward Institute
David	Buland	USDA - NRCS
Mark	Cochran	University of Arkansas System
Steve	Deller	University of Wisconsin-Madison
Rebekka	Dudensing	Texas A&M University
Dari	Duval	University of Arizona
Henry	Eichman	US Forest Service
Leah	English	University of Arkansas System
Essence	Hales	USDA - AMS
James	Henderson	Mississippi State
David	Kay	Alward Institute
William	Lazarus	University of Minnesota
Larry	Leefers	Michigan State University
Chelsea	McIver	University of Montana
Bruce	McWilliams	USDA - FSA
Michelle	Mensing	Decision Innovation Solutions
Wayne	Miller	University of Arkansas System
Spencer	Parkinson	Decision Innovation Solutions
Mark	Peters	USDA - NRCS
Jennie	Popp	University of Arkansas System
Mallory	Rahe	Oregon State
Michael	Retzlaff	Economic Insights of Colorado
James	Squibb	IMPLAN
Jenny	Thorvalson	IMPLAN
Brigid	Tuck	University of Minnesota
Sherry	Wise	USDA - AMS



## WORKSHOP PROCEEDINGS

### OPENING REMARKS

Moderators Wayne Miller (University of Arkansas) and Steven Deller (University of Wisconsin-Madison) opened the workshop by welcoming participants and offering an overview of the workshop agenda (see pages 5-6). Participants were then asked to go around the room and briefly introduce themselves (see page 7).

Jennie Popp of the University of Arkansas joined remotely to thank those who collaborated in putting the workshop together and opened a discussion on the importance of contribution analysis.

### TOPIC 1: IMPORTANCE AND USE OF CONTRIBUTION STUDIES

This section of the workshop functioned to highlight the importance of contribution studies and describe how they are used by various stakeholders. Some common issues and research concerns were also discussed.

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### STAKEHOLDER PERSPECTIVES

**Mark Cochran** (Vice President for Agriculture, University of Arkansas System, Division of Agriculture) joined remotely to offer insights into the use of impact and contribution studies by university administrators. He highlighted the fact that lawmakers are actively trying to provide tax incentives to bring new industry into the state. Therefore, information allowing comparisons of return on investment for attracting large scale projects into the state versus trying to grow existing industries can be highly useful. He also brought up the fact that information on the prospect of trade expansion and global markets is always something of interest within the agriculture sector.

*"It's very important to get good, consistent numbers across both geography, and across sectors in various components of doing contribution analysis. Part of that's going to be methodology. Part of that's going to be data. Part of that's going to be definitions. So I'm very very pleased that you're all together. I'm anxiously awaiting the outcome of this meeting because as a land grant university, our role is to do public science and we need to have good numbers in this economic contribution area."*

**Larry Leefers** (Associate Professor Emeritus, Michigan State University) joined remotely to give a brief presentation concerning the importance and use of forestry contribution analyses in Michigan. He offered some context regarding the needs and goals established by Michigan governor Rick Snyder at the Michigan Forest Product Summit in 2013. These included: increasing the economic contribution of the forest products industry to \$20 billion within five years, increasing the export of value-added forest products by 50% and increasing forest products industry jobs by 10%. His use of simple multipliers has been helpful in monitoring the progress of those goals.

Dr. Leefers realized the need for a systematic approach to provide a consistent source for information and monitoring. Therefore, he proposed that a systematic set of reports be produced, allowing stakeholders to take a closer look at the role of the forest industry within the state.

*"As a result, Michigan now has a consistent reporting program that's used, not only by state Department of Natural Resources (DNR), but also by the forest products industry, agriculture industry, and government officials."*

He went on to note various analysis issues such as: deciding which forestry sectors to include, how to handle sectors that have both wood and non-wood components (e.g. support activities for agriculture and forestry), how to properly analyze the sector at various scales (e.g. state, regional, county levels), what to report (e.g. value-added, output, taxes, employment), and how to properly multiply or add in contributions. Issues have also been realized in terms of terminology used to describe the analysis, effectively describing methods used, and the inability to double check data due to non-disclosure issues.

