Purpose. The purpose of this economics technical note is to clarify the type and correct use of data. It will help planners and analysts understand the correct types and uses of data to communicate benefits and impacts of conservation.

Effective Date. Effective upon receipt.

Background. Understanding the difference in data is important because the results derived can be mistakenly presented if there is lack of understanding about its measurement, validity, or reliability. In order to make an informed presentation or provide an informed response to questions, one needs to be aware of and able to express the differences and limitations in the data.

Explanation. This technical note is one of a series. It was developed to provide NRCS personnel and planners some critical insights on dealing with data. It attempts to address one of the main economic considerations involved with implementing conservation practices and activities on agricultural lands: using appropriate data and examples to show how a practice or activity may fit on a given farm and understanding the limitations of that data.

Distribution. This directive is available on the NRCS eDirectives System Web site at https://directives.sc.egov.usda.gov/.

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

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Understanding the Information Being Presented

Differentiating between Quantitative and Qualitative

By

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Purpose

The purpose of this economics tech note is to clarify the type and correct use of data. In the course of our professional duties, data is often used to present information from research results, demonstrations, or other resources. This information can be used by planners in an effort to address questions of landowners, producers, and the general public as a part of our outreach and education efforts; with the goal of encouraging expansion of conservation activities across the landscape. Unfortunately, data is too often confused or misrepresented by planners and field staff.

Data can be categorized as quantitative or qualitative, depending on how the data being discussed was collected and measured. This has implications as to the applicability of the data.

This difference is important to be aware of because results derived from data can be mistakenly presented as if there is no difference in the measurement, validity, or reliability of the data (e.g., demonstration data is not the same as research data). In order to use data responsibly, one needs to be aware of and able to distinguish differences and limitations in the data.

What is Quantitative Data? What is Quantitative Research?

Quantitative data, or empirical data\(^{(1)}\), is data that has been collected and measured against a numerical scale or an external, calibrated tool. Many university-variety research trial results provide examples of quantitative data. Collecting, analyzing, and interpreting the results of quantitative data utilizes an established protocol known as the scientific method. Other studies should be able to generate the same or similar results if different individuals use the same protocol with the same variables—this is a critical point of the scientific method. Quantitative studies provide the ability to ask and answer the question “can we do that again?”
Quantitative research studies often use statistical analysis to reach a conclusion based upon the data. Economists, statisticians, and others trained in data analysis and interpretation typically become involved to help explain the results of quantitative data analysis.

A strength of quantitative analysis is the ability to generalize. Many statistical analyses allow for an inference to be made beyond the sample to the population from which the sample was drawn. Thus, results from a statistical analysis can be extended beyond describing the sample to the population. This allows the individual to take what was learned from a study and apply it to a different situation (i.e., a different sample, group, or plot) (quantitative example in appendix A).

What is Qualitative Data? What is Qualitative Research?

Qualitative data captures a rich, deep description of the variables in the sample being considered in the study(2,3). Examples of qualitative data include soil color descriptions, NRCS case studies, or farm demonstration trials. Additionally, the individual performing qualitative research is the filter data is passed through, rather than an external, calibrated tool—this is an essential difference in the data. Qualitative studies are not focused on the ability to repeat a study to achieve the same results. Notably, the findings may not extend beyond the study itself.

Qualitative data may also be referred to as anecdotal data(4,5,6). Qualitative data may be characterized as perspectives that represent a given set of circumstances at a select point in time.

Qualitative research studies contain findings that may be characterized as observations or descriptions. Qualitative data can be expressed along the lines of “my experience has been….,” Results from qualitative studies may also come in the form of a general statement, followed by the statement “individual results may vary.”

This does not mean that qualitative data is not as valuable as quantitative data. In fact, anecdotal data may be more persuasive or point to an outcome different from empirical data(7). Additionally, information that comes from qualitative studies may be useful in developing new hypotheses or identifying different trends (qualitative examples provided in appendix B).

