



Finding the ways that work



A practitioner's guide to conducting budget analyses for conservation agriculture

December 2020



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In addition to the major contributors above, we would like to thank the following individuals who participated in interviews, workshops and/or reviewed the report:

Ben Gordon, Granular
Archie Flanders, Soil Health Institute
Emma Fuller, Granular
Scott Henry, LongView Farms
Kevin Klair, University of Minnesota
Cristine Morgan, Soil Health Institute
Rob Myers, University of Missouri and Sustainable Agriculture Research and Education (SARE)
Alejandro Plastina, Iowa State University
Wynn Richardson, University of Minnesota
Shelby Shelton, Environmental Defense Fund
Gary Schnitkey, University of Illinois
Katie Wilts, University of Minnesota
Agricultural lenders who prefer to remain anonymous

Photography: iStock

About this guide

Agricultural conservation practices — including conservation tillage, cover crops, and nutrient management — provide many public environmental benefits including improved water quality, reduced soil erosion, improved soil health and carbon sequestration. Increasing the adoption of these practices could reduce nitrate levels and sedimentation in U.S. waterways, and increase organic matter in U.S. farmland soils.

The use of conservation practices in the U.S., while growing, remains relatively low.¹ No-till is used on 26.3% of cropland, reduced tillage (excluding no-till) on 24.7%, and cover crops are only adopted on 3.9% of U.S. cropland.²

Greater adoption of conservation practice is in part held back by a financial information gap. Farmers and their financial partners are without clear information on the financial dynamics of adopting these practices. Information on the costs and benefits to farmers of adopting conservation practices is especially useful in the context of the difficult farm economy and low profit margins.

In-field agricultural conservation practices

Adapted from EDF's Farm Finance and Conservation³ report.



Conservation tillage

In conventional farming systems, the soil is turned to prepare the seedbed and control for weeds. No-till and reduced till are management approaches where the soil is not turned or only minimally turned, leaving plant material on the surface of the soil. The seed is then directly drilled for planting. Conservation tillage reduces soil erosion and improves the quality of the soil, for example by increasing water-holding capacity.⁴



Cover crops

In a conventional system, nothing is planted in a field after harvest. Cover crops are grasses, legumes or forbs planted to provide seasonal soil cover on cropland when the soil would otherwise be bare. Cover crops are generally not intended for harvest or sale, although some growers earn revenue by integrating livestock into their cover crop systems or planting an overwintering cash crop such as winter wheat. Cover crops can prevent soil erosion, improve soil health, suppress weeds and disrupt pest cycles. Depending on the crop, they may also supply nutrients.⁵



Nutrient management

Managing the amount, source, placement and timing of plant nutrients such as nitrogen fertilizer to optimize yield without applying excess. This reduces the potential for nutrients to go unused and result in water pollution or greenhouse gas emissions.⁶ This is often accomplished through the use of precision technology.

¹ USDA. Ag Census 2017. Table 47. Land Use Practices by Size of Farm: 2017 and 2012. Accessed at: nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_1_US/st99_1_0047_0047.pdf

² USDA. Ag Census 2017. Table 1. Historical Highlights: 2017 and earlier years. Accessed at: nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_1_US/st99_1_0001_0001.pdf

³ Monast, M., Sands, L., Grafton, A. 2018. Farm finance and conservation: how stewardship generates value for farmers, lenders, insurers and landowners. Accessed at: edf.org/ecosystems/how-farm-conservation-can-generate-financial-value

⁴ Wade, Tara, et al. 2015. "Conservation Practice Adoption Rates Vary Widely by Crop and Region." US Department of Agriculture Economic Research Service. ers.usda.gov/publications/pub-details/?pubid=44030

⁵ Ibid

⁶ US Department of Agriculture Natural Resources Conservation Service. 2017. "CONSERVATION CHOICES: Soil Health Practices." nrcs.usda.gov/wps/portal/nrcs/detail/null/?cid=nrcsprd412634

Resources

NRCS [conservation practice list and technical guides](#).

EPA Agricultural Management Practices for Water Quality Protection [module](#).

Iowa State University soil erosion and agriculture [primer](#).

NRCS soil health [informational hub](#).

NRCS [Agricultural Conservation on working lands: trends from 2004 to present \(2018\)](#)

Filling the information gap

Building the financial case for adopting agricultural conservation practices can support greater implementation of these practices. Presenting this financial case for conservation at a time of economic uncertainty in the agriculture sector can help farmers and their financial partners understand the financial dynamics associated with these practices and the effects they can have on farm budgets.

The purpose of this report is to provide guidance for researchers, academics, conservation nonprofits, state and government agencies, and other organizations interested in measuring the farm financial outcomes of in-field conservation practices.

The impetus driving the authors to develop this guide was the need for more comparable and actionable financial data on the costs and benefits of adopting agricultural conservation practices. This best practice guide aims to help researchers contribute to this goal.

The guide is informed by a review of farm budget analyses that examine conservation adoption and interviews with the researchers who conducted them. The authors reviewed 33 farm budget case studies and five multi-farm analyses conducted by 11 organizations (presented in more detail on page 8). The authors also conducted three virtual workshop sessions in June 2020, in which experts discussed the strengths and weaknesses of different methodological approaches. The resources in this guide can help organizations invested in U.S. agriculture grow the collective understanding of the financial impacts of conservation practices that provide private and public environmental benefits. Integrating the lessons in this guide to strengthen financial information for conservation practices could support solutions for farmers to profitably adopt these practices at higher rates and ultimately build agricultural resilience and support long-term productivity.

What is a conservation agriculture budget analysis?

Economic analysis is widely applied in American agriculture to evaluate efficiencies in crop and livestock production, the effect of policies on the farm economy, natural resources valuation and extended impacts of production.

This report specifically focuses on applying financial analysis — a subfield of economics — to measure the private costs and revenues to farmers associated with conservation agriculture production systems. Farm management financial analysis measures the financial outcomes of on-farm management practices such as the cost of applying alternative rates of inputs and the relative profits of tilling fields or leaving crop residue over the winter. **This practice of comparing the financial impacts of different management practices is especially useful for farmers trying to understand how adopting conservation practices affects profit.**

“Conservation agriculture budget analysis” is a term developed for this report to specify the use of financial analysis to understand farmer cost and revenue changes associated with adopting conservation practices.

Definition

Conservation agriculture budget analysis

A study that uses a farm budget format to measure the financial impacts associated with conservation practices in comparison to existing practices.

The practice of creating a conservation agriculture budget analysis involves combining financial and farm management information to better understand the cost and revenue changes

Resources

For more information on economic analysis in agriculture, visit the USDA Economic Research Service's [research topics](#).

USDA's [page and resources](#) on crop and livestock production practice data.

[NRCS's conservation practice economics page](#) including its Economics Technical Note on Developing Conservation Case Studies for Decision-Making and a list of case studies.

associated with transitioning from existing practices to agricultural conservation practices. It is meant to inform farmers and their financial partners — including agricultural lenders, supply chain companies and crop advisors — to support their conservation efforts.

There are numerous approaches to generating a conservation agriculture budget analysis, the appropriateness of each being dependent on the researcher's target audience and research goals. This guide includes a set of best practices for conducting these analyses based on the experience and expertise of partner organizations that are experienced in conducting such analyses.

