



Organic for All

Results of the Organic Diet Biomonitoring Study



Friends of the Earth



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This report was written by Kendra Klein, Ph.D., senior staff scientist, Friends of the Earth U.S.

The study summarized in this report, *Organic Diet Intervention Significantly Reduces Urinary Pesticide Levels in U.S. Children and Adults*, was published in the peer-reviewed scientific journal *Environmental Research*. Pesticide analysis was conducted by independent laboratories at University of California at San Francisco and the Québec National Institute of Public Health.

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ABOUT FRIENDS OF THE EARTH:

Friends of the Earth U.S., founded by David Brower in 1969, strives for a more healthy and just world. Together we speak truth to power and expose those who endanger the health of people and the planet for corporate profit. We organize to build long-term political power and campaign to change the rules of our economic and political systems that create injustice and destroy our environment. Friends of the Earth has more than 1.5 million members and supporters in all 50 states, and we are the U.S. voice of the world's largest federation of grassroots environmental groups, with a presence in 75 countries.

Friends of the Earth's Food and Agriculture program works via policy advocacy, market transformation, organizing, science and storytelling to advance three fundamental shifts in our food system: from chemical-intensive to organic, ecological and regenerative; from corporate-controlled to democratically governed; and from a system that embodies the deepest inequities in our society to one that advances social justice and fulfills the needs of all eaters now and into the future.

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What happens when we eat **organic**?

**Can eating organic really reduce levels of pesticides in our bodies?
We tested four American families to find out.**



For full study results see: Hyland, C., A. Bradman, R. Gerona, S. Patton, I. Zakharevich, R. Gunier, and K. Klein. 2019. Organic Diet Intervention Significantly Reduces Urinary Pesticide Levels in U.S. Children and Adults. *Environmental Research*. For more information, go to www.OrganicforAll.org

What happens when we eat **organic**?

All of us are exposed to a cocktail of toxic synthetic pesticides linked to a range of health problems from our daily diets. Certified organic food is produced without these pesticides.

But can eating organic *really* reduce levels of pesticides in our bodies? We tested four American families that don't typically eat organic food to find out.

First, we tested the levels of pesticides in their bodies on a non-organic diet for six days. We found 14 chemicals representing potential exposure to 40 different pesticides in every study participant. These included organophosphates, pyrethroids, neonicotinoids and the phenoxy herbicide 2,4-D. Some of the pesticides we found are linked to increased risk of cancer, infertility, learning disabilities, Parkinson's, Alzheimer's and more.

An organic diet rapidly and dramatically reduces exposure to pesticides

Then, we tested them on an all-organic diet. We found that eating organic works. An organic diet rapidly and dramatically reduced their exposure to pesticides. In fact, levels of all detected chemicals dropped an average of 60.5% in just six days on an organic diet.

The most significant drops occurred in a class of nerve agent pesticides called organophosphates. This class includes chlorpyrifos, a highly toxic pesticide linked to increased rates of autism, learning disabilities and reduced IQ in children. Organophosphates are so harmful to children's developing brains that scientists have called for a full ban.¹

The neonicotinoid pesticide clothianidin also dropped significantly. Neonicotinoids are a key contributor to massive pollinator losses and bee die-offs,² are among the most commonly reported pesticide residues in infant and toddler foods³ and may affect the developing fetus and child, possibly leading to

changes in behavior and attention, including an association with autism spectrum disorder.⁴

“ Everyone has the right to clean organic food. That is a human right. ”

Tara, study participant, Baltimore

In addition to reducing eaters' exposure to toxic pesticides, organic farming systems protect the health of farmworkers, farmers and rural communities, and safeguard our air, water, soil, pollinators and other critical species.

