

6-1-2018

## Word Cloud Analysis of Early Adopter No-Till Farmer Interviews

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### Recommended Citation

Jemison, J. M., Welcomer, S., Kersbergen, R., & Majewski, C. (2018). Word Cloud Analysis of Early Adopter No-Till Farmer Interviews. *Journal of Extension*, 56(3). Retrieved from <https://tigerprints.clemson.edu/joe/vol56/iss3/11>

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## Word Cloud Analysis of Early Adopter No-Till Farmer Interviews

### Abstract

We interviewed early adopter no-till farmers in the New England region to assess why they changed tillage practices and what the perceived advantages and disadvantages of doing so were. We then generated word clouds from answers to key interview questions to convey the farmers' experiences. Most of these innovators were influenced to convert to no-till by the success of other "exemplary" farmers. Advantages noted included reductions in production time and fuel use. The greatest perceived disadvantage was pest management issues caused by cover crop residues. Yield losses were not mentioned, and many of the farmers experienced increased yields. Our findings suggest that Extension staff can increase adoption of new production techniques by identifying and conveying experiences of key farmer leaders.

**Keywords:** [farmers](#), [no-till](#), [adoption](#), [word clouds](#), [qualitative research](#)

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## Introduction

Extension personnel who work with the agricultural community are frequently evaluated on how well they influence growers to adopt novel practices. From integrated pest management to no-till production, Extension educators strive to influence growers to adopt practices that can improve farm profitability and reduce environmental impact to natural resources (Malone, Herbert, & Pheasant, 2009). No-till forage production can provide growers with a more resilient production system in an increasingly variable weather environment as well as reduced cost of production (Derpsch, Friedrich, Kassam, & Hongwen, 2010). Soil organic carbon in soil's surface layers increases with no-till, making more water available for crop growth, and residues remain on the soil surface, protecting the soil from damaging rains and reducing surface runoff (Bronick & Lal, 2005; Rhoton, 2000); additionally, soil macropores remain intact, allowing for improved spring drainage (Blanco-Canqui, Wienhold, Jin, Schmer, & Kibet, 2017). Soil erosion in the United States has decreased 43% over 20 years, mostly due to the adoption of no-till methods (Huggins & Reganold, 2008).

In northern dairy production zones, however, adoption of no-till has been slow. Over the past 5 years, only 5% to 10% of dairy farmers in the region have adopted no-till forage production. The reluctance to adopt is due in part

to concerns over cool soil temperatures and short growing seasons. Manure management issues also have slowed adoption as leaving manure on the soil can increase nitrogen (N) loss and, therefore, the need for purchased fertilizer. However, no-till production encourages crop rotation, which should boost both productivity and profitability. Additionally, research has been conducted to show how no-till production can sequester carbon and reduce fuel usage, thereby reducing carbon emissions from farms (Blanco-Canqui & Lal, 2008). To determine the extent to which these issues affected the decision to convert to no-till and other factors that motivated farmers to change practices, we conducted a study of early adopter no-till dairy farmers in the New England region. Our study involved conducting one-on-one interviews with the early adopter no-till producers to identify key factors that led to early adoption and to explore the biggest advantages and disadvantages these farmers found related to no-till production. Specific quotes from these interviews were then used to encourage other growers to adopt no-till.

## Methods

We developed a total of 17 questions to guide the interviews with growers, and these were submitted for human subjects review. Each farmer signed a release allowing us to discuss our findings with other growers and publish the study results. Each interview lasted between 90 and 160 min. Each of the 20 interviews was taped, transcribed, and analyzed through the use of NVivo 11 software. Word clouds were generated from farmer responses regarding why they adopted no-till and the key advantages and disadvantages they had found in doing so. The more frequently a word was used by the growers interviewed, the larger the word's size was in the corresponding graphic. The information generated was incorporated into educational programs to encourage other growers to adopt no-till.

## Results

### Reasons to Convert

Conversion to no-till can be thought of as a sequenced process of adoption based on perceived benefits of the innovation and perceived ability to manage uncertainty (Rogers, 2003). In this sequenced process, innovator farmers base their decisions on a range of factors that include economic and social benefits. Those who adopt an innovation after it has been well distributed—late adopters—are thought to weigh possible negative effects of adoption more heavily and therefore adopt the innovation after uncertainty and perceived risk have diminished.

When growers were asked why they converted to no-till, many identified other farmers' success as a key driver to change. As indicated in Figure 1, many farmers mentioned the use of no-till by two well-respected farmers in the dairy community, Bobby Fogler and Perry Lilley, as the main reason they tried to produce using no-till methods. The Fogler family had adopted no-till before the other farmers in the region experimented with it and realized several no-till benefits. Given his very early timing and positive experience with no-till, Fogler was a very early adopter who was open to innovation, willing to risk time and money to test the no-till innovation, and interested in sharing his insights with other next-wave adopters, including Lilley.

#### Figure 1.

Reasons Early Adopter Farmers Converted to No-Till Production







Sometimes identifying specific words *not* seen in a given word cloud is instructive. Missing from the "reasons to convert" word cloud (Figure 1) is identification of how no-till might help with increasingly variable weather patterns or weather variability. There was no mention of this factor when growers were asked the associated question. No-till production increases crop water availability in dry years, and intact worm channels allow cold wet soils to warm and drain the soil, facilitating early planting (Blanco-Canqui & Lal, 2008). In particular, no grower used terms such as *resilience* or *climate change* or *soil quality* in discussing reasons for adoption. In a previous research project in Maine, dairy producers showed less concern about increasingly variable weather patterns than other commodity groups (Jemison, Hall, Welcomer, & Haskell, 2014). Many of the participating farmers in that study said they used irrigation and/or tile drainage systems as management measures for reducing short-term risk, but few said the measures were based on climate change or increasingly unpredictable weather patterns (Jemison et al., 2014). Similar trends were found in our study. Only two farmers, Ward and Fogler, discussed improved soils and reduced erosion as primary reasons to produce using no-till. In our presentations related to no-till production, we first focused on economic benefits related to how no-till with cover crops allows earlier planting, permitting farmers to harvest their grass at peak quality. After making this point, we discussed how no-till can reduce risk from variable weather and protect soils in an increasingly variable climate.

Another key issue we found is that no farmers mentioned a yield loss associated with converting to no-till, even in the first years. Yield drag has been mentioned as a drawback of no-till production (Baker et al., 2007). That none of the early adopter farmers interviewed reported yield losses and four specifically mentioned yield improvement is important, and Extension educators' promoting an improved understanding of the relationships between no-till and yield should result in increased adoption of the method.

Identification of time savings and fuel savings as the biggest advantages of no-till was not surprising and is consistent with previous literature (Sudermeier et al., 2009). Discussion of improved N management was surprising due in part to the reported no-till disadvantage related to manure management. One participant noted that Cooperative Extension has a credibility issue because after years of our educating farmers to incorporate manure as soon as possible after application, we are now advocating surface application without tillage. More research is needed to understand manure N status in no-till systems with cover crops. In fact, we have initiated research in Vermont and Maine to address this topic.

Though words such as *resilience* were absent from the word clouds, this does not necessarily mean that resilience is not important to farmers. It is important within the framework of farm survival. Sudermeier et al. (2009) stated that economic survival is key to farmer success and that growers often first make decisions to improve that bottom line. Improved soil and environmental quality are important to farmers, but we did not see those as the key issues driving farmer change.

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