The diverse set of approaches to conservation agriculture budget analysis used across studies demonstrates the applicability of financial analysis to a wide range of target audiences, research questions and levels of specificity. For example, studies can be used to inform a wide range of stakeholders and their conservation agriculture objectives including farmers, agricultural lenders, supply chain company sustainability initiatives and policymakers. **Each project objective and methodological approach discussed in this report plays an important role in growing the collective understanding of conservation's impact on the farm bottom line.** The report aims not to rank approaches, but to inform future studies with best practices that can deliver more consistent, complementary and comprehensive outcomes for the different methodologies.

Ultimately, this guide can support current and future practitioners in conducting robust farm conservation budget analyses that can effectively inform farmers, agricultural lenders, supply chain companies and policymakers.

Who is this guidance for?

This guide was designed to support a wide range of practitioners interested in understanding, researching and communicating the farm financial implications of conservation practices. It can be used by many stakeholder groups and can be adapted to specific needs, objectives and limitations. The guide could be especially useful for the following practitioner groups and their conservation objectives:

- **Conservation and producer organizations** looking to support their conservation advocacy and farmer technical assistance with financial solutions and information.
- **Agricultural companies** looking to enhance their agronomic and financial services with conservation practice data.
- **Universities and extensions** looking to expand the literature on financial impacts of adopting conservation agriculture practices and provide their states with production budget estimates of conservation tillage, cover crop, nutrient management and diverse rotation production systems.

How to use this guide

This guide provides a checklist of key methodological considerations in preparing for and executing conservation agriculture budget analyses. It should also be used as a decision support tool for key junctures in executing a robust analysis. Each key issue presented will include a presentation of different methodological options, best practice, and adjustments based on the objectives of the study. Finally, this guide functions as a collection of resources that can help researchers as they consider different methods, by presenting examples and lessons learned from existing studies.

In addition to this checklist, we suggest you familiarize yourself with the studies presented on page 8.

TABLE 1

Conservation agriculture budget analyses that informed this guide

Multi-farm analyses				
Organizations	Geography	Crops	Conservation practices	Sample size
Environmental Defense Fund & KCoe Isom	Midwest	Corn, soybeans, alfalfa, wheat, sorghum	Conservation tillage, cover crops, nutrient management	13 ⁷
Sustainable Agriculture Research and Education (SARE)	U.S.	Corn, soybeans	Cover crops	759
Precision Conservation Management (PCM)	Illinois and Kentucky	Corn, soybeans	Conservation tillage, cover crops, nutrient management	200
Iowa Soybean Association	Iowa	Corn, soybeans	Cover crops	17
Iowa State University	Iowa, Illinois, Minnesota	Corn, soybeans	Cover crops	233
Case studies				
American Farmland Trust (AFT)	California, Illinois, New York, Ohio	Corn, soybeans, almonds, wheat, alfalfa	No-till, cover crops, conservation cover, nutrient management, mulching, compost application	9
USDA Natural Resources Conservation Service (NRCS)	New York, Missouri	Corn, soybeans	Conservation tillage, cover crops	7
Datu Research	Illinois, Iowa, Missouri	Corn, soybeans	Conservation tillage, cover crops	4
Soil Health Partnership	Indiana, Iowa	Corn, soybeans	Cover crops, nutrient management	2
The Fertilizer Institute	U.S.	Potatoes, tomatoes, corn, cotton, strawberries	Nutrient management	12

⁷ The EDF analysis included three in-depth case studies and a 10-farm comparative analysis.

Checklist:

Key considerations for your study

1. What question are you trying to answer and who is your target audience?

2. What limitations will you need to address?

3. What characteristics are you looking for in your sample?

4. Which comparison is best suited for your objectives?

5. What data is available and appropriate for your study?

6. How will you obtain data and protect farmers' data privacy?

7. What budget information is needed for your analysis?

8. Which accounting method will you use?

9. How can you most effectively present the results of your study to your key audiences?

10. Which form of communication is most helpful to your target audience?

Selecting objectives and target audiences

The objectives and target audience are the foundation of any conservation agriculture budget analysis. At the outset of a project, it is essential to clearly identify the target audience and the objectives for informing that audience. Throughout this guide, the best practice suggestions are based on the objectives of the study and the target audience. This section provides guidance on how to develop objectives and define the target audience.

Key consideration 1

What question are you trying to answer and who is your target audience?

Conservation agriculture budget analyses aim to quantify the financial impacts of conservation practices. To identify the objectives for the study, clearly define the financial information gap(s) the analysis intends to address. The table below provides examples of questions that can be answered with farm conservation budget analyses. These examples correlate the relationship between the adoption of conservation practices and changes in farm budgets.

Information gap examples

What costs and cost savings are attributed to conservation practices?

When do costs and benefits of conservation occur over time?

How do cover crops affect profitability?

How are crop yields and revenue affected by conservation adoption?

The target audience of the analysis should inform the level of detail, comparison groups and the communication of the research. Different audiences need different information to inform their decisions. While refining the study objectives, it is essential to clearly identify the study's target audience, their information needs and their preferred methods of communication. The study objective should provide information that fills a financial information gap that are actionable for farmer and financial partner decision-making. In this process, you should ask:

- How will the target audience use this information?
- Do the objectives align with decisions farmers have to make in their operations?
- Can the objectives provide insights for farmers' financial partners including agricultural lenders, crop advisors and supply chain companies?

If the target audience's information needs are not clear, consult members of the target audience or their closest advisors in order to understand their needs (this could include farmers, farmer associations or USDA staff). Below are some existing insights from partners of this report about the types of information needed by common target audiences to build the business case for conservation agriculture.⁸

⁸ EDF conservation agriculture budget analysis guidance workshop series. (June 2020).

Resources

To learn more about the role of agricultural lenders in supporting conservation agriculture and the five “Cs” they use to evaluate a farmer’s credit, visit page 17 of [this EDF report](#).

To learn about the objectives and value of benchmarking, [visit this article](#) from Purdue University.

Farmers

Farmers want to know if conservation practices can be profitable on their farms while providing the environmental outcomes they seek. Farmers want information that comes from farms that have similar operations to their own. Results are most meaningful to farmers if they come from a similar geography, farm size and crop rotation. Farmers look for replication and validity in financial analyses to give them confidence that the results can translate to their own operation. Farmers also need contextual information about the decisions made by the represented farmers to help them relate to and understand the operations that were analyzed. Farmers often rely on trusted advisors such as certified crop advisors and extension specialists for agronomic information. Informing farmers’ trusted advisors or collaborating with them in conducting the analysis can go a long way in communicating to farmers effectively.

Agricultural lenders

Agricultural lenders are farmers’ closest financial partners and provide financial support to farmers based on the soundness of the farmers’ credit. Agricultural lenders are interested in budget analyses that show trends connecting conservation practices and financial performance (e.g. cost savings, yield impacts, etc.). Agricultural lenders cannot advise farmers on which practices to implement, but they do assess whether farm management changes proposed by their borrowers are financially sound. Agricultural lenders look for larger sample sizes that can show a significant relationship between conservation and profitability, because they make decisions across a portfolio of clients. They utilize benchmarking — the practice of comparing individuals to an identified standard — as a way to compare farmers and practices to “good performers.” Lenders rarely have access to detailed financial information on how conservation practices impact farm budgets, therefore conservation agriculture budget analyses can help lenders serve their clients who want to adopt conservation practices.