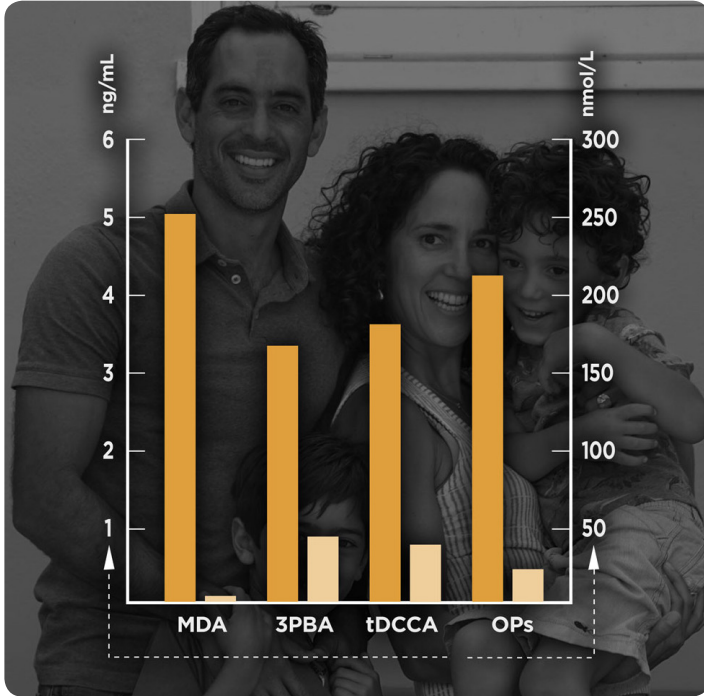
We need organic for all. No one should be exposed to toxic pesticides in the food they eat. No farmer or farmworker should have to sacrifice their health or their children's health to grow the food we all eat. And the way we grow food should protect rather than harm the ecosystems that sustain all life.



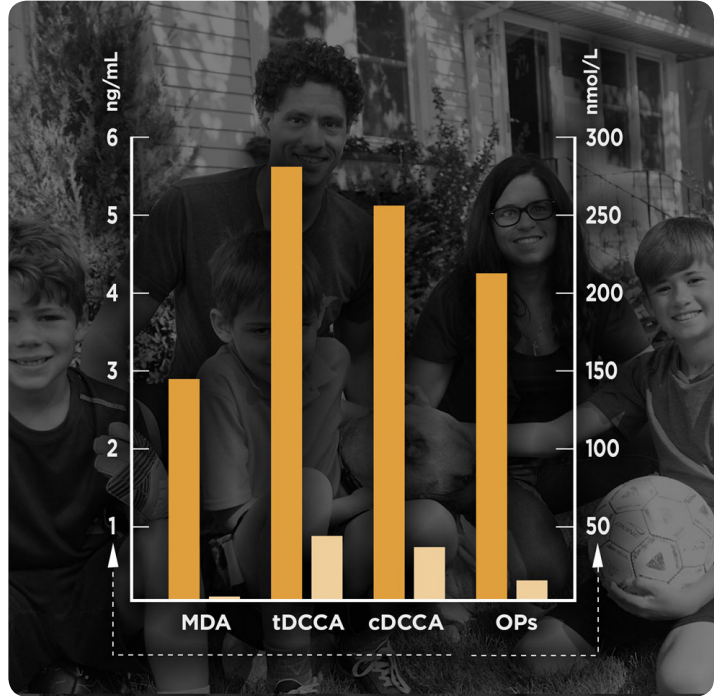
Top four pesticide decreases in each family

All detected pesticides dropped in each family, these charts show the top four decreases per family.

