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Technical Note: 200-ECN-2 **Date:** December 5, 2014
Subject: ECN – Guidelines for Economic Impact Analysis with IMPLAN

Purpose. To distribute the attached Technical Note, “Guidelines for Economic Impact Analysis with IMPLAN.”

Expiration Date. Effective upon receipt.

Explanation. This technical note is one of a series—it was developed to guide NRCS staff in using IMPLAN appropriately and consistently. The diversity of NRCS conservation programs and projects to which IMPLAN can be applied makes it difficult to define a single recipe to follow for all analyses. This guidance focuses on general principles that need to be followed when conducting economic impact analysis with IMPLAN. It assumes that readers are familiar with IMPLAN and how the model is to be used.

Distribution. This directive is available on the NRCS Electronic Directives System Web site at <http://directives.sc.egov.usda.gov/>.

Filing Instructions. Due to printing and distribution costs, the availability of this information is limited to electronic format.

Contact. For assistance, contact Mark Peters, Senior Economist, Resource Economics and Analysis Division, at (301) 504-1564 or by email at mark.peters@wdc.usda.gov.

/s/

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Attachment

DIST: R, S, L, and National Center Director

Guidelines for Economic Impact Analysis With IMPLAN

I. Purpose

NRCS economists typically use IMPLAN to estimate the economic impact of NRCS conservation expenditures. IMPLAN's detail, scalability, and ease of use make it a flexible model that can generate results for any size project. Used properly, IMPLAN provides valuable information on the support that NRCS expenditures provide to local, State, and regional economies.

This technical note was developed to guide NRCS staff in using IMPLAN appropriately and consistently. The diversity of NRCS conservation programs and projects to which IMPLAN can be applied makes it difficult to define a single recipe to follow for all analyses. So, this guidance focuses on general principles that need to be followed when conducting economic impact analysis with IMPLAN. It assumes that readers are familiar with IMPLAN and how to use it. For detailed IMPLAN terminologies and analysis techniques please consult the IMPLAN.COM Web site.

II. Background

IMPLAN is an input-output model. Input-output models trace the flow of goods and services through the economy. They are typically used to analyze the impacts of an influx of government or private expenditures into a community or regional economy on consumption, net output, and jobs.

The input-output table (see figure 1), the core of the input-output model, contains one column and one row for each sector of the economy. The rows typically represent the amount spent for a commodity or service by all other industries or institutions, including households, businesses and government, while the columns represent each industry's or institution's expenditures on commodities and services, and the wages and taxes it pays. The model is general since it accounts for all sectors in a national or regional economy. Across the rows, Total Gross Output equals the market value of all commodities and services produced including the total market value of intermediate inputs (products). Total Gross Output can also be measured down the columns as expenditures on intermediate inputs (products) plus Value Added (compensation paid to labor, taxes paid, and profit). Private consumption expenditures (PCE), private fixed investment (PFI), Net Exports, and Government (Govt.) represent institutions. They are the final users of goods and services. Value Added equates to Final Use or gross domestic product (GDP). Neither Value Added nor Final Use includes the value of intermediate products used in the production of commodities.

Value added as a measure of economic activity measures the value of what is being added in each stage of the production process to the commodities and services already produced. Thus, value added represents the total amount of additional or new economic activity that occurs from a given influx of funds. Total gross output also measures economic activity, but in terms of total revenue or sales. Thus, total gross output represents not only the amount of additional or new economic activity, but also the amount of economic activity that was produced in an earlier stage of production and in that sense already exists. Since value added is a subset of total gross output it will always be smaller than total gross output. Of the two indicators value added represents the more accurate measure of new or

Figure 1. Structure of Input-Output Model

		INDUSTRIES										
		Agric.	Constr.	Mfg.	Trans.	Trade	Serv.	PCE	PFI	Net Exports	Govt.	Total
COMMODITIES	Agriculture	Intermediate Inputs						Final Use				Total Gross Output
	Construction											
	Manufacturing											
	Transportation											
	Trade											
	Services											
	Compensation	Value Added						GDP				
	Taxes											
	Gross surplus											
	Total	Total Gross Output										

Source: Bess, 2011

additional economic activity resulting from an influx of funds or investment. Total gross output overstates the amount of additional or new activity because it counts products used as intermediate inputs more than once. First when they represent new or additional activities and again every time they or a product they were used to produce is used in the production of another good or service.

