



TO: James Rowe, Acting Director, Resource Economics and Analysis Division (READ), Natural Resources Conservation Service (NRCS)

CC: Jason Weller, Chief, NRCS  
Leonard Jordan, Associate Chief for Conservation, NRCS  
Lauren Cartwright, State Economist, NRCS-Missouri  
Byron Kirwan, State Economist, NRCS-Illinois  
Lee Norfleet, Director, Conservation Effects Assessment Program (CEAP), NRCS

FROM: Michelle Perez, Senior Policy Specialist, American Farmland Trust (formerly with World Resources Institute)

DATE: August 31, 2016

RE: Ideas for replacing the qualitative statements representing the non-monetary benefits and costs associated with conservation practices with more useful estimated and proxy market values

## **INTRODUCTION**

### **Meeting NRCS's desire to provide effective economic analysis to aid farmer decision-making**

The NRCS Natural Resource Economics Handbook (2012) states that during the conservation planning process with farmers, "NRCS field planners are expected to be able to independently complete (economic) analysis of simple to intermediate complexity, including partial budget and other types of analysis." A partial budgeting analysis is limited to identifying and quantifying only the benefits and costs associated with adopting a new conservation practice (in contrast to a whole farm enterprise budgeting analysis). The handbook recognizes that "One of the land user's important concerns is whether his or her potential benefits from installing new conservation measures would outweigh their costs. Therefore, from this perspective, a field-level economic analysis mainly evaluates the benefits and costs of a specific conservation project."

Despite this expectation, NRCS conservation planners who do conduct partial budget analyses presently use qualitative statements to represent the private and public as well as onsite and offsite benefits and costs associated with conservation practices rather than providing potential economic impacts. Typical statements include, "time saved by conservation tillage," "improvements in soil quality from cover crops," "improvements in downstream water quality from manure storage facilities," or "increased risk with new pasture crop management," etc. This limitation prevents the agency from helping a farmer fully evaluate the conservation practice alternatives and make informed decisions.

### **Opportunities to improve the agency's economic services to farmers**

This memo explores two preliminary ideas that could enhance the economic services that NRCS offers to farmers to aid in their conservation decision-making and provide the agency with additional information about the public, private, onsite and offsite economic impacts of conservation practices. First, the memo explores opportunities to use available literature-based estimates of proxy market values to represent the non-monetary benefits and costs of conservation practices during the conservation planning

process. Second, the memo outlines the development of a new tool for use during conservation planning that offers farmers the opportunity to factor in their own farm objectives and values in the cost-benefit analysis. A new database, housed at NRCS, could collect these newly identified proxy market values of benefits and costs of conservation practices. By pursuing these ideas, NRCS will be better equipped to fulfill its goal of “providing economic support for conservation planning (so)... land users (have) enough information for them to make sound decisions regarding conservation activities.” (NRCS 2012)

**METHODS**

Nine representatives from USDA, NRCS, and a university, reflecting economic, science, and policy backgrounds were interviewed to identify the types of economic data that are available and missing from NRCS’s payments schedule database and the conservation planning process (listed in Appendix 1). During the discussions, participants identified existing conservation benefits quantification tools and other economics-related efforts and discussed ideas for new tools that could provide added value to NRCS’s existing efforts. Interviewees helped identify a variety of institutional, technical, and social barriers to the ideas presented. In addition to the interviews, a review of several technical resources available on the NRCS Economics website was also conducted.

**HOW TO IMPROVE THE EXISTING PARTIAL BUDGETING PROCESS IN CONSERVATION PLANNING**

**How economic analysis is currently handled in the conservation planning process**

NRCS uses a three-phase, nine-step planning and implementation process that “requires the use of skills from many disciplines, such as economics, agronomy, soils, and engineering, to achieve the highest quality of assistance” (NRCS 2012):

<p><b>Phase I: Collection and Analysis</b>          Step 1: Identify problems and opportunities          Step 2: Determine objectives          Step 3: Inventory resources          Step 4: Analyze the resource data</p>	<p><b>Phase II: Decision Support</b>          Step 5: Formulate alternatives          Step 6: Evaluate alternatives          Step 7: Make decisions</p>	<p><b>Phase III: Application and Evaluation</b>          Step 8: Implement the plan          Step 9: Evaluate the plan</p>
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Planners are expected to develop a partial budget analysis during Phase II of the process to evaluate whether the net economic benefits outweigh the costs of each identified conservation alternative in order to inform a farmer’s decision about which practice or suite of practices to pursue to address his/her farm’s resource concerns and objectives. Planners are expected to display the components of the partial budget analysis in a “T-chart” with positive effects (benefits) listed on the left-hand side and negative effects (costs) listed on the right-hand side. When the estimated benefits and costs are converted to “like terms” (e.g., dollars per acre per year), the net benefits (or costs) can be calculated by subtracting total costs from total benefits. See Appendix 2 for more details.

