Multistate Research Fund
IMPACTS

UNDERSTANDING & MITIGATING THE IMPACTS OF AGROCHEMICALS

Pesticides, herbicides, fertilizers, and other agrochemicals are used on farms to protect crop yield and quality and in urban and residential settings to control pests and weeds. Despite important uses, agrochemicals can leach into soil and groundwater or flow into surface waters, where the chemicals can adversely affect human and environmental health. Agrochemicals can also accumulate in edible organisms, creating food safety concerns and contaminating livestock feed and manure.

Though progress has been made on sustainable alternatives, agrochemical use will remain a cornerstone of agriculture for years to come. Understanding the fate, transport, and impacts of agrochemicals is key to minimizing the risks associated with them.

Since 1956, a team of researchers from 20+ Agricultural Experiment Stations has used traditional and emerging approaches to characterize the fate of agrochemicals in agricultural, urban, and natural areas; determine adverse impacts from agrochemical exposure to cells, organisms, and ecosystems; and develop technologies that mitigate the adverse impacts of agrochemicals.

The team's research and Extension has provided key information and technology to regulatory agencies, agrochemical manufacturers, farmers, and others, helping them make prudent decisions about pesticide use, management, and policy.

RESEARCH HIGHLIGHTS

Researchers developed tools that can help measure exposure to agrochemicals. For example, Washington State University scientists developed a sensor that can rapidly quantify multiple biomarkers associated with pesticide exposures. The method is minimally invasive and can be used in the field to measure very low exposures. Researchers with the USDA-ARS, Maryland, discovered a new method for estimating the age of groundwater under agricultural lands, which helps anticipate which contaminants may be present.

Studies and models are showing how pesticides are affecting surface waters. Oregon State University researchers used the Soil and Water Assessment Tool to better estimate how different cropping practices or mitigation strategies would affect pesticide loads in Zollner Creek in the Willamette Valley. Louisiana State University studies showed that shallow water and salinity affect agrochemical fate and toxicity and should be considered when estimating exposure. Researchers at the University of California showed that urban use of pyrethroids for pest control can contaminate streams with compounds that disrupt hormones.

Scientists are discovering new ways to remediate areas contaminated with agrochemicals. For example, University of Hawaii studies found that glycerol can enhance the ability of the bacteria to biodegrade PAHs, which are widespread, carcinogenic substances.

Composting yard, garden, food waste, and manure has many benefits; however, compost can be contaminated by plants treated with herbicide. Organic producers may lose certification if they use herbicide-contaminated composts, and compost producers can suffer financial setbacks due to claims of damaged gardens and landscaping. Ohio State University studies are providing a better understanding of herbicide persistence in composts. Results showed that composted grasses treated with Roundup® are only toxic to plants when composted alone. Ohio State University scientists are also developing low-cost amendments that can remediate contaminated composts.

Research has helped understand food safety issues related to pesticides and guided mitigation efforts. For example, University of Nebraska scientists gained knowledge about the fate of arsenic, cadmium, chromium, and uranium present in soil and irrigation water and their potential toxic impacts on human and animal health. University of California researchers identified contaminants most likely to accumulate in vegetables.

Research is helping determine whether the extensive use of pesticides is connected to honey bee colony collapse. Montana State University and Washington State University studies showed low potential for negative effects on bees from pesticide levels in the tested agricultural landscapes. Scientists at the University of California developed a sensitive fiber that can detect neonicotinoids in the nectar and sap of live, flowering plants and provide much-needed information.

Research is shedding light on the impacts of agrochemicals on fish and wildlife. For example, scientists at Purdue University found that even low doses of per/polyfluoroalkyl acids reduce body condition in eastern tiger salamanders, which could adversely affect the species. Oregon State University simulations of chlopyrifos in the Zollner Creek watershed will help understand risks to Pacific salmon from pesticide exposure.

Researchers are exploring ways to reduce agrochemical use. For example, Montana State University lab and field studies showed that the perennial grass smooth brome can help trap wheat stem sawfly, which causes $350 million in damage to fields in the Northern Great Plains each year. USDA-ARS scientists in South Dakota found that applying dairy slurry fertilizer to corn fields in the summer at lower rates can reduce nitrate losses without impacting yields.

Scientists provide objective, research-based information about pesticides and toxicology. Researchers work closely with industry groups and non-profits and offer suggestions to agrochemical manufacturers. The U.S. Environmental Protection Agency uses research findings to create pesticide labels and set restrictions that result in safer use of pesticide products. Oregon State University houses the National Pesticide Information Center, which provides free information to the public. In addition, researchers produced numerous peer-reviewed publications and presented research findings at national and international meetings.

Project Funding & Participation

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