Supply chain companies

Supply chain companies — including grain buyers, food companies and retailers — are increasing their commitments to sustainable agriculture. As part of these commitments, many companies are creating programs that support farmers in adopting conservation practices. To inform the design of these programs, supply chain companies need information on the specific cost and revenue changes affected by conservation practices, how these changes take place over time, and where financial support is needed to help farmers through the transition to conservation practices. Supply chain companies also need to measure environmental outcomes to assess their performance towards their sustainability targets.

Example Target Audiences



Farmers



Lenders



Landowners



Policymakers



Food Companies



Input Providers

Example of study objectives and key audience: Precision Conservation Management

Objective “The objective of PCM is to work one-on-one with farmers to help them understand the costs and benefits of adopting new conservation practices.”

Key audiences Farmers, state and national policymakers

Resources

To learn more about data privacy concerns in agriculture, visit [this Farm Market ID blog](#).

[This blog](#) describes farm financial recordkeeping challenges and the importance of good recordkeeping for understanding the impacts of conservation practices.

Refer to the NRCS crop calendar [here](#).

Key consideration 2

What limitations will you need to address?

After identifying the information gap the study aims to fill and how the objectives will inform the audience, you must address expected study limitations. All farm conservation budget analyses face limitations, but identifying those limitations during the objective-setting process can help prevent significant roadblocks throughout the study. Upon identifying the study's expected limitations, consider whether the objectives need to be adjusted based on the expected limitations.

Farm budget analyses most frequently face three forms of limitations: limited access to farmers, limited data and insufficient recordkeeping, and limited time and resources.

Limited access to farmers

Farmers are busy professionals. This limits the time they have to share their stories and their data. Limited access to farmers' information can cause barriers to conservation budget analyses by preventing researchers from achieving the intended sample size, the intended comparison groups or the intended set of conservation practices. Farmers are also concerned about data privacy, which can make them unwilling to participate in budget analyses. Data protection is covered in more detail under key consideration 6. Having a clear idea of which farmers researchers will be able to access ahead of the project and which data they are willing to share can help select the proper study objectives and methodology.

Limited data and insufficient recordkeeping

One of the greatest restraints identified by researchers is access to data. Part of this issue is due to insufficient farm recordkeeping. There is often a significant gap between the data researchers seek and the financial records available. Data limitations can affect the breadth of the budget that practitioners can analyze. It can also affect the number of years that researchers can compare. Insufficient recordkeeping can also increase the time and effort that practitioners spend cleaning the data — thereby significantly increasing the cost of the project. There is also very limited data from farms that have attempted conservation practices and found those practices to be financially unsuccessful.

One common technique used when facing insufficient farm financial data is to use published average costs. Land Grant University agricultural extensions publish yearly crop budgets using average costs. These resources can be used to fill gaps in financial information. The use of average costs is described in more detail under key consideration 5.

Limited time and resources

Organizations working to identify the financial case for conservation can face time and budget constraints that affect their methodology. Time constraints can limit the number of farmers reached by the study and the number of comparisons conducted. Financial resource constraints can also limit the size of the sample, the sophistication of the data analysis and the efficacy of the study's communications. Farmers also face time and resource constraints that affect their ability to contribute to analyses. The farming calendar can make farmers inaccessible during certain times of the year. Realistically setting study expectations based on limitations associated with your time, resources and the farmers' time is important to ensure quality results and proper interpretation of results.

Resources

[Here is a list](#) of commodity and agricultural organizations for reference.

[Here is a list](#) of cooperative extensions for each state.

Recap: Setting good objectives



Identify the key questions you want your analysis to answer.



Identify your target audience.



Set objectives that provide actionable information for the audience.



Identify limitations you expect to face in your analysis.



Refine your objectives based on the limitations you expect to face.

Sample selection

A sample is a small group of individuals selected to represent a larger group of which they are part (i.e. a set of farmers representing a larger constituency of farmers). The sample you select will determine the budget comparison you will be able to make, the results you will be able to achieve and the information you will be able to share. **The selection of your sample should be informed by the objectives of your study, the limitations you face and the information needs of your target audience** determined in key consideration 1.

Key consideration 3

What characteristics are you looking for in your sample?

Start developing the sample by identifying which farmers you have access to and whether their operations, practices and geography align with the study objectives. If you do not have access to the right farmer participants through your network, consider partnering with an organization that has access to farmers. Such organizations include farmer associations, cooperative extensions and conservation districts. Whether you are working directly with farmers you know or partnering with another organization associated with a network of farmers, it is essential to take the time to build relationships with farmers to develop trust.

It is also important to consider the value of different sample sizes, the characteristics you are looking for in participating farms, and the comparison groups you need to assure that the selected sample aligns with the study objectives.

Resources

[Precision Conservation Management's analysis](#)

of cover crops, tillage practices and nutrient management from over 200 farmers is a great example of what can be done with a large sample size.

[EDF's 2018 farm budget analysis](#) demonstrates how a medium sized sample can be used to do some comparative analysis while also providing detailed information from each producer.

Case studies by [American Farmland Trust](#), [Datu Research](#), [NRCS](#), and [Soil Health Partnership](#) provide detailed information on each producer, while also clearly demonstrating the economic outcomes of conservation practices.

Sample characteristic considerations



Conservation practices



Crops



Geography



Farm size



Recordkeeping quality



Years of conservation experience

Different sample sizes are suited for different objectives

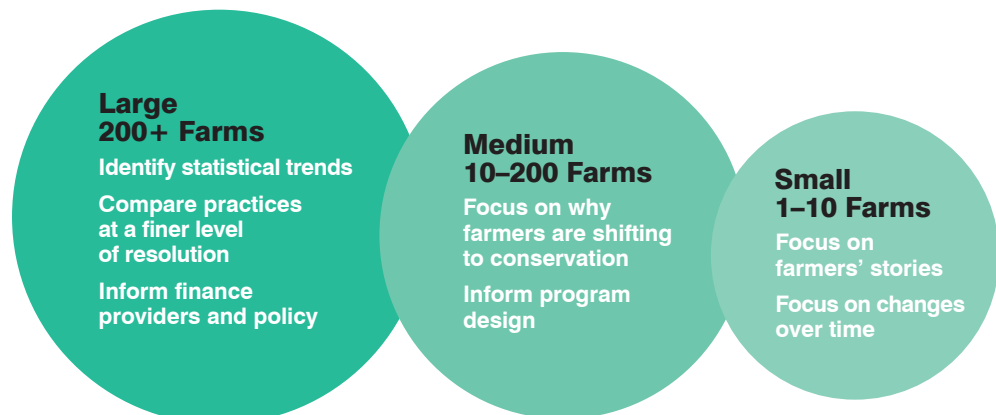
There are natural tradeoffs between statistical strength and detailed contextual information associated with different sample sizes. As depicted in Figure 1, large sample sizes (200+ farms) can provide statistical strength to analyze the relative effects of conservation practices on farm profits (assuming the robust underlying financial data). Large sample sizes and benchmarking (adopter vs. non-adopter) can inform agricultural lenders assessing farm performance across their lending portfolio. Large sample sizes are also useful in informing policy design. Large sample sizes are better able to identify trends at finer levels of resolution, including comparisons of different forms of conservation tillage or different nitrogen application methods. For example, Precision Conservation Management's data from 200 farmers allowed the organization to make comparisons across multiple practice variations such as four different fertilizer application methods. Of course, with large sample sizes it is not possible to describe each farmers' choices in great detail.