**Identified shortcomings of the Handbook and associated Technical Notes for conservation planning**

The primary shortcoming is that the Economics Handbook and the Technical Notes do not provide monetary estimates of the benefits and costs of conservation practices that are normally regarded as

having non-market value (NRCS 2012, 2013, and 2015). Thus, the non-market benefits and costs of conservation practices are relegated to a qualitative description in the “Other” sub-category (see Appendix 2) and are not included in the calculation of net benefits (or costs). This shortcoming is understandable but remediable.

Furthermore, the examples of partial budgeting and T-chart displays in the Handbook and Technical Notes lack sufficient guidance to planners on how to quantify monetary values for factors. Though the handbook provides brief descriptions of five methods to generate “estimated or proxy market values” for “non-market benefits and costs,” the guidance is not sufficient to enable a planner to embark on such an effort. The five methods are replacement cost method; opportunity cost approach; travel cost method; hedonic pricing method; and contingent valuation (see page 17 of the Economics Handbook Part 610 (NRCS 2012) for more details).

In fact, all of the examples given in the Handbook and the Technical Notes show conservation practices that result in net benefits and thus are economically justified. The examples give the impression that there is no need to estimate dollar values for additional benefits and costs that do not have market values. Such examples obfuscate the opportunity to describe practices and farmer situations where the high upfront costs are still too expensive for the farmer, even though net benefits are calculated. Additionally, the examples obfuscate the opportunity to describe situations when some conservation practices under some conditions do result in net costs. Such an example would offer the opportunity to demonstrate that a change from net costs to net benefits could be calculated with the inclusion of dollar values for onsite and offsite, private and public environmental benefits and costs.

### **Ideas for culling and storing available proxy values for non-monetary costs and benefits**

The first step to collecting and storing estimated or proxy market values for the otherwise non-monetary benefits and costs associated with conservation practice adoption is to conduct a literature review. NRCS economists have likely already undertaken these kind of reviews, so what would be useful is for the agency to make some of the identified dollar values available to conservation planners for use during the planning process.

For example, the NRCS state economists from Missouri and Illinois who developed the “Cover Crop Calculator Tool” decided to provide several literature-based proxy values for otherwise non-monetary benefits (Cartwright and Kirwan 2014). For example, \$2.10/ton is included in the tool to represent the value of avoided soil fertility loss, and \$4.93/ton is included to represent the value of off-site water quality benefits. These dollar values are multiplied by the tons of erosion prevented from leaving the field due to cover crop plantings and factored into the tool’s short-term partial budget analysis. See Appendix 3 for proxy values included in the tool’s long-term analysis.

It is possible that the literature reviews that have already been conducted or will be conducted provide an insufficiently robust number of dollar estimates and proxy market values to reflect all the major cropping systems, weather conditions, topographic characteristics, farmer objectives and values to represent a majority of the major farming activities. If this is the case, economists at NRCS as well as the USDA Economic Research Service (ERS) and land grant universities could undertake a series of research and demonstration projects to use each of the five methods identified in the NRCS Handbook in order to generate “estimated or proxy market values” for “non-market benefits and costs” reflecting different types of farming, types of farmers, and types of agro-ecoregions.

Three new white papers<sup>1</sup> to be released in December 2016 may be able to help jumpstart some of the activities proposed above. USDA's Office of Environmental Markets (OEM) and REAP commissioned white papers from The Council on Food, Agricultural and Resource Economics (CFARE) that will provide an overview of the valuation process of ecosystem services associated with conservation practices and outline additional tools and authorities that are needed to do the valuations. The papers will provide some pricing information about specific practices to quantify associated non-monetary benefits as well as case studies, but they were not meant to be exhaustive or authoritative. In addition, new guidance from the White House Council on Environmental Quality (CEQ) is forthcoming for all federal agencies on how to incorporate ecosystem services into agency planning.