As shown in the input-output table in figure 1, an increase in expenditures on agricultural commodities not only affects the production of the agriculture sector, but will also cause an increase in production of those industries, such as construction, manufacturing, and transportation, that produce the inputs used by the agriculture sector. IMPLAN tracks the impacts of these increases through the economy back to the point where inputs to production are purchased. It does not track the impacts up through the economy from the point where the initial change occurs. That means that while it captures the increase in PCE resulting from increases in compensation to workers in agriculture, construction, etc., it does not capture the changes in PCE needed to absorb the increase in agriculture production. It also does not analyze how the increase in demand for inputs or immediate products changes their prices.

III. Appropriate use

IMPLAN is useful for tracking the economic impacts of conservation program expenditures beyond the farm or ranch and into the surrounding community and economy. However, IMPLAN does place restrictive assumptions on production, consumption, income and input supply, including fixed proportion production technology, constant returns to scale, no factor substitution, no product substitution, fixed prices, and no supply, income, or budget constraints. Consequently, IMPLAN should only be used when analyzing scenarios with little or no changes in underlying supply or demand functions. Also, IMPLAN should not be used to analyze the economic impacts of expenditures that will result in changes in input or product prices or will be affected by constraints on the supply of resources.

IMPLAN is better suited for analysis of the economic impacts of small to medium size projects than large projects. Small or medium refers to the size of the shock relative to the size of the markets or the major

sectors being affected. They do not refer to geographic scope. For example, if the size of an economic impact is large enough to cause changes in product prices, household allocation of consumption expenditures, or aggregate income, then IMPLAN should not be the only model used. For relatively large projects, analysts may wish to use other models. Most NRCS activities cause little change in product prices and only affect a small percent of any particular industrial sector.

When looking at the impact of Federal spending, IMPLAN does not consider the impact of how the spending is funded. This is not a major issue for NRCS when looking at State or regional impacts, or even national impacts when looking at impacts of NRCS expenditures in isolation. It does become an issue when looking at the impact of NRCS expenditures nationally in conjunction with other Federal spending. The first time IMPLAN was used by NRCS for a national analysis was when analyzing the impacts of the 2009 stimulus bill. This was deemed appropriate in this instance because of the collapse in investment demand and the belief that resources were not being fully employed during the economic crisis. In addition, IMPLAN should not be used within the National Economic Development (NED) account of Watershed Plans (under the 1983 P&G), but has utility while developing the Regional Economic Development (RED) account. IMPLAN should also not be used for analysis of social benefits or costs under OMB Circular A-92 (see Section 6.b.1, “Multiplier Effects”). Generally, analyses should treat resources as if they were likely to be fully employed. Employment or output multipliers that purport to measure the secondary effects of government expenditures on employment and output should not be included in measured social benefits or costs.

IV. Sorting NRCS Budget Data for Analysis

According to Title 340, General Manual, Part 413, all NRCS budget analyses with the IMPLAN Model must use data obtained by the Resource Economics and Analysis (REA) Division. NRCS budget expenditures (payments) should be used, not obligations. Payments provide measurable impact to local economies. Obligations are not a guarantee of economic impact in regional economies since they can be canceled, modified, or spread over a period of time. Obligations should not be used as source data for IMPLAN analysis unless providing an analysis of the likely impacts of funds allocated to a program or project in a given year. In this case it should be noted that actual expenditure of funds may be smaller than the funded amount.

NRCS budget expenditures are contained in the Financial Management Modernization Initiative (FMMI) data system. Expenditure information is sorted by program, unit, and State in the database. Additional data on payments is found in the NRCS Program Contracts System or ProTracts. IMPLAN analysis uses both FMMI and ProTracts data to estimate regional economic impacts depending on program. Fiscal year data is generally available ten weeks after the close of the previous fiscal year.

Although many programs like EQIP provide a payment rate as an estimated percent cost of the total practice cost, NRCS should not include estimates of the landowner share of costs within the analysis. NRCS payments represent new funds coming from outside the region. The funds for the landowner share of the cost of installing the practice are viewed as coming from within the region and likely replacing other farm expenditures that would occur that year.