He spoke briefly on the use of the Forest Economic Analysis Spreadsheet Tool (FEAST) for modelling and contribution analysis in forestry. Then went on to discuss issues in calculating employment contributions. Three different methods for using IMPLAN to calculate employment were shown: 1) simple multipliers applied wholesale to various sectors, 2) within sector control (IMPLAN single-industry approach), 3) control among sectors (IMPLAN multi-industry approach). Results ultimately varied between methods, but Dr. Leefers highlighted the fact that:

*“State foresters and others are looking for numbers to report, to share. And they need us to provide a consistent starting point for it.”*

Dr. Leefers is pleased to see that this work is valued and will be carried on through future studies. As a result of work in this field, Michigan DNR’s Forest Resource Division has decided to create an economist position for these studies.

Going forward, he would like to see a USDA report on standard procedures for contribution analysis of agriculture and forestry. Just as the terms “Model I” and “Model II” are widely recognized among forestry economists, he believes that agreeable language needs to be developed within the context of contribution of agriculture and forestry studies.

**Henry Eichman** (Economist, US Forest Service) was present in Minneapolis to discuss how members of the US Forest Service utilize impact and contribution studies. He described how management of the Forest Economic Analysis Spreadsheet Tool (FEAST) has allowed them to standardize the process of conducting economic impact and contribution studies within their agency. He explained how FEAST is able to provide them an interface for using IMPLAN’s response coefficients, and has also allowed them to standardize the process of calculating contributions. In addition to FEAST, the Forest Service also utilizes the Treatments for Restoration Economic Analysis Tool (TREAT) for conducting some studies.

Overall, the resulting outcomes are used to provide justification for funding of programs by using the value of contributions to monitor program outcomes. The Forest Service conducts these studies at various levels (e.g. individual forest, state, national), and in varying contexts. For more information on how the US Forest Service uses these tools: <http://www.fs.fed.us/emc/economics/applications.shtml>

**Mark Peters** (Senior Economist, Resource Economics and Analysis Division, USDA Natural Resource Conservation Service) was present in Minneapolis to discuss his agency’s use of IMPLAN for performing economic analysis. The Natural Resource Conservation Service (NRCS) utilizes IMPLAN for their regional economic, program, and project analyses. This includes the examination of national and regional impacts of watershed and Conservation Reserve Program (CRP) projects, justification for local cost sharing, analysis of Resource Conservation and Development (RC&D) projects, general resource policy analysis, and state/regional planning. Economists can use IMPLAN to analyze any combination of US states or counties, making it a valuable tool for national agencies such as the NRCS.

Reports and other resources can be found by visiting the NRCS IMPLAN Analysis Site: [https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/econ/tools/?cid=nrcs143\\_0097](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/econ/tools/?cid=nrcs143_0097)

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**Bruce McWilliams** (Agricultural Economist, Economic Policy Analysis Staff, USDA Farm Service Agency) was present in Minneapolis to discuss his experience in conducting impact and contribution analyses as a member of the Economic and Policy Analysis Staff of the USDA Farm Service Agency.

The Farm Service Agency (FSA) began performing multiplier analysis using IMPLAN around 5 years to assess the Farm Service Agency's Direct Payments program. An economic impact study was performed by an outside academic group with results indicating relatively low impacts, in comparison to other studies.

*"We indicated the limitations of the numbers regarding the year of the data used in the study. They were accepted, but internally our staff at EPAS was not ready to put much stake in the multiplier analysis in general, and some were openly skeptical about the I-O Multiplier approach."*

In 2014, Dr. McWilliams was tasked with estimating the impact of the FSA within each member of the House Agricultural Appropriations Committee's congressional districts. An economic impact analysis was initially performed, but it was later decided that a contribution study might be more appropriate. Methods were devised to estimate these contributions, but were found to be different than those presented in IMPLAN's knowledge base. As FSA's Economic Policy Analysis Staff will undoubtedly be tasked with performing these studies in the future, they would like to be sure that they are using the most appropriate methods.

*"... I am here because I want to be sure I am doing it correctly and it is consistent and supported by the practices of the academic community."*

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## OVERVIEW OF ISSUES

After realizing variations in contribution methodologies between states, researchers at the University of Arkansas, Division of Agriculture, Center for Agricultural and Rural Sustainability (CARS) conducted a survey of agricultural economists to determine what methods were being utilized. After noticing similar variations in the forestry studies, forestry researchers conducted a survey and held a meeting to discuss contribution methodologies in their field. These inquiries showed that there was high variation in methodologies between researchers. This section of the workshop functioned to highlight the primary issues determined by each of these studies, including the importance of state policy makers to be able to compare and contrast their state with other states in a consistent and reasonable manner.