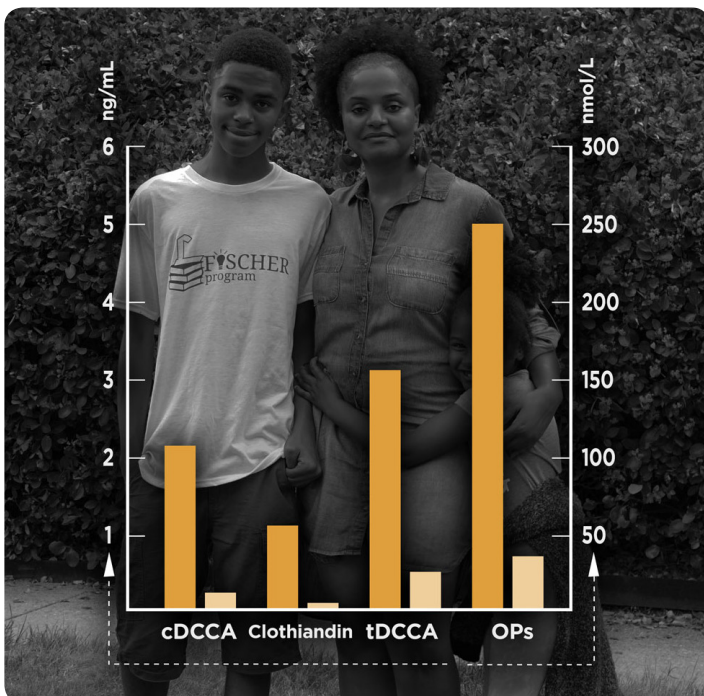
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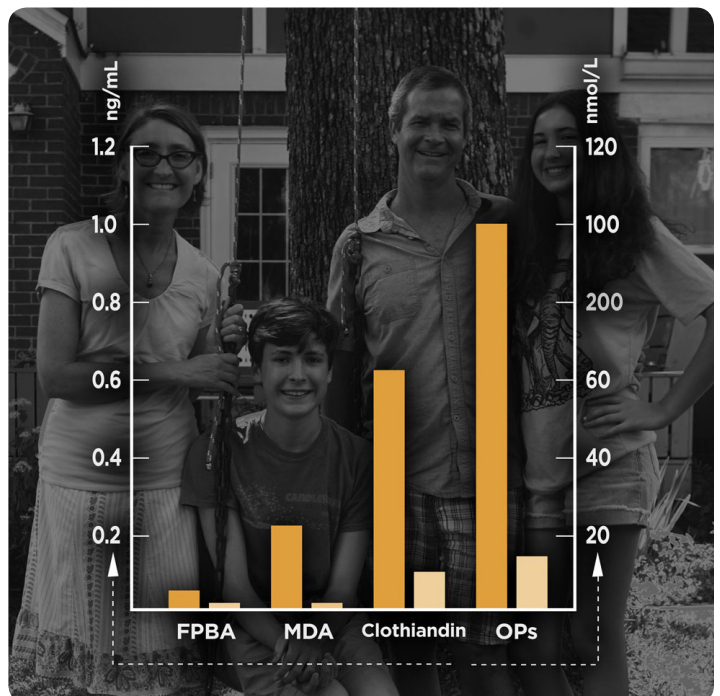
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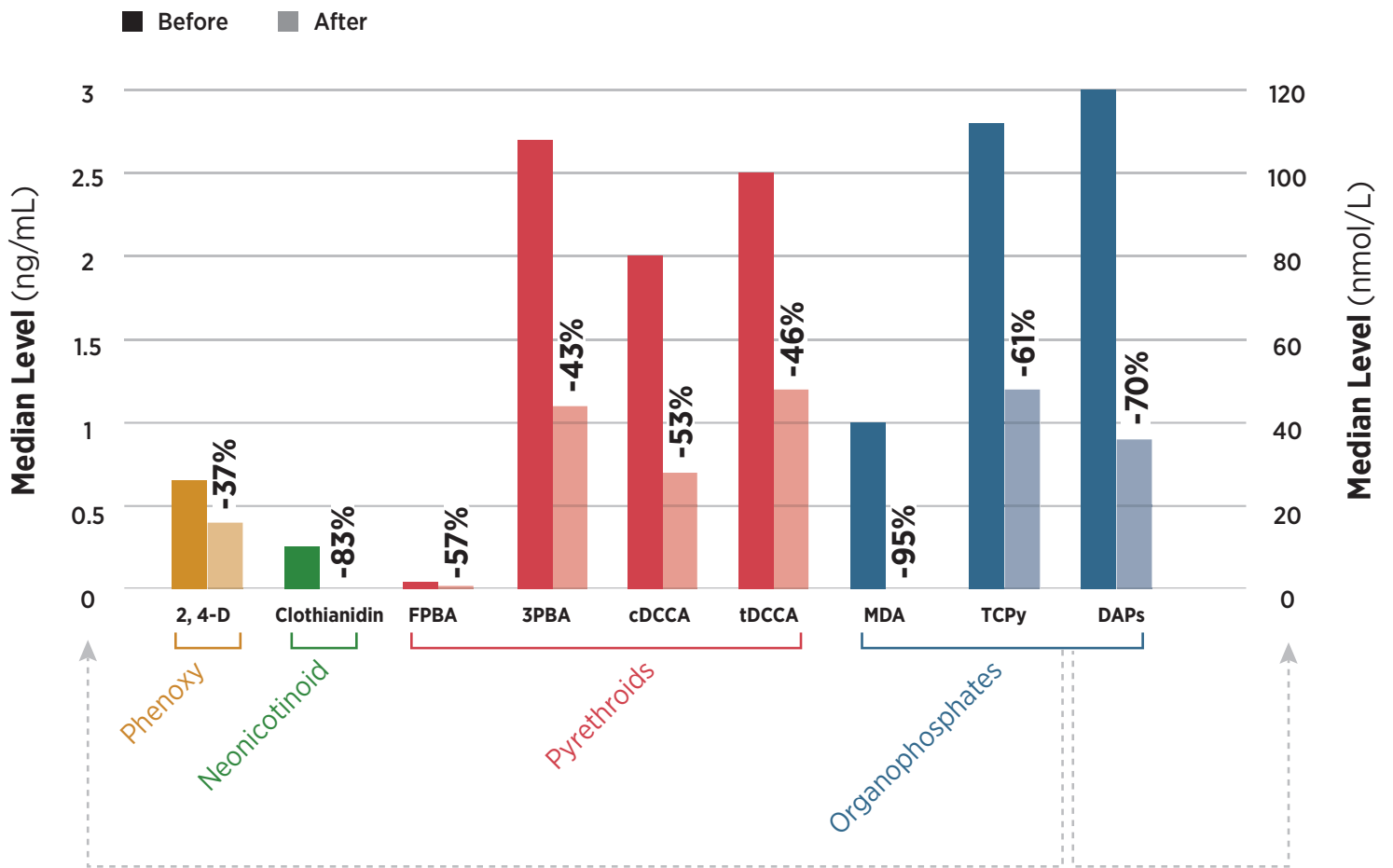