Quantitative and Qualitative—A Difference in Scope

An important difference between quantitative and qualitative research is the goal of each type of study. Quantitative studies are interested in making inferences beyond the study itself, but only for the specific variables being measured. In contrast, qualitative studies are not as focused on making implications beyond the study itself, but may help identify multiple variables that are interacting, generating hypotheses to be tested, or explaining why a particular result in a study is obtained.
Another difference between quantitative and qualitative studies regards scope. Quantitative research studies focus upon a small number of specific variables from a particular context while all other components are held constant. In contrast, qualitative research studies include a large number of variables and focus on the whole context.

This allows quantitative studies to gain a clearer understanding of interaction between the measured variables, even if the total interactions among all variables in a system are not well grasped. Qualitative studies help describe the behavior of the system as a whole though the detailed specifics of the different components may not be well grasped.

These differences may be better expressed as an analogy—quantitative research focuses on specific trees in the forest, while qualitative research focuses on the whole forest but not specific trees.

**Using Quantitative and Qualitative Studies Responsibly**

Both qualitative and quantitative research and data are valuable, but used for different purposes. Knowing which type of data to reference and use in a given situation is essential to providing an informed answer to our co-workers, our clients, and the public.

There are no absolute rules governing when to use information from a particular kind of research study. However, the following considerations help determine which type of study might be most appropriate to reference.

- If a question is in regard to general trends or applicability of a practice or production method *inside* of a given locale, qualitative data or research findings (with similar parameters) may provide the most useful information.

- If a question is regarding specific measures, statistical or confidence measures, or application *outside* of a given locale, then quantitative data or research findings may provide the most useful information.

**Conclusion**

Not all data is the same. The differences between quantitative and qualitative research and data must be understood and their findings presented in context in order to provide accurate and informed answers to co-workers, our clients, or the public.

Not all features will be in every research article or study. However, the following is a guide to help you differentiate between empirical and anecdotal studies and their data.

Quantitative and qualitative research methods differ primarily in—

- Their analytical objectives.
• The types of questions they pose.
• The types of data collection instruments they use.
• The forms of data they produce.
• The degree of flexibility built into study design.

Understanding they type and source of data enables planners to select the best information to present, allowing producers, landowners, and the public to make informed decisions regarding conservation applications.

Applications

The following table illustrates some common types of research and data available to field staff and how the information can be typically expressed.

<table>
<thead>
<tr>
<th>Research Relevant to NRCS</th>
<th>Quantitative Research</th>
<th>Qualitative Research</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Qualitative Data</td>
<td>Quantitative Data</td>
</tr>
<tr>
<td>University research trials</td>
<td>Observations as to appearance and other subjective factors</td>
<td>Typically replicated research trials. Results designed to be applicable to wide area with similar variables</td>
</tr>
<tr>
<td>NRCS Case Studies, On-farm trials</td>
<td>Typically not undertaken or found</td>
<td>Most on farm trials do not utilize methods to yield quantitative data. Limited applicability beyond subject location</td>
</tr>
<tr>
<td>Ag. Industry trials</td>
<td>Variables such as growth type, color, vigor and other subjective indicators</td>
<td>May be as replicated and rigorous as a University research trial; with results applicable beyond the trail location</td>
</tr>
<tr>
<td>CEAP (Conservation Effects Assessment Project)</td>
<td>Select individual survey measures may contain anecdotal information along with empirical information</td>
<td>Data collected based upon predetermined sample points; used with specific modeling information to provide widespread</td>
</tr>
<tr>
<td>SARE Cover Crop Survey (Sustainable Agriculture Research and Education)</td>
<td>benefits</td>
<td>Results taken from those who respond. No differentiation as to location, soil type, etc.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>N/A</td>
<td>This survey was not designed to be quantitative, so no definitive recommendations come from this.</td>
<td></td>
</tr>
</tbody>
</table>

On-farm demonstrations are not synonymous with on-farm research. The purpose of demonstrations is not to identify or validate answers to research questions but rather to simply gain experience with new technology or cultural practices. Sometimes demonstrations are designed purely to expose growers and others to new technology or cultural practices. (9) On-farm demonstrations may not be generalizable beyond the locale in which they occurred.