Medium sample sizes (10-200) are well suited to balance comparisons between farms and providing each farmer's experience in detail. They can compare average costs between production systems with different practices, supplemented with information about each farmer's experience with conservation practices. They are informative for regional analyses that aim to show average financial outcomes while providing sufficient contextual information for farmers in that region. For example, EDF's 2018 farm budget analysis report describes the key financial changes associated with conservation practices and describes the role of farmers' key financial partners in supporting the financing of these practices.

Small sample sizes can be utilized to understand the farm budget changes that occur over time in greater detail. They can provide a wealth of knowledge through in-depth contextual information about the agronomic and financial decisions farmers make, and sometimes take more of a storytelling approach to communicating the information. They can also describe farmers' process of trial and error through the adoption transition. Examples include case studies by American Farmland Trust, Datu Research, NRCS and Soil Health Partnership.

As much as possible, aim to align your sample size with the objectives of your study from key consideration 1.

FIGURE 1



Resources

Union of Concerned Scientists' [Leveling the Fields report](#) describes the inequalities in opportunity for small farmers, women farmers and farmers of color.

This [Government Accountability Office report](#) describes the limited access to financial credit faced by socially disadvantaged farmers and lenders.

The sample should reflect the target audience

Farmers are more likely to value the information provided by the study if it comes from farms growing the same crops or livestock and located in the same geography. The agronomic practices and inputs applied differ between crops, therefore making it difficult for a corn farmer to interpret results from a wheat farm. Climate and soils differ across geographies and drive different management practices. Therefore, the geographical, production system and conservation practice specificity of your sample should match your target audience. The Precision Conservation Management business case for conservation practices report (see resource box on page 11) is a good example of providing detailed information for a particular region (Illinois) and a particular production system (corn-soybean rotations).

The number of years of conservation experience can affect your conservation comparison

Some farmers have thirty years of experience with conservation tillage, while others are adopting it for the first time. Optimal data and analysis can differ based on the number of years of experience sample farms have with conservation practices. Farmers who have used conservation practices for many years can help demonstrate how costs and revenues associated with conservation practices change over the transition period to these practices. On the other hand, these farmers are less likely to have financial records from years before their transition to conservation practices because farm records were less sophisticated and complete in the past. Sampling farmers who have recently adopted conservation practices allows practitioners to evaluate the budget before and after the adoption of conservation practices. It may even be possible to analyze the transition period by gathering budget information for the first few years of adoption, and therefore be able to collaborate with the farmer on the desired data collection methods throughout the study period (discussed in further detail in key consideration 4).

Addressing sampling bias associated with underrepresented farmer groups

Many practitioners seek to study farms that have existing, complete and computerized recordkeeping and datasets in order to make data gathering and analysis simple and cost-effective. However, farms with this type of data often are large farms with higher levels of technology adoption than the average farmer. This preference often results in the exclusion of smaller farms, farmers with less time and resources to participate in research, women farmers and farmers of color.

This sampling bias can create multiple problems. First, practitioners are unable to learn from the valuable knowledge and skills of the excluded groups of farmers. Second, systematically excluding certain groups of farmers can perpetuate inequities in access to relevant information for those groups. Finally, if the results of farm budget analyses are used to inform the design of private or public conservation programs, excluded groups of farmers are also likely to be left out of those programs and be further disadvantaged.

The best practice for studies of these groups of farmers is for them to be conducted by practitioners or researchers who are members of those groups or have existing productive relationships with them. Practitioners who do not come from those groups can address this source of sampling bias by collaborating with other practitioners mentioned above, including equitable distribution of funding, and by building relationships with organizations that represent small, low-income, women farmers and farmers of color. This collaboration can inform practitioners on the information needs of those groups of farmers, as well as any modifications to study methodologies that are needed to collaborate effectively with those farmer groups.

Key consideration 4

Which comparison is best suited for your objectives?

Crop and livestock production are influenced by many variables, which creates a significant challenge to identify which farm budget changes result from conservation practices, and which result from other farm management changes, or market and environmental factors. For this reason, the comparisons chosen to isolate the financial benefits of conservation adoption from other factors are perhaps the most important aspects of a conservation agriculture budget analysis.

The most essential aspect of the comparison is identifying the baseline. You will see in the comparison types described below that the baseline data will differ based on the comparison type. For example, if comparing costs and revenues during the most recent crop year to costs and revenues prior to the farmer's use of conservation practices, it is important to identify and collect data from that baseline year prior to conservation. On the other hand, if the study uses an adopter vs. non-adopter comparison, the baseline data would be the costs and revenues from farms not adopting conservation practices.

What is a baseline?

The baseline for your study, also known as your control, should be the group of farmers, fields or years that you identify as not including conservation practices. In most conservation budget analyses, the baseline is the data from farms not using conservation practices, the last year(s) a farmer used conventional practices, or the acres on which the farmer is not using conservation practices. The baseline data is used in order to identify and quantify the change that occurred from adopting conservation practices.

The most controlled comparison type utilized by academic researchers is replicated strip trials. Strip trials allow for direct comparisons of practices on side-by-side tracks with similar soil characteristics and weather conditions. However, strip trials face limitations in measuring financial outcomes since the outcomes are measured at a more granular level than farmers' financial and management decision-making. The comparison types outlined below measure changes at the acre or field level, which more closely align with the scale of farmers' decision-making.

There are three key categories of comparison used in conservation agriculture budget analyses: time, place and practice. As you assess the comparison types below, think about whether they reflect the decisions or comparisons your target audience makes.

Across time

Before and after

Many farm budget analyses compare farm budgets associated with costs and revenues before adopting conservation practices to those after adopting conservation practices. Some studies use one specific crop year budget before conservation adoption to one specific crop year budget after conservation adoption, while others ask farmers to provide cost and revenue information for a typical year's experience to compare against the information from the years since conservation practices were implemented. The benefit of the before and after approach is that you can gather great insight from a small sample size. One challenge to comparing before and after is that weather and other biological factors change from year to year, creating variability that is unrelated to the adopted practices. Another challenge to comparisons between

two distinct time periods is that estimating the operating costs from many years ago can be difficult for farmers. Many farmers using conservation practices have done so for many years, making it difficult for them to estimate their baseline costs and revenues. Estimated average costs from Land Grant University Extension Service crop budgets can be helpful when farmers have insufficient historical records. This is described in more detail in key consideration 5.

Example of before and after comparison: *American Farmland Trust case studies*

Using a detailed questionnaire, the American Farmland Trust (AFT) interviewed nine farmers across the country to understand the estimated cost and revenue changes the farmers attributed to the use of soil health conservation practices. AFT asked farmers to report on economic data (i.e. yields, input, and machinery costs) associated with a “typical year” before practice adoption and a “typical year” after practice adoption to produce partial budgets using the Retrospective-Soil Health Economic Calculator (R-SHEC) tool.

Adoption over time

Another comparison type is comparing a single farm across consecutive years. Specifically, this approach compares a multi-year pre-conservation adoption baseline to multiple years after the practices were adopted. Datu Research utilized this comparison with four farmer, following their management decisions and financial outcomes over three to five years after adopting conservation practices. The challenges of this approach are the time and resource commitment to follow financial records across multiple years.

