Crop species diversity changes in the United States: 1978-2012

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Ecologists generally feel that diversity is one of the most important components in ensuring a healthy ecosystem. In cropping systems, diversity is also important for processes such as nutrient cycling, water use, pest and disease control and weather variation. In the February 2012 we reported on initial analysis of changes in diversity in the United States between 1978 and 2007, using National Agricultural Statistics Service (NASS) 'Census of Agriculture' data. Because the Census of Agriculture is conducted every 5 years, the availability of the 2012 data in May, 2014 allowed us to include the relatively high crop prices that occurred after 2007.

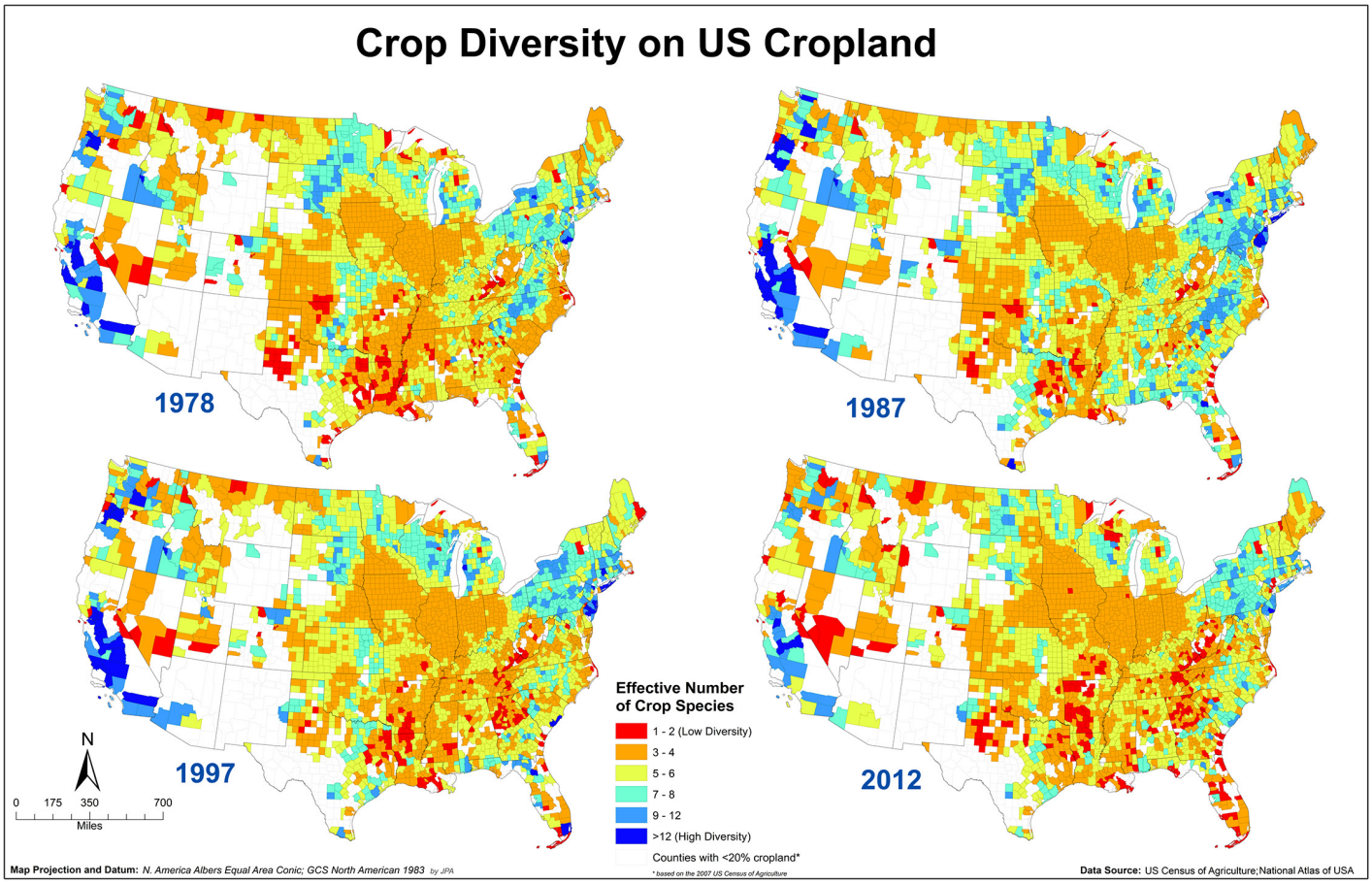

Figure 1. Crop species diversity for each county in the continental United States in 1978, 1987, 1997 and 2012. The redder hues indicate less crop diversity while the bluer hues indicate more crop diversity within each county.

The Census of Agriculture provides two key pieces of information needed to evaluate crop diversity: the number of crops within each county and the acreage for each crop. By using this information, we could develop a diversity index for each county that adjusted for number of crops and how evenly these crops were distributed. This is important since using the number of crops without adjusting for distribution can provide a biased picture of crop diversity.

Two trends from this data are revealed by looking at Figure 1. First, crop diversity at the national level decreased over time and second, this decrease was not evident in all areas of the country. For example, central North Dakota was less diverse in 1978 than in 2012 while the opposite trend can be seen in southeast North Dakota and central Minnesota. We looked at dominant crops within each county using Ag Census data from North Dakota for potential explanation of these trends.

