

Connectivity illuminates risk of spread of crop pests, diseases

February 2 2009

The United States is one of the most important crop production areas in the world, so its vulnerability to crop pests is a vital concern. Ten such pests are estimated to enter the country every year, and the federal government spends more than \$1 billion annually on research, emergency response, and education related to crop pests.

A graphical analysis that assesses the vulnerability of different crops to pests in the United States is described in the February issue of *BioScience*. Margaret L. Margosian of Kansas State University and her colleagues based their work on county-level information about the amount of four key crops grown per hectare across the lower 48. By assuming that pests spread more easily between closely spaced counties and between those with high densities of a particular crop, they could identify regions of the country within which pests affecting the crop in question should move relatively easily. The analysis was repeated for hypothetical pests that are transmitted with different levels of difficulty.

Data on soybean, maize, wheat, and cotton yielded distinctly different patterns of connectivity at the national scale. The soybean crop was judged highly connected for easily transmitted pests, and thus potentially vulnerable to their spread. It was however, less connected for less easily transmitted pests. Maize was vulnerable to pests with a wide range of transmissibilities. Cotton and wheat, in contrast, were much less connected nationally.

Margosian and colleagues suggest their type of analysis could help in the

formulation of strategies for dealing with invasive pathogens and pests. It might, for example, be prudent to encourage cropping patterns that disrupt connectivity, to minimize the likelihood that a pest will spread. And once a pathogen or pest has been introduced, graphical analysis could suggest where and when radical interventions, such as crop eradication, might be justified to prevent the pest's spread.

Source: American Institute of Biological Sciences

Citation: Connectivity illuminates risk of spread of crop pests, diseases (2009, February 2)
retrieved 27 April 2024 from <https://phys.org/news/2009-02-illuminates-crop-pests-diseases.html>

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