Example of studying adoption over time: *Datu Research*

Datu Research conducted case studies with four farms in the Upper Mississippi basin to measure the financial impacts of adopting cover crops and no-till. Datu followed the budgets of the four farmers across 3-5 years to understand how cost and revenue changes occurred over time. Datu Research established baselines for the key cost and revenue categories they measured and compared costs and revenues over time to that baseline.

Across practices and place

Adopters vs. Non-adopters

In comparison, some analyses compare financial impacts across conservation adopters and non-adopters. Precision Conservation Management created multiple comparison groups, for example, comparing no-till, strip-till, and 1-, 2- and 3-pass tillage systems. The benefit of using this comparison method is that meaningful comparisons can be made with a single year of data, making data collection easier. This approach is also well suited for informing agricultural lenders, who often use benchmarking to assess common success factors. However, this approach takes a larger sample size. It also requires that the adopter and non-adopter have similar characteristics in terms of geography, soil type and farm size.

Combined practice comparisons

Another type of analysis is one that compares different combinations of practices, for example, one comparison of tilled fields and no-till fields across farms that implemented both practices, one comparison of farms that tilled all fields and farms that no-tilled all fields, and one aggregate comparison of adoption and non-adoption. This type of analysis differentiates between parts of the rotation and between other conservation practices, like cover crop

adoption, within the rotation. The benefit of this approach is that it identifies the financial dynamics of practice interactions and parts of the rotation. It also helps to reduce the effects bias that can occur when solely comparing adopters to non-adopters. The challenge associated with this approach is also the need for a large sample size of farms with the specific characteristics of your comparison groups.

Example of multiple practice comparison: *Iowa Soybean Association*

The Iowa Soybean Association (ISA) compared crop budgets of fields adoption cover crops and those not adopting cover crops. They made these comparisons across fields on the same farm, fields on different farms, and one aggregated comparison.

Recap: Sample selection

- Identify the sample characteristics that match the needs of your target audience.**

- Identify the potential samples you can access.**

- Consider the strengths of different samples sizes and how they align with your objectives.**

- Select the comparison type that is best suited to your objectives and the information needs of your target audience.**

- Clearly define the baseline in your comparison.**

Selecting and gathering data

Farm conservation budget analyses are only as good as the quality of the data. Data often poses the most substantial challenge to researchers because they must collaborate with farmers to collect farm financial and management records or self-reported data, which are often made available in different formats. For this reason, best practices for selecting and gathering data can help make studies more comparable and replicable.

There are two important data gathering considerations to evaluate prior to conducting a budget analysis: what form of data is appropriate based on your objectives and sample size, and how will you collect this data while ensuring farmers' data privacy?

Key consideration 5

What form of data is available and appropriate for your study?

There are many forms of data that can be used to evaluate the financial implications of agricultural conservation practices. These forms of data range from direct farm financial records to public data sources including USDA and Land Grant Universities.

Before jumping into the different data options outlined below, it is worth considering the relationship between different data types and your objective, target audience and sample size. The table below provides suggestions about the suitability of different data types for the characteristics of your study. The descriptions on the following page go into further detail about these data options.

Form of data	Objective	Sample size	Target audience
Farm financial or self-reported data (e.g. input receipts, price for crops received)	To identify the specific financial impacts and cost item changes	Small-Medium	Farmers, lenders
Farm management data with average prices	To identify statistical trends	Large	Lenders, policymakers

Utilizing direct financial data vs. average cost values

Farm budget analyses can estimate costs and revenues through two basic methods: 1) direct farmer financial data and 2) farm management data combined with average cost values. Selecting direct farmer financial data as the main data source measures the actual costs of a farmer's practices (i.e., what the farmer paid for seeds, chemicals, equipment etc.). While this is important from the perspective of the farmer studied, as well as anyone involved in their finances (e.g. lenders), it can also introduce variability due to differences in prices paid for inputs or received for crops. It can also be challenging to track, because you must collect farmer financial data in addition to farm management data. On the other hand, pairing farm management data with average cost values allows for greater sample sizes and less data normalizing and cleaning.

Average costs can be used in combination with farm management information to estimate the cost of production. Average costs can also be used in studies using direct farmer financial data when the true cost of an input or activity cannot be accurately estimated by the farmer. For example, it can be challenging for farmers to put a price per acre value on their own time.

Resources

University of Minnesota's Center for Farm Financial Management [FINBIN database](#) provides summary report for whole farm, crop and livestock budgets across many states in the Midwest. It can also generate benchmarking reports for different crops and management practices.

Iowa State University and most other land grant university extensions provide [yearly estimated crop budgets](#) for common row crops in the state.

There are also instances when the variables necessary to completing a proper budget are not related to the farmer's management practices. For example, the price at which a farmer sells his or her crop does not reflect the outcomes of his or her in-field management practices. In cases when the farmer cannot appropriately estimate a cost or when the cost is not related to in-field management decisions, average cost values should be used. These estimated values are provided in the form of crop budgets by Land Grant Universities at a state level. These include crop production cost estimates by Iowa State University and actual producer averages by University of Minnesota's Center for Farm Financial Management FINBIN database (see Resources box to the left).

Using average cost values also has the benefit of protecting producers' private financial data. Many of the case studies analyzed for this report normalized commodity prices as a means of making the benefits and costs of conservation adoption comparable across farms.

Example of using management data and average cost values: *Sustainable Agriculture Research and Education*

Sustainable Agriculture Research and Education (SARE) estimated the financial implications of adopting cover crops in normal circumstances and under specific conditions. SARE utilized data from the Conservation Technology Information Center National Cover Crop Survey that included cover crop cost data from approximately 2,000 farmers. SARE used the average costs from the survey and practice change assumptions to estimate the total cost and revenue changes associating with implementing cover crops.

Self-reported vs. machine generated

Many conservation agriculture budget analyses use self-reported farm data including management history, current management practices and financial records. Researchers often gather financial data directly from the farmers' records and follow up with interviews to gather more detailed information. Key consideration 6 provides more information on gathering self-reported farmer data.

The growth of agricultural technology platforms provides a new opportunity for gathering and analyzing management and financial data. Machine-generated data is gathered by sensors in farm machinery and sensors in the field. These sensors gather management activities such as number of passes over the field, yields, seed application rate and more. The data gathered by this machine software can be used in farm budget analyses to indicate input use, number of field passes, fuel use and yield, which can all be translated in dollar terms with farm financial data or average costs. The benefit of using machine generated data is that it often provides more detail than self-reported data and can be more accurate if equipment is calibrated appropriately. It can also provide data points that could not be measured using self-reporting methods.

Machine generated data also has challenges, including data corruption when the data is taken off the equipment or inserted into the computer improperly, calibration issues when the farmer forgets to calibrate the monitor before starting a task, or lack of experience using the technology. Another challenge with using machine-generated data is data privacy. Farmers are rightfully wary of sharing detailed management data about their operation with outside parties. Machine generated data also only represent farmers that have access to these expensive technologies, which leaves out important information from smaller farms and low-income farmers.

The variety of recordkeeping methods farmers utilize requires that practitioners normalize and clean the financial data before starting the analysis. Cleaning self-reported data is important to assure the data properly represents the management and budget items analysts wish to evaluate. Analyses often have to normalize the data from farmers into the same units, accounting method, time period and budget categories. Many studies set out budget and management criteria, interpret financial records and then normalize them into their methodological criteria.