■ Before ■ After

OPs = organophosphate metabolites DMP + DMTP + DMOTP
 MDA = malathion; FPBA, 3PBA, cDCCA, and tDCCA = pyrethroid metabolites



Pesticide levels before and after switching to an organic diet



Pesticides detected in the Organic for All study

Analysis was conducted by independent laboratories at University of California at San Francisco and the Québec National Institute of Public Health.

Kind of pesticide	Chemical we tested	Pesticides associated with the chemical we tested	Maximum level detected	Percent decrease	
Organophosphate Insecticides	MDA	Malathion	1.04 ppb	95%	
	TCPY	Chlorpyrifos	19.48 ppb	61%	
	DAPs	DMP	Azinphos-methyl, chlorpyrifos-methyl, dichlorvos, dicrotophos, dimethoate, fenitrothion, fenthion, isazofos-methyl, malathion, methidathion, methyl parathion, naled, oxydemeton-methyl, phosmet, pirimiphos-methyl, temephos, tetrachlorvinphos, trichlorfon	2,040 nmol/L	70%
		DMTP			
		DMDTP			
DEP	Chlorethoxyphos, chlorpyrifos, coumaphos, diazinon, disulfoton, ethion, phorate, sulfotepp, terbufos				
DETP					
DEDTP					
Pyrethroid Insecticides	3-PBA	Allethrin, cyhalothrin, cypermethrin, deltamethrin, fenpropathrin, permethrin, trialomethrin	47.7 ppb	43%	
	F-PBA	B-cyfluthrin	7.1 ppb	57%	
	cis-DCCA	<i>cis</i> -Cypermethrin, <i>cis</i> -cyfluthrin, <i>cis</i> -permethrin	39.64 ppb	53%	
	trans-DCCA	<i>trans</i> -Cypermethrin, <i>trans</i> -cyfluthrin, <i>trans</i> -permethrin	47.2 ppb	46%	
Neonicotinoid Insecticide	Clothianidin	Clothianidin	6.6 ppb	84%	
Phenoxy Herbicide	2,4-D	2,4-D	2.4 ppb	37%	



Why it matters

YOUR HEALTH

Pesticides are poisons. The properties that make pesticides toxic to insects and weeds can also make them toxic to other forms of life, including humans. More than 90 percent of Americans have detectable pesticides in their bodies,⁵ and government testing finds at least 29 different pesticides in the average American.⁶ Decades of data clearly shows that pesticides can disrupt and derail the healthy functioning of our bodies.⁷ Pesticide exposure is linked to cancers, asthma, neurodevelopmental disorders like autism and ADHD and to adult neurological diseases like Alzheimer's and Parkinson's.^{8,9,10,11} Pesticide exposure is also associated with reproductive disorders like infertility and other disorders related to the endocrine system.^{12,13}