**Leah English** (Program Associate, Center for Agricultural and Rural Sustainability, University of Arkansas) began this discussion by presenting on the findings of the contribution of agriculture survey conducted at the end of 2015. In this presentation she discussed the differences noticed by reading various published contribution reports. One commonly noticed difference was in the use of the terms "contribution" and "impact" within the reports. This issue has been documented in the past with Watson et. al. publishing a paper titled *Determining Economic Contribution and Impacts: What is the difference and why do we care?*

A second difference noted between studies was their methods for reporting results, especially in terms of reporting output versus value added. As these values are generally showcased in reports, fact sheets, and pocket guides, it's important that the meanings of these terms are properly conveyed to the audience.



As more and more contribution reports are being published, the general public has begun to take notice. But with this notoriety comes questions concerning the validity of values put forth by researchers. For example, in 2015 the Georgia Farm Bureau released a statement saying "Agriculture contributes \$71 billion to Georgia's economy annually." This prompted a citizen to write in to the Georgia Politifact site to inquire about the accuracy of the number. Politifact ultimately deemed the statement "mostly true" due to the fact that, even after speaking to researchers, there was still some question as to how exactly the value was calculated.

The image is a screenshot of a Politifact website article. At the top left is a logo showing stylized figures. To its right, text reads: 'Agriculture contributes \$71 billion to Georgia's economy annually, making it the state's largest industry. — Georgia Farm Bureau on Thursday, January 8th, 2015 in a statement on the Georgia Farm Bureau website'. To the right of this text is a 'MOSTLY TRUE' badge with a green dot and the text 'POLITIFACT TRUTH-O-METER'. Below this is the main headline: 'Does agriculture contribute \$71 billion to Georgia's economy?'. Underneath the headline is the byline: 'By April Hunt on Friday, January 9th, 2015 at 12:00 a.m.'

Another article penned by Bob Weeks appears to suggest that Kansas lawmakers had exaggerated the value of agriculture to their state economy.

## The Kansas economy and agriculture

🕒 August 26, 2015   👤 Bob Weeks   💬 Leave a comment

*There's no need for Kansas state government to exaggerate the value of agriculture to the Kansas economy.*

A recent press release from the office of [Kansas Governor Sam Brownback](#) quoted the governor thusly: "Agriculture is our largest economic driver, bringing more than \$63 billion into the Kansas economy." ([Governor Sam Brownback visits will reinforce the importance of Kansas agriculture](#), August 17, 2015.)

While we cannot expect to appease each audience with our findings and explanations, having an agreed upon set of methods for performing these analyses may help increase legitimacy as interest in these studies continues to grow.

In terms of consistency of methodologies used between researchers, there appears to be very little. In fact, out of 18 researchers who completed the CARS contribution of agriculture survey, none performed their analyses in exactly the same way. Around half did appear to follow the general guidelines for contribution analysis offered on IMPLAN's website, but other variations occurred in the use of trade flows methods, closing the model, and selection of sectors for analysis. One of the largest differences centered on the definition of agriculture and which industries to include in the analysis.

**James Henderson** (Associate Extension Professor, Mississippi State University) continued the discussion by speaking about a recent meeting (summit) of forest and regional economists, as well as the results of a similar survey of forestry stakeholders. He noted that the meeting and survey came about after several analysts realized there were some variances in methodologies between states. At the Forest Economic Summit held in Little Rock, Arkansas in March 2015, forest and regional economists and stakeholders met to compare methodologies used to conduct economic impact and contribution analyses of the forestry and forest products industry and to determine issues needing to be resolved for a better comparison of forest economic data. The primary issues noted were:

1. Double Counting - issues here were primarily caused by the improper use of the terms "contribution" and "impact". These terms have two different meanings in production economics.
2. Modelling Assumptions - given the numerous modeling options available, an analysis can yield substantially different results from another, while seemingly examining the same industry and region.
3. Reporting in Current vs. Constant Dollar Values
4. Reporting Output vs. Gross Domestic Product (or Value Added)
5. Definition of Forestry Industries - found that different analysts include different sectors when assessing the forest products industry and that these are also aggregated for reporting differently.
6. Adjustments to the Social Accounting Matrix (SAM) - while IMPLAN defaults to household categories, some analysts include others. This is not often reported.