Key consideration 6

How will you obtain data and protect farmers' data privacy?

Financial and agronomic management data can be gathered from farmers in a few different ways, including farmer interviews, survey instruments, data from ag tech platforms or hybrids of these options. Here are three common forms of gathering farm management and financial data.

Farmer interview and document collection

For smaller case studies, practitioners often gather financial data directly from the farmers and follow up with interviews to gather more detailed information and confirm provided values. For example, Datu Research collected financial records from farmers, interpreted them into a budget template and then followed up with the farmer to confirm the accuracy of their interpretations of those records. Working with organizations that have dedicated field staff that work with farmers on a regular basis makes gathering data more efficient and allows farmers to feel comfortable discussing financial data with a trusted advisor. Farmer data can also be gathered virtually using Microsoft Excel-based workbooks. This strategy may require a farmer training session to instruct farmers on how to use the workbook. It's best to follow up with phone calls to confirm the financial information provided.

The benefits of talking to farmers

Many experts expressed the importance of having conversations with farmers during the data gathering process. Having conversations with farmers about their data and management provides the following benefits:

1. It provides contextual information about the farm's operations, the decisions farmers have made and why, and the conditions under which farmers made their decisions.
2. It allows you to determine if you interpreted their budget data correctly.
3. It helps to get a sense of how farmers process information in their budgets.

As researchers, it is important to be aware of competitive dynamics in agriculture and to protect farmers' data privacy. To protect farmers from losing their competitive edge by contributing their financial data to your study, it is important to protect certain key pieces of information. Here are a few tips to protect data privacy:

1. Always use a normalized crop price for all farms.
2. Never present information on farmers' cash rent.
3. Never attribute a farmer's specific information without their explicit approval.

Resources

[SARE's cover crop economics bulletin](#)

shows how survey data can be combined with average costs to estimate cover crops' financial outcomes.

[Precision Conservation Management](#) and Illinois's [Farm Business Farm Management Association \(FBFM\)](#)

provide an example for a digital data collection platform combined with estimated costs from FBFM's clients to provide a large sample size comparison of conservation practice financials.

Trying to normalize prices across time? This [U.S. Bureau of Labor Statistics inflation calculator](#) can help you compare costs across time.

This [Farm Journal article](#) presents the Privacy and Security Principles for Farm Data document created by a collaboration of farm associations. It outlines key data privacy considerations researchers must consider when using farmer data.

Survey data

Multi-farm studies also use surveys or membership data platforms to gather management and financial data from farmers. For example, SARE gathered cover crop management practices and yields through their National Cover Crop Survey. When using survey instruments, it is important to consider the potential biases caused by self-selection, including the tendency of successful practice implementers to participate in the survey at higher rates than farmers who did not have success in conservation adoption or have not yet tried it.

Digital data collection platforms

An emerging method for gathering data is to develop digital data gathering platforms or partner with an agriculture technology platform to gather detailed information on the farmers' activities in the field, the amount of inputs applied and the timing of each activity. For example, PCM developed their own data collection platform in which PCM specialists, working directly with farmers, store farm management data and then pair that data with average costs and revenues generated from Illinois's Farm Business Farm Management Association (FBFM), which acts as a financial accounting manager for farms in Illinois. By connecting data from these two data platforms, PCM can measure costs and benefits of conservation practices by using data aggregated from many farmers across the state.

While gathering data using one of the methods described above, it is important to clearly build the baseline data to ensure an accurate comparison.

It is also important to recognize the need to make adjustments to the baseline data in order to truly compare apples to apples. For example, the cost of tillage equipment in the 1980 is not the same as the cost of tillage equipment today. The feasibility and methods to adjust prices across time is important to establish before gathering that baseline data.

Recap: Gathering data



Identify which type of data is available to conduct your comparison.



Identify whether direct financial data or average cost values are more appropriate for your study.



Identify your method of data gathering.



Determine how you will protect farmer data privacy.

Resources

American Farmland Trust's [Soil Health Economic and Environmental Case Studies Tool Kit](#) provides a wealth of resources for conducting partial budget analysis case studies. The main component of the toolkit is the Retrospective Soil Health Economic Calculator (R-SHEC), an Excel-based tool for inputting and analyzing economic data obtained through interviews with producers who have already adopted soil health practices. The R-SHEC tool guides users to conduct a partial budget analysis and generate a partial budget analysis table that featuring the change in net income and an estimate of the return on investment (ROI) in the practices. The site also includes guidance for selecting producers, conducting interviews, sample questionnaires, and case study writing guidance.

Analyzing farm budgets

Analyzing the effects of conservation on the farm's bottom line requires thoughtful evaluation of how changes in agronomic practices affect the budget. Therefore, it is important to consider whether partial budget or enterprise budget analyses are more appropriate to capture the financial impacts of the management change, which revenue and cost categories are affected by management changes, and which accounting methods to use.

Key consideration 7

What budget information is needed for your analysis?

Conservation practices can have multiple impacts on the costs and revenues of a farm operation. Based on the objectives of the study, the availability of data, time and resource limitations, and the type of comparison conducted, **it is important to consider what budget information is needed to capture the financial effects of conservation adoption** in the study. More details about these decisions are presented below.

Comparing partial budget analysis and enterprise budget analysis

Case studies and analyses use two different budget approaches: partial budgets and enterprise budgets.

A partial budget approach isolates the specific line items predicted to be directly affected by the new conservation practice. Financial information is gathered on these specific costs and revenues and the net impact on income is calculated from these changes. The advantage of using a partial budget approach is that the process to collect information from the farmer focuses on what costs and benefits changed with the adoption of each conservation practice. Thus, there is less data to collect and the outcomes are simpler to communicate. One limitation of a partial budget analysis approach that relies on farmer self-reported information is that a farmer might find it difficult to recall the "before costs" and might be unable to differentiate economic effects between adopted practices. To address this challenge, a combined practice effect analysis can be conducted, and open-ended questions to probe all possible effects, not just the ones predetermined by the researcher can be asked. The partial budget example from American Farmland Trust for an Ohio corn-soybean farmer who adopted no-till, cover crops, and nutrient management practices can be found on the following page.

Partial budget analysis example from American Farmland Trust

TABLE 2

Economic Effects of Soil Health Practices on MadMax Farms (2018)

Increases in Net Income				Decreases in Net Income			
Increase in Income				Decrease in Income			
ITEM	PER ACRE	ACRES	TOTAL	ITEM	PER ACRE	ACRES	TOTAL
Yield Impact Due to Soil Health Practices	\$69.00	1,250	\$86,250	None Identified			\$0
Total Increased Income			\$86,250	Total Decreased Income			\$0
Decrease in Cost				Increase in Cost			
ITEM	PER ACRE	ACRES	TOTAL	ITEM	PER ACRE	ACRES	TOTAL
Nutrient Savings due to Soil Health Practices	\$17.51	1,250	\$21,881	Variable Rate Application Cost	\$3.00	1,250	\$3,750
Reduced Seeding Rate for Soybeans	\$5.00	625	\$3,125	Increased Soil Testing Every Two Years	\$10.00	1,250	\$12,500
Pesticide Savings due to Soil Health Practices	\$18.75	1,250	\$23,438	Residue and Tillage Mgt. Learning Activities	\$1.17	1,250	\$1,465
50% Reduction in Treated Soybean Seed	\$6.00	625	\$3,750	Cover Crops Learning Activities	\$5.86	1,250	\$7,326
Reduced Machinery Costs Due to Reduced Tillage	\$35.45	1,250	\$44,317	Nutrient Management Learning Activities	\$3.32	1,250	\$4,151
Field Repair Savings due to Soil Health Practices	\$1.00	1,250	\$1,250	Using Biologicals in Furrow	\$30.00	1,250	\$37,500
				Increased Machinery Costs due to Change in Nutrient Management	\$6.30	1,250	\$7,875
				Cover Crop Costs	\$49.50	1,250	\$61,875
Total Decreased Cost			\$97,761	Total Increased Cost			\$136,442
Annual Total Increased Net Income			\$184,011	Annual Total Decreased Net Income			\$136,442
Total Acres in this Study Area		1,250		Total Acres in this Study Area		1,250	
Annual Per Acre Increased Net Income			\$147	Annual Per Acre Decreased Net Income			\$109