Figure 2 shows changes in crop diversity for each Census of Agriculture for North Dakota. We also looked at the most dominant crop within each county for each census period. In 1978, small grain dominated most of

the state; however, by 2002 soybeans dominated cropland in the south east portion of the state. By 2012, soybeans were dominant in the eastern half of North Dakota. Crop diversity in south east North Dakota also started to decline during this time frame.

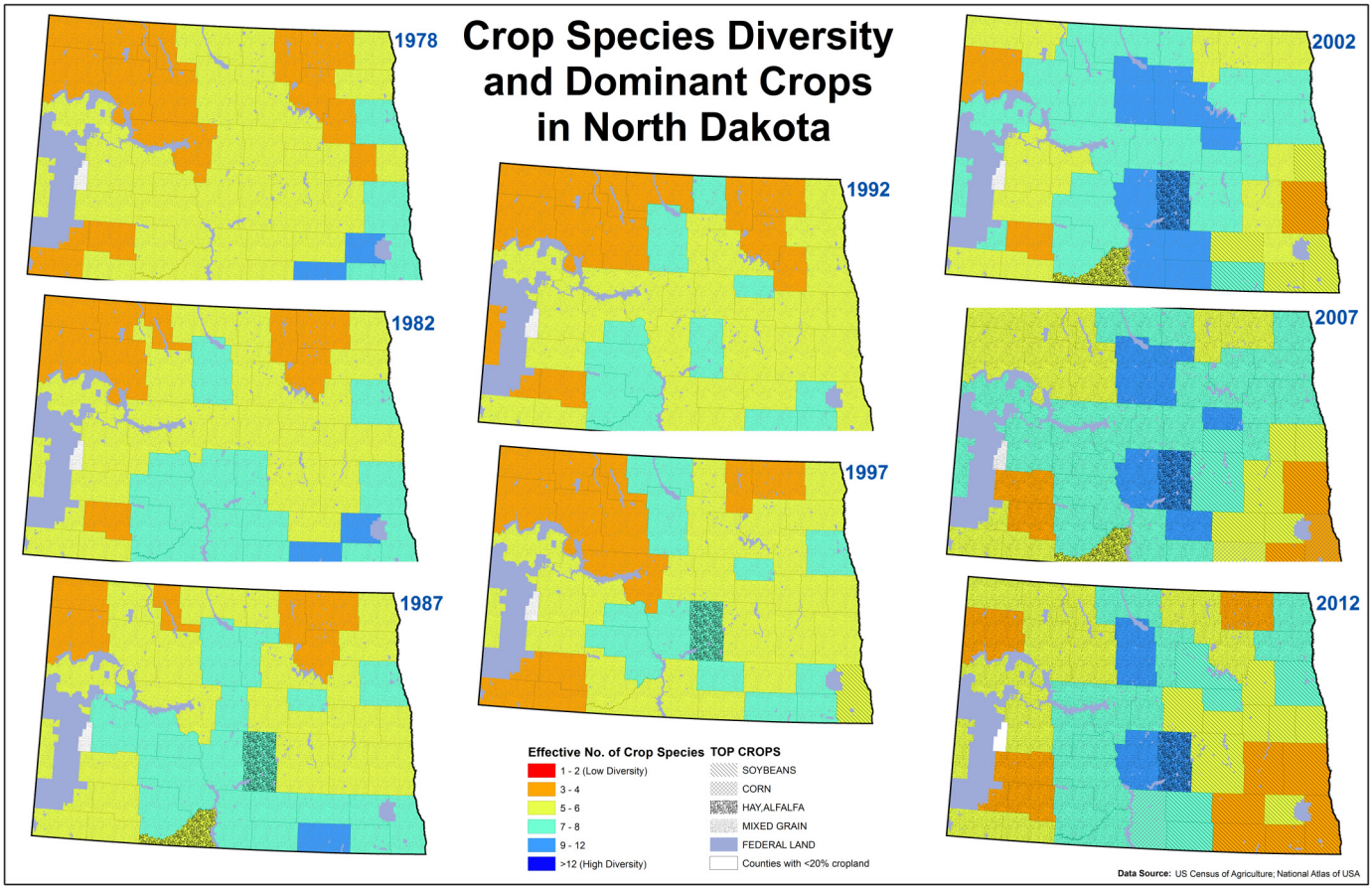

Figure 2. Crop diversity and dominant crops for each county in North Dakota in 1978, 1982, 1987, 1992, 1997, 2002, 2007 and 2012. The redder hues indicate less crop diversity while the bluer hues indicate more crop diversity within each county. Counties are also shaded to represent different dominate crops at each census point.

While the increase in soybean production did occur with declines in crop diversity, it is important to realize that there were multiple factors that may have affected crop diversity in North Dakota during this time frame. No-till helped to conserve soil water which allowed producers to increase cropping intensity and grow more crops. The fusarium head blight affected small grain production and many producers looked for alternative crops. Also, improved genetics and technology and rising crop prices have made corn and soybean both more attractive to producers and easier to grow throughout North Dakota.

Prior to this paper there had been a lot of discussion about changes in crop diversity in the United States but very little hard data. Understanding crop diversity was important since croplands are 22% of the total land base in the lower 48 states. This paper provided the first evaluation of national crop diversity over a relatively long time frame. Questions still remain on why crop diversity has increased in some regions and decreased in others. Answering these questions is critical for understanding factors that contribute to enhanced crop diversity in our agro-ecosystems.

J. Aguilar, G.G. Gramig, J.R. Hendrickson, D.W. Archer, F. Forcella, M.A. Liebig. PLOS One 10(8) 2015. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0136580