7. Using IMPLAN's study area data for sector values vs. Local Information - some analysts may choose to use local or primary data such as timber harvest values which are based on timber severance tax data.
8. Model vs. Result Aggregation - since IMPLAN results are calculated for each sector, results should be aggregated after the analysis to avoid aggregation bias.
9. Consistent Reporting - there are many ways to conduct these analyses using IMPLAN. Methods should be properly reported through reference to technical reports or footnotes.

Dr. Henderson then discussed the results of a survey that was sent to 60 Southern forest and regional economists and end users of forestry and forest products economic contribution reports, of which 48 responded. In terms of preferred economic indicators used in reporting, employment was most preferred, followed closely by output and value added. In terms of datasets used for forest economic contribution analyses, the majority of researchers recorded using state specific data in combination with IMPLAN's study area data. Analysts were also asked whether institutions other than IMPLAN's default SAM (households) were included when building their model, half responded no, over 35% said yes, and almost 15% were unsure.

It was noted that two articles concerning this topic are set to be published in the *Journal of Forestry*: 1) Standard Procedures and Methods for Economic Impact and Contribution Analysis in the Forest Products Sectors (Currently available online: <http://www.ingentaconnect.com/content/saf/jof/pre-prints/content-jof16041.jsessionid=3n3mpavsafvmo.x-ic-live-02>), and 2) A Synopsis of Methodological Variations in Economic Contribution Analyses for Forestry and Forest-Related Industries in the US South (In Press).

Information was also provided about a website created through collaborative efforts from the Southern Group of State Foresters and Southern Regional Extension Forestry to promote the importance of forests and the forest product industry in the Southern Region of the United States. This information can be found by going to <http://forestryimpacts.net/>.



## TOPIC II: DEFINING AGRICULTURE AND FORESTRY

One major source of contention among researchers and stakeholders appears to be the defining of aggregate agriculture and forestry sectors. While researchers seem to agree that production of agricultural and forestry products should be included in the definition of agriculture, there is some disagreement as to whether forestry should be lumped into the agriculture sector, and whether or not processing and other related sectors should be included. Recent surveys shed some light as to what researchers across the country think about this topic as this section of the workshop aimed to introduce current definitions being used by researchers and open a general discussion on the topic.

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### INTRODUCTION TO CURRENT PRACTICES FOR DEFINING AGRICULTURE AND FORESTRY

**Leah English** (University of Arkansas) began this discussion by presenting on findings from the contribution of agriculture survey, concerning the definition of agriculture in contribution analysis. Within the CARS survey, respondents were asked which of IMPLAN's 536 sectors should be included in a contribution of agriculture analysis (regardless of whether that activity took place in their state or not). When breaking down the aggregate agriculture sectors into the individual IMPLAN sectors, almost all (94%) agreed that IMPLAN sectors 1 thru 15 (crop and livestock production) and sector 19 (support activities for agriculture and forestry) should be fully included in a contribution of agriculture analysis. Although most researchers would include agricultural processing in their analyses, results show a wide variation regarding the selection of individual processing sectors for inclusion. For example, over 75% of respondents indicated that all industries classified under NAICS code 311 (Food Manufacturing) should be included in the contribution of agriculture analysis. A lower percentage felt that those falling under NAICS classification 312 (Beverage and Tobacco Product Manufacturing) should also be included. And less than 50% would include Textile Mills, Textile Product Mills, Apparel Manufacturing, Leather and Allied Product Manufacturing, Wood Product Manufacturing, and Paper Manufacturing. Forty-one percent would include sector 262 (Farm Machinery and Equipment Manufacturing), with around a quarter adding sectors 263 (Lawn and Garden Equipment Manufacturing), 267 (Food Product Machinery Manufacturing), 269 (Sawmill, Woodworking, and Paper Machinery), 459 (Veterinary Services), 469 (Landscape and Horticulture Services), and 501-503 (Food and Drinking Places). There were several other sectors that a lesser percentage of respondents felt could contribute, either fully, or partially to agriculture. In total, 164 sectors were identified as being considerable for inclusion in a state-level contribution of agriculture analysis.

**James Henderson** (Mississippi State University) also spoke about the related forestry survey. In the survey, respondents were asked which sectors they would include in a contribution of forestry analysis. Analysts completing the survey chose 33 sectors that were believed to contribute directly to the forestry and forest products industries. Of those 33 sectors, 19 were unanimously agreed upon. These include IMPLAN forestry production sectors 15 (Forestry, forest products and timber tract production) and 16 (Commercial logging). As well as IMPLAN processing sectors 134-142, 144-150, and 153. Other sectors with near unanimous consensus include sector 151 (Stationary product manufacturing), 152 (Sanitary paper product manufacturing), 368 (Wood kitchen cabinet and countertop manufacturing), 369 (Upholstered household furniture manufacturing), 370 (Non-upholstered wood household furniture manufacturing), 373 (Wood office furniture manufacturing), and 374 (Custom architectural woodwork and millwork).