In contrast, on-farm research often looks to localize and replicate the findings that may have been discovered from university, industry, or other identified research. True on-farm research will follow the methods and rigor of established research protocols.

In order to work collaboratively with these groups, researchers, scientists, and other professionals must provide the linkage between work, research, and application. It is important be able to understand, utilize, and present research and data in a responsible and appropriate manner.
References


Appendix A

An Example of Quantitative Data

Methodology for the Quarterly Food Away From Home Prices Data

How Was the Study Conducted?

ERS researchers used prices without tax collected by the U.S. Bureau of Labor Statistics (BLS) for the Consumer Price Index from 1998 to 2012 to construct average, weighted prices for 20 FAFH and alcohol products for the United States, the four census regions, and nine census divisions for four establishment types, full-service restaurants, limited-service restaurants, vending machines, and school lunches. Full-service restaurants are defined by BLS as establishments where a server takes customers’ orders and payment is made after eating, while limited-service restaurants include establishments where customers pay at a register before eating. Only prices for entrees and combination meals were included in the average, weighted price calculations for the disaggregated products of full- and limited-service restaurants and schools. For vending machines, alcoholic beverages, and related disaggregated products, average, weighted price calculations were per ounce. The weights are based on the sample of outlets from which BLS collects prices and are designed to ensure prices represent the census regions and divisions. The researchers estimated standard errors using a jack knife approach to facilitate hypothesis testing.
Appendix B

Examples of Qualitative Data

1. The Power of Diversity

The more diverse the crops and pastures become on Gabe and Shelly Brown's ranch, the more successful they become. The Browns rotate more than 50 crops and cover crops—all no-tilled—in various mixtures, and rotationally graze both cover crops and pastures to imitate the soil-building processes of natural prairies on their 5,000-acre family operation near Bismarck, North Dakota.

"Where do you find a monoculture in nature?" Gabe Brown asks. "You need a polyculture to feed the life in the soil below. The life in the soil need a balanced diet, just like we do, and you only get that with a diversity of species—plants, animals, and insects—and plant roots. So that's what we're trying to do."

When Gage and Shelly bought the 629-acre ranch from her parents in 1991, like most of the native rangeland in the area, it had little plant diversity and was in poor health. Organic matter levels were low on cropland soils. "We just wanted to raise a family on the ranch," Brown says.

"Soil health wasn't on my radar screen, and I didn't understand holistic management. But I was reading about people who grew their own nitrogen, the benefits of cross-fencing, and other resource management ideas, and I wanted to make some changes." No-till not enough

In 1993, Brown bought a no-till drill and converted all of his cropland to no-till. "We were saving fuel, moisture, and time." Brown says. The next year he added peas to the rotation, to fix nitrogen. "In the crop following peas, in 1995, is where I first noticed the soil felt different and the crop looked healthier," he says.

But a hailstorm destroyed their entire wheat and corn crop later that year. The following year, after seeing positive results from his first try at crop diversity, Brown added winter triticale and hair vetch, along with companion crops barley and red clover. But, as bad luck would have it, another major hail storm hit. "Even though I got hailed out, I saw a slow improvement in organic matter in the soil and how the plants responded to more diversity," Brown says. Afterwards, he seeded a cover crop combination of cowpeas and sudan grass as forage for his cattle.

2. 2013-2014 COVER CROP SURVEY REPORT

A SYNOPSIS OF THE INFORMATION COLLECTED DURING THE 2013-2014 COVER CROP SURVEY.

ABSTRACT
This document summarizes information from farmers across the United States, both users and nonusers of cover crops, who responded to a cover crop survey. The report assesses attitudes about cover crops, perceived benefits and challenges surrounding their use, and communications channels that can aid in supporting the adoption and success of cover crops.