Annual Change in Total Net Income = \$47,569
Annual Change in Per Acre Net Income = \$38

This table represents costs and benefits over the entire study area (1,250 acres) as reported by the farmer. • All values are in 2018 dollars. • Crop prices used in the analysis: Corn: \$3.55/Bu, Soybeans: \$8.60/Bu. Source: Crop Values 2018 Summary, USDA, NASS. • Fertilizer prices used in the analysis: Nitrogen: \$.30/LB, Phosphate: \$.39/LB, Potash: \$.27/LB. Source: Estimated Costs of Crop Production in Iowa—2018. • For information about study methodology, see <http://farmland.org/soilhealthcasestudies>. For information about USDA's Nutrient Tracking Tool, see <https://www.oem.usda.gov/nutrient-tracking-tool-ntt>.

For information about USDA's COMET-Farm Tool, see <http://cometfarm.nrel.colostate.edu/>. This material is based on work supported by a USDA NRCS CIG grant: NR183A750008G008. • Eric is receiving technical and financial assistance through a Conservation Stewardship Program (CSP) contract (2016-2020). This support allowed Eric to conduct tissue testing and Haney soil testing on 300 of his acres. The CSP income is not included in the analysis given the mismatch in years and acres between the contract and the study. Readers can assume that during the contract years, Eric received additional net income from CSP.

Resources

NRCS's [Economics Technical Note: Developing Conservation Case Studies for Decision-Making](#) provides guidance for developing conservation case studies. The resource includes guidance for setting goals, determining the amount of detail required to meet the case study goals, selecting appropriate producers to highlight, the information to collect and the types of comparisons that can be made. NRCS also developed the [Economics Technical Note: Basic Economic Analysis Using T-Charts](#). This technical note supports the first by explaining how to conduct simple cost-benefit analysis of conservation practices. These resources are specifically useful for individual farmer case studies using partial budget analysis. NRCS provides other economics resources including a cover crop economics tool [here](#).

An enterprise budget approach assesses all budget line items a farmer includes in his or her budgets. The advantage of using an enterprise budget approach is that it gathers financial information without predetermining which costs and revenues are predicted to change. It allows the researcher to see all revenue and cost changes before determining which ones are due to the adoption of the conservation practice. One challenge with this approach is that it requires more data collection. Another challenge with the enterprise budget approach is that researchers must distinguish which budget changes are due to the practice change and which are due to other factors. This can require follow-up questions to the producers to understand why costs and revenues changed and whether or not they are related to the conservation practice. The study conducted by EDF provides an example of the enterprise budget approach for an Iowa corn-soybean farmer who uses no-till, cover crops and nutrient management as shown in the table below.

TABLE 3
Enterprise budget analysis example by EDF

Crop	Corn following corn	Corn following soy	Soybeans	Seed soybeans
Acres	920	1,840	1,380	460
Yield (bu/acre)*	210	210	55	55
Commodity price (\$/bu)	\$ 3.50	\$ 3.50	\$ 9.50	\$ 9.50
Gross income	\$ 735	\$ 735	\$ 523	\$ 523
Gross income (total \$)	\$ 676,200	\$ 1,352,400	\$ 721,050	\$ 240,350
Seed	113	80	59	41
Fertilizer	121	116	30	30
Pesticides	61	62	49	38
Total input costs	\$ 295	\$ 258	\$ 137	\$ 109
Other variable costs	\$ 17	\$ 17	\$ 15	\$ 21
Grain dry and storage	\$ 21	\$ 21	\$ 6	\$ 6
Total input + variable costs	\$ 333	\$ 296	\$ 158	\$ 136
Crop consultant/soil test	\$ 3	\$ 3	\$ 3	\$ 3
Hired labor	\$ 30	\$ 30	\$ 30	\$ 30
Machinery	\$ 60	\$ 60	\$ 60	\$ 60
Equipment depreciation	\$ 12	\$ 12	\$ 12	\$ 12
Other fixed costs	\$ 47	\$ 47	\$ 47	\$ 47
Interest charge	\$ 21	\$ 21	\$ 21	\$ 21
Total fixed costs	\$ 173	\$ 173	\$ 173	\$ 173
Total expenses	\$ 506	\$ 469	\$ 331	\$ 309

Revenue and cost categories

The line items utilized to measure the cost of conservation practices vary across case studies, while the line items utilized to measure revenue impacts are more consistent across analyses. These required revenue categories include number of acres, yield in bushels per acre and commodity price (actual or estimated).

Including all necessary cost categories in the correct units is essential to creating a budget analysis that is robust and understandable by the intended audience. Variable costs, including inputs like fertilizer and planting, are those that depend on the rate at which they are used. Fixed costs, including equipment and land rental, are costs that do not change based on the amount they are used.

Measuring impact

There are many ways to measure and present the financial impact of conservation adoption. These include changes in net profit, changes in input costs and more. The best measure of financial impact depends on the type of comparison used in the study and whether the study uses a partial or enterprise budget analysis. The steps below can get you started to measure the financial impact of conservation practices, but you will need to adjust these steps based on the budget comparison used in your study:

Measure change in yield and revenue

Per acre yield * estimated crop price = per acre revenue

Measure change in total operating costs

Sum total input, machinery, fuel and labor costs

Measure change in net profit

Per acre revenue - per acre costs = per acre profit

Identify which costs changed substantially

Measure the difference between baseline costs and costs under the conservation practice.

Identify whether significant cost changes are attributable to the change in practices

Confirm the significant cost changes with a few farmers in your sample

Present the impacts conservation practices had on total revenue, total costs, net profit and important cost changes

Present individual cost changes and the total impact on revenues and costs

Resources

This [Texas A&M AgriLife Extension Risk Management Series paper](#) provides a more in-depth look at the differences between cash and accrual accounting and how they are used.

Key consideration 8

Which accounting method will you use?

It is essential to consider the form of accounting you will implement before analyzing farm budgets. The two accounting methods — accrual accounting and cash accounting — differ on the time at which revenue and expenses are counted. Therefore, the costs and revenues are distributed across crop years differently.

Cash accounting

Cash accounting is a single-entry bookkeeping system, meaning there is one entry for each transaction. Cash accounting counts costs and revenues when money exchanges hands. In this case, inputs purchased in 2019 for the 2020 planting season would be entered in the year 2019 budget. Most farmers utilize cash accounting for the ease of recordkeeping, as well as for potential tax benefits.