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## GROUP DISCUSSION OF INDUSTRY DEFINITIONS

The floor was open for discussion of sectors that participants felt should be included in either a contribution of agriculture or forestry analysis. Although there was some consensus on certain topics, it appears that this area requires further discussion.

One topic under consideration was whether forestry should be included within contribution of agriculture reports. The general consensus was that forestry could be included in a contribution of agriculture analysis. However, many expressed the belief that, if included, forestry should be delineated as a separate category from agriculture. For example, a more accurate title for a report including forestry would be *Economic Contribution of Agriculture and Forestry to the Arkansas Economy*, as opposed to simply *Economic Contribution of Agriculture to the Arkansas Economy*.

The inclusion of commercial fishing, hunting and trapping (IMPLAN sectors 17 &18) was brought into question. While arguments could be made against this inclusion, participants were in general agreement that they could be included. In some cases, these sectors have been further defined as “ag related” activities.

The question was raised concerning the inclusion of processing within a contribution of agriculture analysis. Some expressed concern that including processing sectors, could overstate the contribution of agriculture in region. An argument made for the inclusion of processing is that, without the presence of agriculture, these firms would likely not be operating in a specific region. However, the point was made that globalization has allowed many firms to operate outside of their primary input regions. In growing cases, this is allowing processors to source the majority (if not all) of their inputs from other regions. If this is the case, does that really amount to a contribution of agriculture, or is this simply classified as manufacturing? Similar to the previous response to the forestry question, there was a general consensus that processing could be included, given that its presence is made clear to the audience.

Within the discussion of processing sectors to be included, some were hesitant to approve inclusion of the various fiber and clothing processing sectors (IMPLAN sectors 112-133). States producing cotton felt that these were as practical to include as other processing sectors. Others were unsure. It was suggested that those including fiber processing should make this clear, possibly labelling their report as an analysis of “Food, Fiber, and Forest Industries”.

The inclusion of other sectors, such as Electric Power Generation – Biomass (47), Manufactured Ice (107), Other Basic Organic Chemical Manufacturing (165), Farm Machinery and Equipment Manufacturing (262), and Landscape and Horticultural Services (469) was debated. The general consensus was that these should not be included in a contribution of agriculture study, unless specific justification was provided for their inclusion. There was also a general consensus that the retail and service sectors should not be included in the definition of agriculture and forestry.



### TOPIC III: DISCUSSION OF POSSIBLE METHODOLOGIES TO BE USED IN CONDUCTING CONTRIBUTION OF AGRICULTURE AND FORESTRY ANALYSES

As the agriculture and forest surveys pointed out, there is much variation among methodologies used by researchers conducting contribution analyses. In this section of the workshop, members of IMPLAN Group, LLC and the Alward Institute for Collaborative Science were asked to address various issues and present suggested methods for conducting contribution analyses.

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#### DISCUSSION OF VARIOUS ISSUES

It was felt that it would be practical to discuss a few issues prior to delving into methods used in contribution analysis. Jenny Thorvaldson and Jimmy Squibb of IMPLAN led this discussion on the following topics.

##### IMPLAN Data Values

Many researchers have realized the difficulty of accurately estimating agricultural values. Much of this is caused by a lack of available agriculture data, especially when it comes down to individual farming sectors. The widespread use of IMPLAN has resulted in two areas that are traditionally controversial: (1) the reasonableness of the multipliers associated with agricultural and food processing and (2) the accuracy of the base or core data. To begin the discussion, Mr. Squibb took some time explaining IMPLAN's methods for estimating the agricultural values found in their datasets:

IMPLAN data come from many sources and in different formats. Source data may come as published data, sets of relationships, or as estimates. Constructing a database means gathering data from the various sources, estimating the missing pieces, and converting them all to a consistent format, all the while controlling it with other data to maintain accuracy. This process begins with the development of production functions. BEA's Benchmark I-O Tables are used as a basis for these functions. However, as the tables are based on national averages and are only updated every 5 years, IMPLAN must make adjustments to reflect the annual, sub-national scenarios.