Over 50 pesticides are associated with endocrine disruption.¹⁴ Endocrine disrupting chemicals, even at extremely small doses, can scramble, block or mimic the cellular mechanisms responsible for developing and managing the body's reproductive, neurological, metabolic or immunological systems.¹⁵ Endocrine disruptors are associated with hormone-influenced cancers such as thyroid, breast and prostate, as well as learning disabilities, brain development problems, birth defects, obesity, diabetes and reproductive disorders.¹⁶



“ Small exposures matter. These small amounts add up, because we are exposed to multiple pesticides throughout our daily lives. ”

Dr. Devon Payne-Sturges
Assistant Professor of Public Health,
University of Maryland

An organic diet is a proven way to reduce exposure to pesticides and can help protect your health. Organic farmers produce abundant food without the use of an estimated 17,000 pesticide products approved for use in conventional farming in the U.S.¹⁷ An organic diet has been shown to reduce overall risk of developing cancer by 25 percent.¹⁸ Another study found fertility benefits for women who ate more organic food.¹⁹



Health impacts of pesticides detected in the Organic for All study

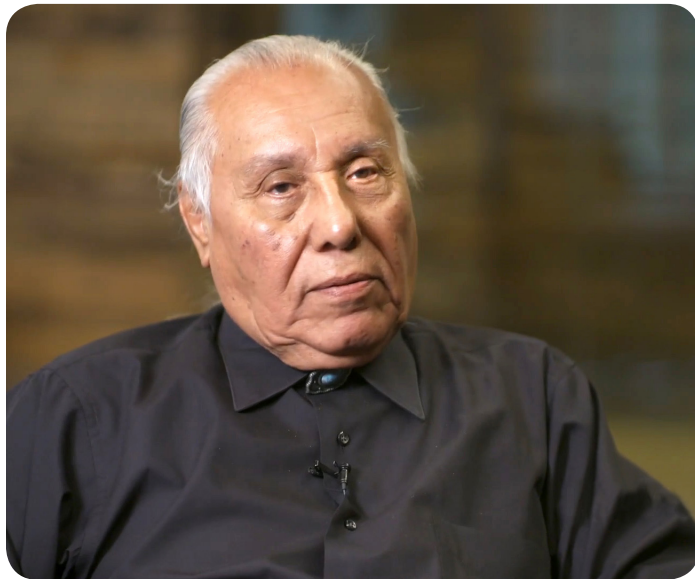
Pesticide Class	Associated Health Problems
Organophosphate	<ul style="list-style-type: none"> ◆ Developed during World War II as toxic nerve agent weapons²⁰ ◆ So toxic to developing brains, even at extremely low levels of exposure, that scientists have called for a complete ban.²¹ ◆ Associated with endocrine disruption, autism, learning disabilities, reduced IQ, attention disorders, delayed motor development, Alzheimer's, Parkinson's, decreased sperm quality and cancers.^{22,23,24,25,26} ◆ Children ages 1 to 2 are exposed to chlorpyrifos, a pesticide in this class, at levels 140 times those deemed to be safe.²⁷
Neonicotinoids	<ul style="list-style-type: none"> ◆ Food residues cannot be washed off because the pesticide penetrates the tissue of plants.²⁸ ◆ Among the most commonly reported pesticide residues in infant and toddler foods.²⁹ ◆ Associated with endocrine disruption and may affect the developing fetus and child, possibly leading to changes in behavior and attention, including an association with autism spectrum disorder.³⁰
Pyrethroids	<ul style="list-style-type: none"> ◆ Associated with endocrine disruption and adverse neurodevelopmental, immunological and reproductive effects.^{31,32} ◆ Associated with learning disabilities and behavioral and attention problems in children, increased risk of Parkinson's and sperm DNA damage.^{33,34,35,36}
2,4-D Herbicide	<ul style="list-style-type: none"> ◆ One of two ingredients in the Vietnam War defoliant Agent Orange.³⁷ ◆ Among the top five most commonly used pesticides in the U.S.³⁸ ◆ Associated with endocrine disruption, thyroid disorders, damage to the liver, immune system and semen quality, a three-fold increased risk of Parkinson's, increased risk of non-Hodgkin's lymphoma and developmental and reproductive toxicity.^{39,40}

