Visualizing pesticide usage in the United States from 1992 to 2009

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Modern agriculture in the United States is only made possible by the use of pesticides, but this has not always been the case (King, 1911). Annually, hundreds of millions of kilograms of pesticides are used to control weeds, insects, plant diseases, and other pests. However, the extensive application of pesticides poses severe adverse impacts on both the environment and human health. Pesticides contaminate soil and water, and have been linked to cancer, human reproductive problems, and neurodegenerative disease. Therefore, this featured graphic aims to explore the two most commonly applied pesticides (ie, Glyphosate and Atrazine) at county level of the contiguous United States.

Glyphosate and Atrazine usage from 1992 to 2009 were derived from a US Geological Survey (USGS) publication (Thelin and Stone, 2013), which contains data on 459 pesticide compounds across the contiguous United States. USGS estimated county-level pesticide usage by combining US Department of Agriculture county-level data for harvested-crop acreage and proprietary Crop Reporting District level pesticide-use data. I selected Glyphosate and Atrazine because: (1) On average (1992–2009), 102 million kg of Glyphosate was applied annually; 79 million kg of Atrazine was applied annually, which is more than twice the usage of third most applied pesticide (Acetochlor). (2) They both have eighteen years of complete data and the most comprehensive spatial coverage: the Glyphosate dataset contains 3061 counties and the Atrazine dataset contains 3039 counties. The final data-sets contain the maximum estimated annual pesticide usage for each county across eighteen years. Population data at county level in 2010 were derived from the US Census.

Cartograms (Gastner and Newman, 2004) are used to reveal per capita pesticide exposure of the top two pesticides of the country (Figure 1). Figure 2 shows the same data not divided by population. Generally, the maximum per capita exposure to Glyphosate is roughly twice that of Atrazine across the United States. The footprint of high per capita exposure to Glyphosate is wider than that of Atrazine, as the former covers the Plains and Rocky Mountains to the Southwest and the Far West, while the latter is confined to the Plains and Rocky Mountains. One possible explanation is that Glyphosate is applied to more agricultural crops than Atrazine, including soybeans, corn, cotton, fallow, oranges, wheat, pasture, and sorghum, while Atrazine is applied mainly to corn and sorghum. The top ten...
Counties with the highest per capita exposure to the two pesticides were marked and ranked alphabetically (A or a denotes the highest) in Figure 1.

- Counties with the highest per capita exposure of Glyphosate spread out in six States. SD (Sully, A; Faulk, D; Spink, J) ranks the first, followed by KS (Greeley, B; Wallace, F) and ND (Slope, C; Steele, H). Kiowa, CO (E), Hayes, NE (G) and Glasscock, TX (I) are also among the top ten.
- Counties with the highest per capita exposure of Atrazine concentrate in KS (Sheridan, a; Greeley, c; Wallace, e; Wichita, f; Gove, h) and NE (Wheeeler, b; Hayes, g; Logan, i; Perkin, j), although Kiowa, CO (d) is among the top ten.
- There are overlaps of counties with the highest capita exposure of both pesticides. Four counties are listed as among top ten counties of both, including Greeley, KS (B and c), Kiowa, CO (E and d), Wallace, KS (F and e) and Hayes, NE (G and g).
Figure 2. Maximum annual pesticide usage in the Contiguous United States. Area of each county proportional to kg.

References


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