In terms of agricultural employment and income, IMPLAN must use multiple sources to determine their per sector values. This begins with use of the BEA Benchmark I-O tables. From there, IMPLAN obtains values for Output, Employee Compensation, and Gross Operating Surplus for each sector. While these data don't directly supply usable values, they are combined with data from other sources from the same data year (in this case 2007) to create ratios that are used in their annual data creation process as shown in the following steps:

1. Discover the relationship between Output and Employee Compensation (EC) per farm sector. The BEA benchmark provides both of these values.
2. Determine Employee Compensation per Wage and Salary (W&S) Worker for each farm sector. Employee compensation can be found in the BEA Benchmark tables, but employment is a bit trickier to determine. To get their "benchmark" W&S employment by farm sector, IMPLAN begins with the 2007 BEA REA "All Farm" W&S employment value. Since this is an aggregate value, 2007 BLS CEW data for "# of employees" by farm sector are used to distribute the "All Farm" W&S employment value obtained from the BEA REA data into individual ag sectors. Data on farm counts by farm type are used to distribute BEA REA proprietor count for the "All Farm" group to individual agricultural sectors. These employment estimates are then used in combination with the BEA Benchmark's employee compensation values to calculate IMPLAN's Employee Compensation-per-Wage and Salary Worker ratios for each farm sector.

3. Determine Proprietor Income (PI) per Output for each farm sector. The BEA Benchmark doesn't offer a value for proprietor income but does give Gross Operating Surplus (GOS) which is the sum of proprietor income and other property income. To determine proprietor income for each farm sector, the "All Farm" PI value from the 2007 BEA REA data is used to generate an agriculture-wide ratio between PI and GOS. This is used to distribute the most recent BEA REA "All Farm" PI amongst the 14 farm sectors. These PI estimates are then combined with the BEA Benchmark Output data to calculate PI-per-Output ratios for each farm sector.
4. Determine Output per Proprietor for each farm sector. We estimate Benchmark Proprietor Employment by distributing 2007 BEA REA farm proprietor employment based on the farm count per farm sector from the 2012 Census of Agriculture. We then combine these Benchmark Proprietor Employment estimates with the BEA Benchmark Output data to calculate Output-per-Proprietor ratios by farm sector.

Since BEA does not offer disaggregated I-O tables annually, ratios calculated from the most recent release are used with annual data to determine yearly values. USDA ERS and USDA NASS provide annual state-level output estimates. NASS value of production numbers are the primary data source with gaps being filled by ERS cash receipt and/or Census of Agriculture estimates. State values are distributed to the counties by using the ratio of county physical production to state physical production from the latest Census of Agriculture (in this case 2012).

These new output values are used with the previously discussed Benchmark ratios to determine annual employment and income for the given data year.

It was noted that IMPLAN's employment values are head counts, not full-time equivalents.

#### **Negative value added**

Several researchers have found sectors exhibiting negative value added totals that are seemingly unreasonable. In general, value added can be found by subtracting the cost of intermediate inputs from total value of production. Value of production is not necessarily the same as sales (revenue), particularly in sectors where a portion of the production is often put into inventory and/or consumed on-farm. Just to note, total output measures total value of production, without subtracting the cost of inputs. In IMPLAN, value added is calculated by taking the sum of employee compensation, proprietor income, other property income, and taxes on production and imports net of subsidies. A cause of negative value added could be the subtraction of subsidies from the taxes on production and imports portion of the value added calculation.

Some participants believed it reasonable to subtract subsidies from value added, however many expressed concern over the fact that the amounts were not matching the state-level values listed in available subsidy datasets. IMPLAN had been obtaining these values from the BEA Benchmark tables which are built at the national level and updated every 5 years, therefore differences in state subsidy rates may not have been accurately captured by these values. In an attempt to correct this issue, IMPLAN now incorporates ARMS data in to their datasets. It's expected that this should allow a more precise level of control when looking at subsidies allotted among states.

Although the subtraction of subsidies from value added seemed reasonable to some, a point was brought up about the value of subsidies to regional economies. As farmers often base decisions on the availability of subsidies and as subsidy money often comes from outside of the study area, the question was raised as to whether this should be seen as a benefit to the regional economy?