FETAL DEVELOPMENT, INFANTS AND CHILDREN

Research has found over 20 pesticides in infant umbilical cord blood in the U.S.,⁴¹ and nearly all children are exposed to pesticides through the foods they eat. Children have unique susceptibilities to the harms of pesticides during fetal development and the early years of life because their brains and bodies are developing so rapidly. Early exposure can impact children for life. It can permanently decrease a child's IQ, increase the risk of autism, birth defects and asthma, and lead to cancers in childhood or later in life.⁴²

“Children's exposure to pesticides should be limited as much as possible.”

The American Academy of Pediatrics



“Farmworkers are on the frontlines. We're the first to go into the field. We have entire communities that have suffered the consequences of pesticides.”

Rudy Arredondo

President, National Latino Farmers and Ranchers Trade Association and former farmworker

FARMERS, FARMWORKERS AND RURAL COMMUNITIES

Often the most vocal advocates for a toxic-free food system are those on the frontlines of pesticide exposure: farmers, farmworkers and pesticide applicators who are exposed to toxic pesticides directly; rural communities whose children live and go to school near farms where toxic pesticides are sprayed; and low-income communities in the shadow of chemical manufacturing plants. Farmworkers can be exposed at levels hundreds of times higher than consumers' exposure to pesticides.⁴³ Farmers, farmworkers and their families have higher rates of acute poisonings, cancers, birth defects, asthma, infertility, autism and other neurological and reproductive effects.⁴⁴ Organic farming reduces farmer, farmworker and rural community exposure to toxic synthetic pesticides.⁴⁵

Pesticide health risks to farmers, farmworkers and rural communities

Agricultural workers

- ◆ EPA estimates 20,000 acute pesticide poisonings each year among agricultural workers, resulting in rashes, blisters, blindness, nausea, dizziness, coma or death.⁴⁶ This number is likely an underestimate.⁴⁷
- ◆ Pesticide exposure among agricultural workers is associated with increased risk of a large range of chronic diseases including: non-Hodgkin's lymphoma; leukemia; prostate, brain, lung, pancreas, colorectal, renal and breast cancer; infertility; endocrine disruption; Parkinson's and neurodegenerative diseases; bronchitis, asthma and other respiratory problems; and thyroid disease.^{48,49,50}
- ◆ Farmworkers are excluded from many U.S. labor laws and worker protection laws do not focus on reducing use of toxic pesticides.^{51,52}

Agricultural communities

- ◆ Agricultural communities are exposed to higher rates of pesticides in drinking water and air.^{53,54}
- ◆ Rural residents have higher risk of developing Alzheimer's, Parkinson's and multiple sclerosis.⁵⁵
- ◆ Children living in agricultural areas are at higher risk for leukemia, brain cancer, autism, neurodevelopmental delays, attention problems, reduced IQ and birth defects.^{56,57,58}

The United Nations asserts that pesticides have “catastrophic impacts on the environment, human health and society as a whole” in a report that debunks the myth that pesticides are necessary to feed a growing world population.⁵⁹



POLLINATORS AND THE ENVIRONMENT

Chemical agriculture is destroying the ecosystems that sustain all life. Pesticides are a key culprit in the decline of bees, butterflies and other pollinators, leading some scientists to warn of a “second silent spring.”^{60,61} Pesticides wreak havoc on the soil by killing the organisms that are the basis of soil life.⁶² And they pollute rivers, lakes and oceans, leading to fish die-offs.⁶³ Pesticides are the cornerstone of an industrial agriculture system that consumes fossil fuels, water and topsoil at unsustainable rates.⁶⁴ The United Nations estimates that industrial agriculture costs the world \$3 trillion annually in environmental damage.⁶⁵ Eliminating dangerous chemicals and polluting practices from our food system is key to protecting vital natural resources like clean water and soil, healthy oceans and the biodiversity that is essential for producing food now and in the future.