To store these newly culled dollar values for the otherwise non-market benefits and costs of conservation practices, a new database will be necessary. The existing payments schedule database, now also referred to as the National Conservation Cost Database (NCCD), does not include any benefits information (Xu 2012). In addition, it has evolved<sup>2</sup> to provide only regional-average cost estimates while more detailed, state-specific or even more localized and tailored benefits and costs information are needed during the conservation planning process.

## **DESIGNING A NEW CONSERVATION BENEFIT-COST ASSESSMENT TOOL TO HELP FARMERS MONETIZE IMPLICIT CONSERVATION BENEFITS AND COSTS**

### **Proposed a new tool to aid in quantification of non-monetary benefits during the conservation planning process**

The general idea for the tool outlined in this memo is one with a farmer-friendly, interactive interface that helps guide the partial budgeting analysis during the conservation planning process in order to elicit farmer feedback on literature-based proxy values for conservation benefits and costs. In addition, the tool could be designed to allow farmers to be "in the driver's seat" by offering them the opportunity to use toggle buttons to decide which of the available and applicable literature-based values of benefits and costs are most acceptable to him/her. This concept is in line with the NRCS Handbook (2012) statement, "When evaluating a project from the land user's perspective, the land user, not the assisting professional, determines the relative importance of the prospective benefits of alternatives in comparison with their costs to establish which alternative offers the most important benefits per dollar, especially in cases where benefits are difficult to quantify or occur at offsite locations."

The toggle button concept offers farmers the opportunity to emphasize or de-emphasize the role of various proxy variables in the calculation to best represent their farm objectives and values. For example, a farmer who wants to free up time to coach his/her child's or grandchild's sports team can push the toggle button to select the "high end" of literature-based ranges of dollar estimates representing the value of time or the "high end" of the weights given to the time factor in the tool's

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<sup>1</sup> The papers will cover (1) carbon and greenhouse gas services from national forests, (2) ecosystem service benefits associated with water quality through the Environmental Quality Incentives Program (EQIP), and (3) habitat benefits from pollinators through the Conservation Reserve Program (CRP).

<sup>2</sup> "Prior to FY2008, NRCS used state cost lists for conservation program payments, but paid as a percent of actual costs for most practices. After FY2008, NRCS paid state payment rates as flat rate per practice. In FY2012, NRCS moved from state-determined to nationally determined payment rates." (excerpt from NRCS's Costs website: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/econ/costs/>)

algorithm. Likewise, the farmer who wants to increase the long-run productivity of his/her fields in order to rent or sell land at an above average rate will be able to toggle the buttons to select the “high end” of dollar values associated with increasing soil organic matter and the “high end” of dollar values related to avoided soil fertility loss. Like the NRCS’s Cover Crops Calculator Tool, this proposed tool should evaluate both short-term and long-term benefits and costs. Naming ideas for this tool include the Conservation Benefit-Cost Assessment Tool (CBCAT, pronounced see-bee-cat).

### **Using NRCS and land grant university economists to guide the farmer through the tool**

Because the purpose of developing the tool is to gain farmer feedback into the applicability of available literature values and to allow farmers to reflect their preferences for increasing certain benefits and minimizing specific costs, a guided conversation approach is needed between the farmer and a trained certified planner to use the toggle-button based tool. Given the paucity of economists at NRCS state offices, NRCS conservation planners and interested farmers could initially partner with land grant university economists to conduct the interviews.

### **POSSIBLE BARRIERS TO THESE SUGGESTIONS**

#### **Institutional and implementation barriers**

Staff capacity issues were raised by a few interviewees as potential barriers to NRCS emphasizing more conservation planning and partial budgeting analysis:

- **Increased funding for conservation programs reduced emphasis on technical services –** According to one interview, starting with the 1996 Farm Bill, the conservation programs grew significantly in dollar amounts. Over time, this infusion of funds changed the focus of NRCS from a technical services agency to more of a program management agency with tremendous pressure to obligate, spend and report on the financial assistance funds. Thus, an emphasis on field office staff spending more time with producers is at odds with the current pressure from the agency to disperse funds.
- **Paucity of economists –** Another interviewee explained that three decades ago, each state averaged two economists per NRCS state office. “Now the agency is down to just 16 economists in state offices and four in the regional centers.” One factor that contributed to this multi-faceted problem involved the lack of a GS13 job position on the NRCS promotions schedule. Thus, potential GS12 economists had to change to a different job series such as Resource Conservationist in order to get a promotion. An emphasis on economic analyses conducted by conservation planners and the development of new economics data and tools would be easier to pursue if there were greater staff economics capacity.
- **Pressure to obligate funds has diminished robust conservation planning and likely limited the quality of partial budgeting analysis –** In 2007/08, NRCS emphasized the importance of conservation planning and (1) established the Resource Management Stewardship (RMS) plan standard which addressed all resource concerns,<sup>3</sup> (2) required farmers to obtain a conservation plan prior to receiving financial assistance funding, and (3) emphasized that every conservation plan should have an economic component to it. However, the pressure to disperse funds

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<sup>3</sup> Resource concerns are soil, water, air, plant, animal, human and energy (SWAPA+HE).

undercuts these policy signals. The agency allowed planners to develop a “progressive management system” plan to deal with the “limited to situations in which a land user simply does not have the time or the interest to contribute to a planning effort that addresses all resource concerns at and RMS level” (NRCS 2012). In addition, the progressive plans satisfied the plan-before-funding requirement and “helped the staff cope with the overwhelming pressure and short time frames to obligate funds,” said one interviewee. “Such plans were unlikely to have included a detailed economic analysis or even have one at all,” said an interviewee.

In addition, a few interviewees raised institutional identify issues as potential barriers to developing a tool to help include quantitative estimates of benefits and costs:

- **Liability issues**—One interviewee said, “NRCS has traditionally stayed away from conducting very much economics analysis for farmers. As a voluntary farm conservation agency, there is concern that if our analysis suggests that farmers can make \$5/acre more by adopting certain conservation practices, the agency is opening itself up to liability.” “Economics has been seen as an Extension Service function rather than something NRCS does,” said another interviewee.
- **Siloes**—When asked if there were plans to incorporate economics into the new Resource Management Systems (RMS) Tool that NRCS conservation planners are pilot testing in several states, one interviewee said that was unlikely given scientists rarely talk with economists. Several other interviewees offered on their own that different NRCS divisions and offices “tend to be very siloed.”

### **Social and political barriers**

- **Time to complete information inputs into tool can be problematic**—A common complaint about the USDA’s Nutrient Tracking Tool (NTT) and Field-to-Market’s Field Print Calculator (which is based, in part, on USDA’s Water Quality Index for Agriculture (WQIAG)) is that farmers have to sit at a computer and answer numerous questions. For example, they have to provide information about what is grown in each field under each rotation including the nutrient, chemical and water inputs plus application methods, tillage and the historical average yield. “They hate taking this time,” said one interviewee. There may be similar pushback to a tool that involves multiple questions about the farmer’s objectives, values, and perceived benefits and costs of specific conservation practices. Such a conversation may be even more difficult given the reality that most people find it very difficult to put a dollar value on otherwise unquantified values.
- **Current sociological and anthropological research suggests that some farmer-decision making is not based on economics**—One interviewee pointed out that recent research led by Prokopy (Prokopy et al. 2014; Perry-Hill and Prokopy 2014) and Arbuckle (Arbuckle and Rosech-McNally 2015) suggests that social factors like farmer identity, impact on family members and other values, are more important in conservation decision-making than economic factors.

## Scientific and technical barriers

- **Possible difficulties in developing and rolling out a farmer-specific economic benefit-cost estimation tool**—Several interviewees pointed out that it takes NRCS many years to disseminate a new tool. Many technical difficulties arise in trying to calibrate and validate tools (e.g. NTT) so that they can operate effectively (i.e., generate estimates of the pounds of nitrogen or phosphorus or the tons of sediment reduced by conservation practices being explored by a farmer) in each new area where they are applied. Attempts to develop an economics tool with the toggle-button idea, and even simply to provide literature-based dollar values to planners as they conduct partial budget analysis, may prove technically and scientifically difficult.