### Trade flows method

The CARS contribution of agriculture survey revealed that various trade flows methods were being utilized within IMPLAN to perform the same type of analysis. Ms. Thorvaldson explained IMPLAN's trade flow options and offered suggestions for their proper use. IMPLAN's National Trade Flow model is a gravity model which allows for multiregional input-output analysis. It accounts for cross-hauling which shows exports of industry goods, as well as imports from the same industry. This model is believed to have several strengths over the Econometric RPC method. In general, use of IMPLAN's National Trade Flow (gravity) model was recommended for all analyses, with the exception of those examining congressional districts and/or zip code level studies, since trade flow data are not available at those geographic levels. In those instances, Econometric RPC would be the suggested method.

### Closing the model

Recent surveys also revealed variation in closing the SAM, with some only using the default "households" selection, while others included additional income categories such as state and local government, federal government, enterprises, capital, and inventory additions/deletions. This selection is left to the judgement of the researcher, but it's important to consider what's practical for the region being analyzed.

For instance, for a state-level study, it would seem practical to include the default household spending, as well as state and local government spending. This is because it can be assumed that most state and local government funds generated by an event would be spent within that state. In this case, federal government should not be included, as it would be impractical to suggest that the entirety of this money would be spent within the individual state being analyzed. The same would go for a county-level analysis. In a county-level analysis it would likely be impractical to include state and local government multipliers when this spending would occur statewide, as opposed to all in one county.

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### IMPLAN RECOMMENDATIONS FOR PERFORMING A SINGLE/MULTI-SECTOR CONTRIBUTION OF AG/FORESTRY ANALYSIS

Purpose is to quantify the output of other sectors that is required to maintain an industry's current level of output. Jenny Thorvaldson discussed the basic methodology behind IMPLAN's contribution analysis:

1. Ensure that the industry produces just one commodity.
2. Do not allow local purchase of that commodity.
3. Run an analysis of the industry's entire current value of output.
4. The industry will still purchase all commodities in the same proportions, but it will not be allowed to make any local purchases from itself.

Basically, how does this industry contribute to other activity in the region?

IMPLAN has a single-industry contribution method, as well as a multi-industry contribution method. These methods are said to be equivalent in terms of overall results. Both methods show the effect of removing an industry/industries from a region, therefore it was suggested that this method be termed "extraction contribution".

A breakdown of methods for this type of analysis can be found by visiting IMPLAN's support page or by contacting [support@implan.com](mailto:support@implan.com). Related documents can also be found in the Economic Contribution Workshop DropBox (email [cars@uark.edu](mailto:cars@uark.edu) for access).

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## ALWARD INSTITUTE - ECONOMIC BASE CONTRIBUTION METHOD

Greg Alward took some time to discuss the Economic Base Contribution method.

Dr. Alward began by discussing the meaning of contribution analysis. He proposes that the term Economic Contribution should be used to describe the significance of an industry's role in the structure of a regional economy. He goes on to discuss how contribution can be measured in two dimensions:

1. Export Expansion - driven by exogenous demand and measured as the portion of an industry's output necessary to deliver final demand, including backward linkages to contributing supply chain industries
2. Import Substitution - driven by endogenous intermediate demand from within a regional economy and measured as the portion of an industry's output necessary to deliver intermediate demand with forward linkages resulting from supplying inputs to other industries

Essentially, export expansion looks at how much money is brought into a region as a result of an industry, while import substitution shows how much money is kept in a region by the presence of the industry.

The traditional Leontief inverse model offers a value of gross output in response to a known final demand. While the economic base contribution model gives a matrix of output, allowing analysts to view both gross and base output. If values in the economic base matrix were summed, you would get the same gross output as the traditional Leontief model. So analysts will still elicit the same gross output results as the previous model, but they can also see the amount of production that was internal to the economy by examining newly generated "base output" columns for each industry. This method provides a 2-dimensional description of each industry's contribution by showing the final demand contribution (base output) and intermediate contribution (gross output).

More information on this method can be found in the paper by Watson et al. titled *A Method for Improving Economic Contribution Studies for Regional Analysis*:  
[http://ageconsearch.umn.edu/bitstream/243975/2/jrap\\_v45\\_n1\\_a1\\_watson\\_et.al.pdf](http://ageconsearch.umn.edu/bitstream/243975/2/jrap_v45_n1_a1_watson_et.al.pdf)