Experts agree that we need a rapid transition to organic and ecological farming in order to protect the ecosystems we depend on to grow food.⁶⁶ Research shows that organic agriculture can be an important climate solution. Organic farming systems use less energy, emit fewer greenhouse gases and help pull carbon dioxide from the atmosphere — where it drives climate

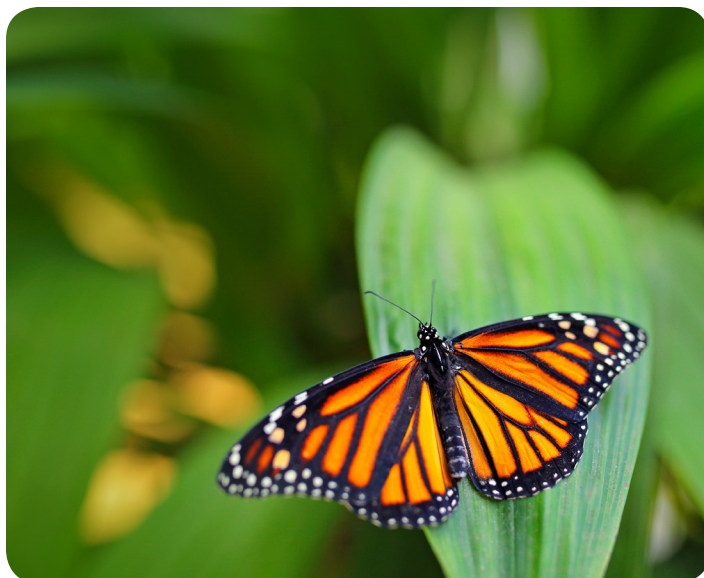


“Pesticides can totally knock out bee populations and pollinators. Organic farming systems are healthier for not only the pollinators, but beneficial insects as well. Organic farming practices go beyond the farm, we become caretakers of a better food system.”

Jennifer Taylor

Organic Farmer, Lola’s Organic Farm, Georgia

change — into the soil where it belongs.^{67,68,69,70} Organic farming has also been shown to yield more food in times of weather extremes like drought and floods, and it conserves water resources, which means organic farmers are more resilient to the impacts of climate change.^{71,72}



Organic farmers also foster biodiversity above ground and in the soil beneath our feet.⁷³ Organic farms help protect pollinators like bees and butterflies, essential to one in three bites of food we eat.⁷⁴ They support up to 50 percent more pollinating species than pesticide-intensive farms and help other beneficial insects flourish.⁷⁵ Below ground, just one teaspoon of compost-rich organic soil can host as many as one *billion* helpful bacteria from 15,000 species. On the flip side, one teaspoon of soil treated with synthetic pesticides and fertilizers may have as few as 100 helpful bacteria — that’s 10 million times less.⁷⁶ Organic farming also protects waterways and helps conserve water resources.^{77,78}

Environmental impacts of pesticides detected in the Organic for All study

Pesticide Class	Environmental Impacts
Organophosphates	<ul style="list-style-type: none"> ♦ Toxic to wildlife, including pollinators, birds and aquatic organisms.⁷⁹ ♦ Toxic to non-target and beneficial insects.
Neonicotinoids	<ul style="list-style-type: none"> ♦ Deadly to insects and aquatic organisms at tiny concentrations, including endangered species.⁸⁰ ♦ Scientists warn of a “second silent spring” due to massive declines in insect and bird populations linked to neonicotinoids.^{81,82} ♦ Persist in the environment, creating long-term toxicity in ecosystems.⁸³ ♦ Toxic to non-target and beneficial insects
Pyrethroids	<ul style="list-style-type: none"> ♦ Extremely toxic to aquatic organisms.⁸⁴ ♦ Moderately toxic to birds.⁸⁵ ♦ Toxic to non-target and beneficial insects.
2,4-D Herbicide	<ul style="list-style-type: none"> ♦ Can harm salmon and other aquatic organisms and is moderately toxic to birds.⁸⁶ ♦ Toxic to aquatic plants and can negatively impact wetlands.⁸⁷ ♦ Toxic to non-target and beneficial insects.