## RECOMMENDATIONS FOR NRCS CONSIDERATION

1. **Recommit to stated policies on economics and ameliorate the problem of diminished economic staff capacity**—One of four stated NRCS economics policies is that, “Economic effects of alternative actions should be provided to NRCS customers in order for them to make informed resource conservation decisions.” NRCS should recommit to fulfilling this policy by building up its staff’s economics capacity. One way to do so is to commit to again having at least two economists working in each state. Another way to approach that task is to fix the staff promotions problem that discourages advancement through the economics track. Finally, NRCS could provide new robust guidance and trainings to NRCS field conservation planning staff who want to conduct partial budget analysis and use the proposed tool and interview process to quantify non-monetary benefits and costs of conservation.
2. **Embark on a collaborative research and demonstration effort to develop dollar values for the non-monetary benefits and costs associated with adoption of conservation practices**—If additional literature reviews are warranted, consider developing collaborative research projects between NRCS, ERS and land grant university economists, dividing the reviews by agro-ecoregion to achieve specific non-monetary benefits. This could replicate the approach used by the Cover Crops Calculator Tool to incorporate non-monetary benefits as well as short-term and long-term analysis. NRCS could also develop collaborative research and demonstration projects with farmers to employ each of the five methods identified in the Economics Handbook to generate new estimated or proxy market prices for non-market benefits and costs for a variety of agro-ecoregions, cropping systems, farmer objectives, and farmer values, etc.
3. **Pursue development of a new tool and economics conservation planning process that provides proxy market prices and elicits farmer feedback**—Like the previous recommendation, consider embarking on a collaborative tool development process with NRCS, ERS, and university economists to develop a tool, as outlined in this memo, with toggle buttons that allow farmers to adjust the available ranges of dollar values to best reflect their farm objectives and values.
4. **Re-emphasize conservation planning and remove road blocks to preventing staff from pursuing more comprehensive planning**—Two recommendations were offered by interviewees to address the many challenges preventing field office staff from developing more comprehensive conservation plans:
  - a. Establish a more realistic ratio between government spending on financial assistance and spending on technical assistance. This ratio is set by states and may range between 8 to 25 percent, although the interviewee was uncertain about the range. The original

effort to minimize the amount of spending on technical assistance stemmed from the desire to reduce the perception that government is excessively bureaucratic and does not serve the needs of the people. Unwittingly, policy makers reduced technical support to farmers, the people most benefiting from USDA government staff. By revisiting this ratio with each of the state conservationists and conservation planning staff, NRCS will begin to fulfill its commitment to comprehensive conservation planning.

- b. Extend the obligation period for conservation funds from having to be consumed within a few months to at least one year or more. Given the current pressure experienced by many NRCS local staff, NRCS should allow staff to conduct more outreach, education and conservation planning activities one year in advance of funding applications being developed, ranked, awarded and obligated.

**5. Envision future federal conservation programs that limit payments for practices that provide net economic benefits to farmers but instead provide technical assistance to conduct the partial budget analyses through conservation planning to quantify the net benefits—**

Conservation program financial assistance funding has been shrinking over the last few years, underscoring the need for more strategic and cost-effective approaches to spending the increasingly limited funds. Many management practices (e.g., no till, cover crop, and nutrient management planning, etc.) tend to have total benefits that exceed total costs—often without the inclusion of dollar values for non-monetary benefits—and are increasingly common and gaining significant acceptance. With these practices likely becoming the new norm, NRCS should consider shifting conservation payments toward practices that (a) also have net benefits but their upfront or continuous costs may be cost-prohibitive to some farmers and (b) structural (e.g., manure storage, etc.) or edge-of-field practices (e.g., riparian buffers, drainage water management, tile drainage nutrient treatment) that have limited on-farm economic benefits but large societal benefits. By conducting the partial budgeting analysis with newly incorporated dollar values for the practices that have little to no on-farm economic benefits, the agency will be effectively making the case for why those practices warrant continued taxpayer support.

**NOTE**

Perez began this research while at the World Resources Institute and continued it after joining American Farmland Trust in April, 2016. AFT welcomes the opportunity to further explore the preliminary ideas presented in this memo with staff at NRCS. AFT continually strives to be helpful to NRCS as the agency pursues its mission to “lead the effort to conserve natural resources on private land within the United States” (NRCS 2012). Please don’t hesitate to contact Michelle Perez via [mperez@farmland.org](mailto:mperez@farmland.org) or 410-353-5492 (cell) to discuss these ideas further.