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## DISCUSSION OF METHODS

Time was spent discussing the economic contribution methods presented by representatives from IMPLAN and the Alward Institute. Based on the discussion, it appears evident that some clarification is needed in defining what makes up a contribution analysis. Each method shows value in terms of performing economic analyses, however the decision to use choose an economic method is ultimately left up to the researcher. At present IMPLAN's "extraction" method appears to be the most widely used method for contribution of agriculture and forestry analysis, especially when being conducted at the state-level. Several participants, however, expressed interest in learning more about economic base contribution analysis, particularly for use in more detailed regional economic analyses. In any case, participants agree that methodologies and assumptions should be clearly defined when reporting results. For example, David Kay mentioned that the economic contribution associated with hypothetically extracting an industry from a region (ex ante) is *not* the same solution as the economic contribution associated with the existence of an industry in a region (ex post) because each methods involves a fundamentally different equilibrium point. Because of important methodological distinctions like this, it's crucial that the various methods described as "contribution analysis" be fully vetted in order to better understand the mathematical procedure involved and the specific research question that each procedure addresses. The Alward Institute maintains that the economic base contribution method is the only method that accurately measures the ex-post contribution associated with the existence of an industry because the procedure doesn't require changes to the underlying historical data or equilibrium point. In the case

where the research question is “what is the economic contribution of an existing industry” the economic base contribution method is the only procedure that can correctly answer this particular question.

Further analysis of these methods can be found in the Economic Contribution Workshop DropBox (email [cars@uark.edu](mailto:cars@uark.edu) for access)

## TOPIC IV: REPORTING OF RESULTS

As variation in reporting was found to be an issue among contribution studies, it was recommended that this be discussed.

### DISCUSSION OF PROPER REPORTING TECHNIQUES AND COMMON PROBLEMS IN REPORTING

This topic was touched on in the opening discussions, but Jenny Thorvaldson of IMPLAN went on to speak a bit more about reporting of results. She highlighted employment and output as two main areas to approach with caution. One of the trickiest things to report and interpret in IMPLAN is employment. Jenny stressed the fact that IMPLAN employment figures are head-counts, as opposed to full-time equivalents. Mix of full-time, part-time, and seasonal employment. Additionally, she pointed out that while IMPLAN estimates resulting jobs, it's not necessarily realistic to assume that these will all be newly created jobs. In some instances, there might simply be an increase in hours worked of existing employees, as opposed to the hiring of a new employee. She noted that employment includes both wage and salary employment, and proprietors. So, if you try to divide IMPLAN's Employee Compensation value by employment, you will be underestimating the compensation per employee value since proprietors are included in the employment number, but their income is not included in employee compensation.

She also spoke a bit about Output. One issue with reporting Output is that it essentially double counts inputs. This also is not as well understood as Value Added which can be related to GDP. IMPLAN appears to promote the reporting of Value Added over Output and this seems to be the consensus among most of the present researchers.

There is, however, some concern that it might be difficult for some researchers to transition from reporting Output to Value Added since this would inevitably result in lower reported values. One participant also brought up the point that some of the terms used in reporting can mean different things to different groups. For example, in the context of contribution/impact analysis, income generally refers to wages and salaries. But to many others, income means sales, or money brought in by the business. Or in terms of value added, for many, this means adding value to a product, as opposed to the analysis definition of employee compensation, proprietor income, other property type income, and taxes on production and imports.

Overall, the consensus appeared to suggest that value added was the preferred economic value for reporting, as it aligns closer to GDP. In either case, it's important to properly define the value being reported, or at least provide reference to a more comprehensive report where methodologies and results are accurately defined. Ultimately, it's important to have an understanding of what the numbers mean and to be able to properly communicate this to stakeholders.

## TOPIC V: NEXT STEPS AND RECOMMENDATIONS

In terms of moving forward, many have expressed interest in the development of guidelines to be utilized and cited when conducting contribution analyses for agriculture and forestry. The need was expressed for a “cookie cutter” guide that could be used by individuals to quickly reference when conducting these analyses. The ultimate goal, however, would be to produce a more expansive document that delves into more complex issues confronted by researchers performing contribution of agriculture and forestry analyses. The following are suggestions presented by workshop participants:

- White paper to be circulated to the group
  - Why do we do contribution analysis?
  - Matter of definition
  - Basic Approaches
    1. Head count
    2. Scalar multipliers
    3. Contribution analysis
    4. Export impacts
  - Warnings and Misuses
- Perhaps a journal article (“methods” have stood the test of peer review)
- Possible USDA ERS publication
- Development of an on-line depository of information and examples related to contribution of agriculture studies, similar to that created by forestry groups (<http://forestryimpacts.net/>)