Requesting Data

Data requests to the REA Division should allow for 2 weeks data processing time. The request should clearly specify the following FMMI query sort terms:

- Programs
- Division, unit, or State
- Fiscal year
- Expenditures (not obligations)
- Business object codes (BOCs)
- Payments and practice codes for ProTracts queries

ProTracts requests need to emphasize payments made on certified practices—not planned practices. NRCS does not estimate landowner in-kind contributions for regional economic analysis with IMPLAN.

Budget Data Translation

The Resource Economics and Analysis (REA) Division performs all sorting of budget data for national, State, and special initiative analysis with IMPLAN. Technical assistance (TA) data is found in FMMI. This data is translated from BOCs to IMPLAN sectors. Financial assistance (FA) data for ProTracts programs (e.g., EQIP) is translated from practice code totals to IMPLAN sectors. Other FA expenditure data for non-ProTracts programs, easement programs or local contracts is recorded in FMMI.

The REA Division has developed a useful annual IMPLAN data tool that has the data and queries for most IMPLAN analyses. This tool should be ready each December for the previous fiscal year for regular IMPLAN users. Cross-reference tables for translation of TA and FA budget codes to IMPLAN sector codes are maintained and updated within the current IMPLAN data tool.

V. IMPLAN Analysis Procedure

Although most of NRCS payments go directly to participants, the economic impacts of the expenditures are not analyzed by applying these expenditures directly to the agricultural sectors they are a part of. The impact of NRCS expenditures are analyzed instead by increasing the demand for the inputs used to implement the conservation practices. This is because the payments only increase the demand for only a portion of the inputs used in the production of agricultural products. In addition various features of the NRCS conservation programs require that the expenditures in these programs be handled differently than the way the expenditures are handled generally.

Treatment of NRCS Financial (FA) and Technical (TA) Expenditures

Financial assistance and technical assistance expenditures are generally made in the year the financial conservation practices are installed and consequently it's possible to represent the economic impact of the expenditures by distributing them to the IMPLAN sectors that provide the inputs and services used to install them. The method to follow to do this are listed below.

- Assign FA and TA expenditures to the appropriate industrial/commodity sector in IMPLAN according to the cross-reference tables for BOC and practice codes.
- Do not include landowner cost-share when estimating economic impacts. This is based on the assumption that participant and partner contributions represent funds that would have been put to other uses and as a result do not lead to increased demand in the study area.
- Do not include expenditures through the Conservation Reserve Program (CRP). CRP is administered by Farm Services Agency (FSA) and since NRCS is reimbursed by FSA for its technical assistance to this program, technical assistance expenditures should be attributed to FSA. Sometimes it is desirable to include CRP in the estimation of the impacts of all USDA conservation programs. In this case information on payments to producers will need to be obtained from the Farm Services Agency to get a complete picture.
- Divide Conservation Stewardship (CSP) payments into stewardship (existing practices) and enhancement (new practices) payment categories based on their share of total payment points¹. Assign the enhancement portion of payment to the appropriate IMPLAN industrial/commodity sector according to the cross-reference tables for BOC and practice codes and assign the stewardship portion of the payment to the Proprietor Income sector in IMPLAN².

Treatment of Easement Payments

Easement payments for the Agricultural Conservation Easement Program (ACEP) and its predecessor programs, the Farm and Ranch Lands Protection Program (FRPP), Grassland Reserve Program (GRP), and Wetlands Reserve Program (WRP) all need to be handled carefully. Results from recent surveys of participants in agricultural easement programs in Ohio³, New York⁴, and the FRPP, indicate that participants put their easement payments towards several purposes or uses, some of which do not have

¹ Because payments are based on environmental benefits and not the cost of implementing the enhancements this division is likely inaccurate. Information about the costs of implementing an enhancement which could be used to more accurately allocate the payment between stewardship and existing is not currently available.

² Only the portion of the payment that goes towards the implementation of enhancements generates direct economic impacts. The stewardship portion of the payment has no direct economic impact, but does induce increased economic activity through its impact on proprietor income. Also, the CSP payments do not include payments delayed into the next fiscal year at the request of the landowner. The level of CSP payments reflect expenditures as reported in ProTracts.

³ Clark, Jill. (2010). *Ohio's Agricultural Easement Purchase Program: From Pilot to Permanent Presence--A Survey of AEPP Participants*. Columbus, OH: The Ohio State University.