Analyses that utilize self-reported data from farmers that use cash accounting use a hybrid approach to avoid the challenges associated with cash accounting by asking farmers to report input costs by crop production cycle instead of by year to insure that all costs and revenue items reported reflect the same growing season.

Accrual accounting

Accrual accounting is a double-entry bookkeeping system. It counts a revenue or cost when it occurs, regardless of whether the actual exchange of money occurs in the moment, in the future or in the past. Using accrual accounting, input costs for a given year's crop are compared to the revenue from the sale of that crop, irrespective of the fact that the input costs were purchased in the previous calendar year. Inputs purchased in 2019 for the 2020 crop year would be counted in the year 2020 budget.

Farm managerial accountants use accrual accounting to compare the costs and benefits incurred in a growing season. However, given that most farmers use cash accounting, accrual adjustments are necessary to analyze and present data in accrual terms (see box).

Accrual adjustments: Turning cash accounting to accrual accounting

Making accrual adjustments to change your data from a cash accounting format to an accrual accounting format involves adding and subtracting elements of the budget that are accounted for differently by the two forms of accounting. Follow the steps below to transform your data from cash to accrual:

1. Add accrued expenses. Add to the budget expenses incurred in the time period but that have not yet been paid. For example, inputs were acquired but have not yet been paid to the dealer, add these expenses to the budget.

2. Subtract cash payments. Subtract payments made in the recording period for expenses that were incurred in previous time periods. For example, subtract cash payments received this year for inputs you purchased and used last year.

3. Add prepaid expenses. Add expenses for the recording period that are prepaid. For example, pre-paid expenses for a technology service that will be used in the current recording period should be added.

4. Add accounts receivable. Add revenue generated from the current recording year whose payment will occur in future periods. For example,

if you secure an offtake agreement with payments occurring in the following year, include the revenue in the current year.

5. Subtract cash receipts. Subtract cash received from revenue generated in a past time period. For example, if cash is received for grain produced in the previous recording year, subtract out that cash from the current recording period

6. Subtract customer prepayments. If customers prepay for a product not created in the current recording period, subtract out that cash.

Recap: Analyzing farm budgets



Identify what budget information is needed to answer your research question.



Identify whether partial budget or enterprise budget analysis is most appropriate for your analysis and for answering your research question.



Identify the method of accounting used by your sample and decide which accounting method you will use.



Adjust farm budgets to align with your accounting method.

Communicating farm budget analyses

Upon completing your analysis, it is critical to effectively communicate about the study and its results to your target audience to achieve your objectives. Developing a communications strategy for your study using the lessons learned below can help you maximize meaningful exposure to your target audience. Partnering with your audience's most trusted advisors and messengers is the first key to effective communication. The second is providing your results in a clear and actionable way. The key considerations below provide more information on how to effectively communicate about the findings of your analysis.

Key consideration 9

How can you effectively present the results of your analysis to your target audiences?

The type of information that is presented to your key audience and the source from which it is communicated can be the difference between a successful communication strategy and a missed opportunity. Different audiences look for different types of information. Therefore, presenting the results of your analysis in the terms, units and formats that your audience is accustomed to is important. Below are some lessons learned to get started.

For farmers and trusted advisers

The financial outcomes of the analysis are most meaningful to farmers if they understand the context in which the farmers in the study made their management decisions. Farmers are more likely to find value in your study if they can understand why participating farmers implemented conservation practices and why they made adjustments to their inputs, labor and other budget categories. It is also helpful for farmers to understand the general characteristics of the farm operations you analyzed in order to assess whether the results could be replicated in

their operation. The questions presented in the list below describe some of the contextual information you should include alongside the financial results of your study.

Contextual information to present alongside financial results

Where, what and how do my participant farmers farm?

What challenge were my participant farmers trying to solve by implementing conservation practices?

What steps did they take in order to start conservation practices

What adjustments did the farmers make over time and why?

How did the results of the conservation practices differ across weather conditions?

What physical, visual and anecdotal evidence did the farmers experience in their fields after adopting conservation practices?

For agricultural lenders

Agricultural lenders make decisions based on the profitability of the farm operation. Therefore, they are less interested in the specific cost increases and decreases, but more so the combined effects across the farm budget. Agricultural lenders also frequently use benchmarking to inform and support their customers, a practice that can be used in communicating the financial case for conservation practices. Presenting enterprise budgets to agricultural lenders aligns best with their decision-making.

Supply chain companies

Supply chain companies are interested in the benefits that conservation provides to the growers they source from, the environmental outcomes that can support their company's sustainability goals, and the financial dynamics that they can support to help their growers adopt conservation. Supply chain companies want to hear stories about how farmers benefited from adopting conservation. They also want to know the measured environmental outcomes, especially those that align with their corporate sustainability initiative.

Key consideration 10

Which form of communication is most helpful to your target audience?

The final product that you present to your target audience and the channel through which you present it can significantly influence the success of your communications strategy.

The farmer, agricultural lender and supply chain audiences are most comfortable with concise reports and two-page case studies. Examples include the report by PCM and SARE. Effective white papers should not be overly lengthy and should quickly arrive at the information the target audience needs for their decision-making. Farmers are also accustomed to learning information through conferences and field days. Although robust methods are important to deliver trustworthy results, most farmers are less concerned about the methodological details. Reports should discuss the objectives of the study, the characteristics of the sample, the financial results and the contextual information that supports the financial results.

The communication channel through which you present your study can influence whether or not your key audience sees and trusts your results. Partnering with trusted organizations can lend credibility and help reinforce the value of your results. These partners can include farmer associations, USDA and university extensions. In addition to communicating results specifically to your target audience(s), sharing your results more broadly can help build the agricultural sector's collective understanding of the financial impacts of conservation.

Recap: Communicating farm budget analyses



Identify the type of information your audience needs for decision-making.



Identify what forms of communication are most effective for reaching your target audience.



Organize and deploy a communications strategy that provides the information your audiences need in formats they find useful.

Conclusion

As agriculture continues to face pressure to improve environmental performance, it is essential to develop solutions that are both environmentally sustainable and financially profitable for farmers. While the practices needed to provide environmental improvements in agriculture are well understood, the financial outcomes of these practices require greater clarity and broader understanding. Gathering larger quantities of robust financial information related to agricultural conservation practices can help farmers adopt financially profitable conservation systems. And when these production systems do not pay for themselves, or require financial support for up-front costs, understanding the financial dynamics of conservation practices over time can allow farmers' financial partners — including agricultural lenders and food companies — to provide support.

Gathering the information necessary to better understand the financial impacts of conservation agriculture requires participation from multiple stakeholders that have interest in growing the adoption of agricultural conservation practices, including conservation organizations, food companies, agricultural lenders, government and state agencies, and academic researchers. It is essential for these stakeholders to be involved, as they each play an important role in developing financial solutions and therefore identifying the information necessary to develop those financial solutions.

This guide serves as a primer to stakeholders engaging in conservation budget analyses. Multiple stakeholders can learn from the experiences gained by the partner organizations that developed the conservation agriculture budget analyses featured in this report. The end goal is for these stakeholders to develop partnerships that can foster greater financial data gathering related to conservation and provide the information farmers and their financial partners need to grow conservation adoption across the country.

Ultimately, this guide offers a path towards building a more resilient agricultural production system — one that is both profitable and sustainable for farmers, their business partners and consumers.