PESTICIDE CORPORATIONS ARE SPENDING BIG TO PREVENT ORGANIC FOR ALL

Organic food should be the norm, but the pesticide industry has a major financial interest in keeping their toxic products on the market. The estimated environmental and health care costs of pesticide use in the U.S. is estimated to be upwards of \$12 billion every year.⁸⁸ Meanwhile, the top four pesticide manufacturers reap over \$150 billion in profit each year from pesticides and other agricultural technologies.⁸⁹

The pesticide industry has undergone massive consolidation in the past five years, and just four corporations now control over 84 percent of the market for pesticides: Bayer-Monsanto, DowDuPont, Syngenta-ChemChina and BASF. These companies spend tens of millions of dollars lobbying legislators and funding false science and front groups that mislead the public about the harms of pesticides.^{90,91} A United Nations report accuses pesticide corporations of the “systematic denial of harms,” “aggressive, unethical marketing tactics” and heavy lobbying of governments which has “obstructed reforms and paralyzed global pesticide restrictions.”⁹²

The estimated environmental and health care costs of pesticide use in the U.S. is estimated at \$12 billion annually. Meanwhile, the top pesticide companies reap over \$150 billion in combined profit each year.

The European Union has banned or restricted 246 pesticides, many of which are widely used in the United States. These include the hormone-disrupting weed-killer atrazine and the class of chemicals known as neonicotinoids, which have been connected to massive pollinator losses and bee die-offs.

Some of the most widely used pesticides today, which we found in the participants of our study, originated as weapons of war. A class of the most commonly used insecticides, called organophosphates, were developed as toxic nerve agents during World War II. And 2,4-D, one of the five most commonly used pesticides in the U.S., made up half of the notorious Agent Orange used as a defoliant in the Vietnam War and is linked to cancer in veterans and the Vietnamese.⁹³ Their formulations have not substantially changed in the ensuing years.

If we want to create a healthy food system that provides for everyone and protects the health of people and the planet, we must put an end to the pesticide industry’s outsized influence. The more we expand organic farming, the more we take back our food system from pesticide companies.



Together, we can make organic for all

Many people across the country still don't have access to or can't afford organic food. This is unacceptable. We all have the right to food that is free of toxic pesticides. And the farmers and farmworkers who grow our nation's food, and their communities, have a right to not be exposed day in and day out to chemicals linked to cancer, asthma, reproductive and developmental harm and other serious health problems.

We should not have to “shop our way out” of exposures to toxic pesticides

We should not have to “shop our way out” of exposures to toxic pesticides. Elected officials must protect the health of people and the planet and stand up to corporate influence. And the food industry has a responsibility to consumers, the environment and society at large. Together, we can demand government and corporations step up to create a healthier world for all people.

With smarter food and farming policies, we can expand organic farming across the country and make organic for all. It will take shifting our public tax dollars away from pesticide-intensive industrial agriculture to organic and regenerative farming. Congress subsidizes chemical-intensive industrial agriculture to the tune of billions of dollars while organic programs are woefully underfunded.⁹⁴ For

example, less than one percent of federal agricultural research dollars go to organic farming.⁹⁵

As a result, U.S. farmers are losing out on the chance to feed Americans' growing appetite for organic food, and our farms, rivers and rural communities remain soaked in toxic pesticides even as consumer demand for organic booms.⁹⁶ Organic remains the fastest-growing sector of the food industry; its growth far outpaces the overall food market.^{97,98} And the latest data shows that the demographics of organic buyers matches the diversity of the American population.⁹⁹ Over 80 percent of U.S. households report buying organic at least sometimes, and a growing number of black and Hispanic families are choosing organic.¹⁰⁰



Data shows that more U.S. farmers want to transition to organic, but they need government policies and research that support organic farming.¹⁰¹ Along with creating a healthier rural environment, organic agriculture can bring economic wealth to farm country as well. Data shows that organic farming is more profitable for farmers and provides greater economic stability and well-being.¹⁰² Organic farms also create more jobs than their conventional counterparts,¹⁰³ and organic “hotspots” across the country are boosting household incomes and reducing rural poverty.¹⁰⁴

Together, we have the power to make organic for all. We can work together to pass laws in our cities, states and nationally that decrease pesticide use and expand organic farming. We can change the national Farm Bill — a major piece of legislation that determines how food is grown in the U.S. and what food is available to us as eaters. And, we can tell food companies and grocery stores to end the use of toxic pesticides in their supply chains and expand organic offerings.

Right now, farming with toxic pesticides is the norm. But, we can turn the system around. The science is clear that we can grow abundant food without pesticides. We need to organize, raise our voices, demand that our leaders step up and shift support, research and policies to create a system where organic is for all. The solution is here — we just have to grow it.

For more information and
to take action, go to
www.OrganicforAll.org



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