⁴ National Agriculture Statistics Service (2010), *The New York Farmland Protection Study, 2009*. Albany, NY: United States Department of Agriculture.

an economic impact. Possible purposes for the payment identified by in the surveys include putting money towards savings and retirement funds; purchasing stocks, bonds, and other financial investments; meeting household needs; paying down debt; buying more agricultural land; constructing or repairing buildings; purchasing or repairing farm equipment; and putting it towards other farm expenditures. The FRPP study, [Impacts of the Federal Farm and Ranch Lands Protection Program: An Assessment Based on Interviews with Participating Landowners](#)⁵, provides information on recipient's intended uses and their order of priority nationally. The information in the study was used to estimate the allocation of payment to each use. The percentage of the easement payment going to each use are reported in table 1 and are recommended as the default allocation for easement payments⁶.

This method addresses the easement payments to the landowner. Additional analysis may be needed to look at the impacts of changes in land value or land usage. IMPLAN can easily be used to measure the impact of loss of cropland with a wetland ACEP easement by reducing the demand for crop or livestock production resulting from the

Table 1. IMPLAN Sectors and percentages used for ACEP Easement Payments

Sector #	Sector Description	Percent of Payment
0	Savings, Investment, Banking, Real Estate; No Impact	58%
10007	Household Spending	14%
36	Construction	7%
203	Farm Equipment	7%
19	Ag. Services	<u>12%</u>
		100.0%

decrease in cropland. There are examples in the literature of this approach with both the old WRP and the CRP.

In some situations, specific information on the spending behavior of NRCS easement recipients may enable these payments to be analyzed in an alternative way to the default method. In these situations the method used to measure recipient spending needs to be documented and the results compared to results obtained using the default method.

The REAP Strategic Information and Data Team have developed a national database to assist the analyst with the translations between spending and IMPLAN sectors.

Running IMPLAN

⁵ Impacts of the Federal Farm and Ranch Lands Protection Program: An Assessment Based on Interviews with Participating Landowners, <http://www.farmlandinfo.org/FRPPImpacts>, survey developed by the American Farmland Trust and Dr. J. Dixon Esseks at the Center for Great Plains Studies of the University of Nebraska-Lincoln.

⁶ This represents a departure from previous practice under which the easement payments were treated as additions to household income.

Economists must define a study area in the IMPLAN model to represent the county, State, congressional district, or region to be analyzed. The study area can be any grouping of counties, States, or both. The analyst works with datasets that show fiscal year, program, and division expenditures. All BOC and practice codes are translated annually into IMPLAN sector codes. IMPLAN events are then defined as these NRCS expenditures by IMPLAN sector. IMPLAN activities and scenarios can group events by program or other administrative category.

Alternately, a multiplier for each relevant IMPLAN sector is modeled for the defined study area and then used in a spreadsheet to estimate economic impact by State, program, or division. In many cases, this second approach is more efficient due to the complexity of program fund codes and activities within States and divisions. Some notes on estimating economic impacts by NRCS program or category:

Multipliers

IMPLAN multipliers are used to estimate the regional economic impacts resulting from a change in final demand and measure the direct, indirect and induced effects of an economic impact. Once a study area is defined, the IMPLAN model calculates a set of multipliers for all the industrial and household sectors. Higher multipliers, and therefore more economic impact, occur when a more diversified economy supplies more inputs to production without leakage from the region. This implies that multiplier effects are greater in larger regions with a number of vibrant economic sectors participating. Suppliers to primary industries are measured by indirect multipliers; household impacts are estimated by induced multipliers. A ratio of jobs support to the level of impact is also calculated for each industrial or household sector in the study area. Once calculated by the IMPLAN model, these multipliers can be applied to any level of economic impact in each industrial or commodity sector.

Industrial vs. Commodity Basis

IMPLAN allows expenditures to be allocated on an industry or commodity basis. If the expenditures are on a commodity basis, IMPLAN will allocate funds to all industries producing that commodity based on the industry's share of production. If the expenditures are input on an industry basis, IMPLAN will allocate all the expenditures to that specific industry. All expenditures should be put in on a commodity basis unless the analyst knows the specific industry from which the purchases will be made.

Construction, most agricultural sectors, and some service sectors are only industries. Specific guidance by practice and NRCS expenditure category is given in the REA data IMPLAN tool.