**REFERENCES**

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## APPENDIX

### Appendix 1. Interviews were conducted with the following individuals

1. Ali Saleh, Associate Director of Texas Institute for Applied Environmental Research (TIAER), Tarleton State University, February 22, 2016
2. Jay Atwood, Agricultural Economist, Soil Science and Resource Assessment Division, CEAP Modeling Team, NRCS, February 22, 2016
3. Lee Norfleet, Team Leader, NRCS Conservation Effects Assessment Program (CEAP) Modeling Team, February 24, 2016
4. Mindy Selman, Senior Analyst, Office of Environmental Markets, Office of the Chief Economist, February 24, 2016
5. Kari Cohen, Natural Resource Specialist Physical Scientist, NRCS, Office of the Deputy Chief, Science and Technology, February 24, 2016
6. David Buland, Economist, Central National Technology Support Center, NRCS-Texas, June 30, 2016
7. Noel Gollehon, Senior Economist, REAP Division, NRCS, June 30, 2016 and August 5, 2016
8. Eugene Backhaus, State Resource Conservationist, NRCS-Colorado, August 23, 2016
9. Chris Hartley, Environmental Markets Analyst, Office of Environmental Markets, Office of the Chief Economist, August 24, 2016

### Appendix 2. Partial budget analysis during conservation planning using T-Charts

The T-chart displays three benefit subcategories:

- **Increased revenue**—Includes private onsite benefits involving “maintaining, restoring, or increasing productivity” such as increased crop yields, increased livestock production, and hunting fees
- **Reduced costs**—Includes “decreasing production costs” such as fewer passes over the field which saves both fuel and machinery wear or other reduced costs such as less labor
- **Other benefits**—Includes private and public benefits that occur onsite or offsite that do not have monetary values, including a beautified landscape, improved water quality leaving the field, increases in wildlife visits, enhanced local air quality, improved opportunities of recreation, and additional time to pursue other activities

Three cost subcategories include:

- **Increased costs**—Includes “installation and other direct implementation costs” such as purchasing equipment and materials, hiring more labor, as well as operations and maintenance costs (O&M) associated with the conservation practice
- **Reduced revenue**—Includes “foregone income” and may include land taken out of production or reduced crop yields
- **Other costs**—Includes “implicit costs” that are less visible like opportunity costs for the time spent implementing the conservation project rather than working at an income-earning job or spending time with family members; other onsite costs could include time spent by project volunteers, and offsite costs could include costs incurred outside the immediate project area in non-targeted areas

### Appendix 3. USDA’s Cover Crops Calculator Tool

The cover crop tool was developed by the state economists for NRCS-Missouri and NRCS-Illinois (Cartwright and Kirwin, 2014) to estimate the expected economic returns in the short-run and the long-run for farmers who are deciding to add cover crops. The tool conducts a partial budget analysis in an Excel spreadsheet format.

The Short Term Analysis of Benefits includes:

- **Direct nutrient credit**—Amounts of nutrients expected to be available to each cash crop in rotation in the year the cover crop is planted;
- **Herbicide/insecticide/fungicide input reduction**—Expected percent reductions in use of chemical inputs as a result of the cover crop (expected increases are reflected in the Other Cost section of the tool);
- **Yield increases**—Expected yield increases due to cover crops resolving yield-limiting factors (e.g., compaction, moisture, nitrogen availability) to subsequent crop growth;
- **Erosion reductions**—Suggested values in the tool based on peer-reviewed literature are \$2.10/ton for the value of avoided lost fertility and \$4.93/ton for the value of off-site water quality benefits. Dollar values are multiplied by the tons of erosion prevented from leaving the field due to cover crop plantings;
- **Other benefits**—Provides the opportunity to enter additional benefits such as reduced tillage costs; and
- **Grazing, baling or seed production benefits**—If livestock utilization of the cover crops is planned, the expected values of renting fields for grazing or mechanical harvesting to a ruminant livestock producer, or a seed producer can be included.

The long-term analysis of benefits includes

- **Overall soil fertility benefit**—Long-term value of potential increase in plant-available nitrogen, phosphorus, and potassium with dollar-per-pound nutrient values for N, P, and K automatically populated in the tool based on values entered in the short term analysis, and
- **Water storage benefits**—In a dry land cropping system, a quantitative proxy value of the avoided cost of irrigation or avoided crop yield reduction due to drought stress can be calculated by the tool user.