Regional Purchase Coefficient (RPC)

IMPLAN defines regional purchase coefficients (local purchase percentage) for all commodities and industries. These are used to determine how much of the expenditures on a commodity or products of an industry stay within the region. IMPLAN's regional purchase coefficients are derived from the available data and represent the typical allocation of expenditures for a commodity in the defined

region. For this reason they should be used at all times unless the analyst has information indicating that the proportion of expenditures staying in the region will be different⁷.

Margins

Margins represent the proportion of total cost above the cost of production that goes to making the product available for purchase. They are applied to items purchased from a retailer or wholesaler. Margins should be used for all commodities for which they exist in IMPLAN. Items such as real estate services, automotive repair, and medical services are purchased directly from the producer of these services and consequently require no margin to be applied. Other items like farm supplies, gasoline, and office supplies are typically purchased through a wholesaler or retailer and need to apply the margin.

VI. Using and Interpreting IMPLAN Results

IMPLAN produces several indicators of economic activity. Output in IMPLAN represents “total sales.” This is useful for looking at impacts on industries, but is not the same as Gross Domestic Product and does not represent the increase in new economic activity in the study area. To represent changes in new economic activity, analysts should use “value added” (wages, profits, rental income, and local taxes). This matches GDP and provides a more accurate estimate of new economic activity within the economy.

Results of the analysis, whether output or jobs, should not be reported as net, new, or additional. IMPLAN can only be used to calculate the amount of jobs and output needed to support a given level of expenditure. IMPLAN does not have the ability to determine whether the jobs or output are new or already existed and are simply being reallocated from other uses discuss

Input-output models such as IMPLAN assume limitless supply of the factors of production. Jobs supported should be reasonably consistent to the size of the relevant labor market. If the number of jobs is disproportionate to the labor market, then where these jobs are coming from will have to be explicitly addressed in the analysis using methodology from more complex IMPLAN modeling (see IMPLAN.com for examples).

The estimated change in economic activity should be assessed relative to overall economic activity. Results should be reasonable and be able to assist the audience understand the contribution of the conservation expenditures to overall economic activity. IMPLAN defines a “job year” as the amount of labor needed for one year’s work. Job estimates coming directly out of IMPLAN represent both full and part-time jobs. It is possible to convert to full time equivalent jobs using a FTE conversion table from the IMPLAN Web site; typical conversions have run between .90 and .92 FTEs for NRCS analyses.

⁷ IMPLAN defaults to 100% local purchase percentage. The analyst should make sure that the LPC is set to the SAM value unless the analyst has better information.

VII. Documentation

It is important to document the version of IMPLAN being used, the model being used (national, State, county, regional, or multiregional), the defined study area, and the manner in which the scenarios were constructed. This includes the level of expenditures used, how the expenditures are allocated to IMPLAN sectors and the source reference for the data on expenditures. If using a regional or multiregional model, it is important to describe how the region or regions were assembled. Zip the IMPLAN .impdb database file for each model to be reviewed or archived. Screen shots of IMPLAN activities, events, and scenario results provide quick documentation for internal quality control, and for reviewers.

VIII. Peer Review

As with any economic analysis, peer review of IMPLAN analyses is necessary. This review will ensure application of model is consistent and the results and conclusions drawn have been appropriately assessed and supported by the data used.

To reduce the misapplication of the model and ensure consistency in analyses across the agency, the following process should be followed by all NRCS economists when conducting economic impact studies:

- (1) Develop scenarios (events) and provide an explanation for each of them. Follow the guidelines provided in this technical note.
- (2) Document assumptions and note where you have deviated from agency guidelines.
- (3) As an initial review, vet scenarios and assumptions with at least one other economist.
- (4) Run the scenarios through the model, and review results in consultation with the initial reviewer.
- (5) Submit writeup of analysis (include documentation of the analysis and a zipped copy of the IMPLAN .impdb database file, as well as description of comments received as part of the initial review) for final review. Please provide a description of the audience or report for which the writeup is intended.
- (6) Obtain final review from at least two economists. Final reviewers should include an economist from REA. The function of this review is to confirm that the scenarios and results are realistic, can be rationalized within the context of the area under study, and that the analysis follows the guidelines set forth in this technical note. Final reviewers will be given 2 weeks to provide comments on the submitted analysis. Part of the reviewer response may include a request for more time to complete the review, granted at the discretion of the analyst.
- (7) Revise and resubmit analysis as needed in consultation with the final reviewers.
- (8) After final review is completed, the document may be released to the requestor.

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