



April 7, 2020

Dear US Environmental Protection Agency,

Current research and interactions with the farming community on the topic of systemic insecticides like neonicotinoids have led to the clear conclusion that **neonicotinoids hurt farmers and society far more than they help us**. There are three central drivers of this conclusion. First, neonicotinoids inflict cost but seldom provide any benefits to farmers in most farming systems. Second, regenerative food systems are more competitive and superior in managing pests profitably. And finally, neonicotinoid contamination prohibits farmers from experiencing pest management benefits of agroecological approaches. For these reasons, these chemicals are hurting society, and EPA's restrictions on neonicotinoids should accompany a massive education program into non-chemical alternatives to these toxins.

**Most farm systems show no benefit of neonicotinoids relative to untreated fields.** There really is no debate on this topic: in most cropping systems, insecticidal seed treatments provide no benefits to farmers, and this is supported by a litany of scientific studies. When applied as seed treatments (the primary mode of application for neonicotinoids), these products seldom improve yields (1-8), and often they do not reduce pest populations (1-3, 9) on the majority of acres on which they are used in the United States. This is true for soybeans, sunflowers, corn, barley, and oats throughout much of their production range. Farmers are charged for a product that does not help them. Indeed, neonicotinoids can reduce yields by reducing pollination and enhancing pest abundance in some of these cropping systems (10-12), leaving farmers worse than when they began. Nevertheless, in many crops, farmers have little option but to buy seed with them, and pay the associated costs. Neonicotinoids thus represent a drain on the profitability of farming on most acres in the U.S. and a substantial risk to society.

**Regenerative food systems are superior to neonicotinoid use.** For those few food systems where neonicotinoids have perceived benefits for farmers, agroecological approaches are more effective based on profitability and promotion of natural resources. Farmers around the world are upending the notion that pests are inevitable, and that pesticides are an effective management tool (3, 13). Regenerative agriculture—which has roots in conservation agriculture and adaptive management (14-17)—relies on four central principles to achieve pest-free crops and livestock. These are: 1) eliminate tillage, 2) never leave bare soil (always have living roots on the ground), 3) some plant diversity is better than none, and more is better than less, and 4) integration of plants and animals on farms. These four underlying principles are achieved through myriad practices that are adapted to the local or regional environment to attain a functioning farm system. Regenerative is organic, but organic isn't necessarily regenerative. The end result is that by focusing on soil health and promoting biodiversity on farms, regenerative farms produce healthy food profitably.

The effect of regenerative principles on pest populations are well founded in ecology. Pest outbreaks are caused by monoculture cropping conditions, and by removing diversity and network connectivity from an agroecosystem (14, 18). Regenerative principles fundamentally restore diversity and reduce disturbance to an agroecosystem within a functioning farm operation. Soil disturbance (e.g., tillage) removes life from the soil, and disrupts the balance among organisms that remain in the soil,

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reducing their ability to function (19-21). These functions of soil life that are related to pest management include making the crop able to resist pest pressure (e.g., increasing the immune function of the plant and the vigor of the resulting crop plant), and increasing the biotic resistance to pest proliferation (e.g., entomopathogens, predators, parasitoids, and competitors). Plant cover and a healthy rhizosphere are essential to maintaining life in the soil year-round (22-25). Most pests are early successional organisms and take advantage of stressed crops grown in monocultures that are devoid of biotic resistance to the pest (26). Practices that eliminate life give a platform for continual pest resurgence. The diversity of most other organisms is directly tied to plant diversity, abundance, and biomass within a habitat (27, 28). Thus, practices that encourage plant diversity on a farm provide clear benefits to pest management (29-32). Animals (livestock) are essential to a healthy biological community on the land, especially a healthy plant community (33). Their dung recycles nutrients and feeds the next generation of plants (34). Livestock, through stimulation of plant growth, direct consumption of plants, and trampling action, are an effective management tool for many pests when crop plants are directly grazed. In the end, pest management is not the prime motivation for these principles; producers are enacting regenerative systems because it makes them more resilient and profitable.

***Neonicotinoids reduce or remove alternative approaches for farmers.*** There is strong evidence that the pest management benefits of regenerative principles are reduced by neonicotinoids. The EPA regulated Bt crops because inappropriate use of the transgene would result in Bt-resistance that eliminates the utility of other forms of Bt for other sectors of the agricultural community. Because they are widespread, systemic in nature, and highly toxic, neonicotinoids are eliminating the ability of farmers to use conservation approaches to fight pests. Thus, farmers that don't want to use neonicotinoids become ensnared in depending on these chemicals.

Regenerative farms have higher yield and profit because natural enemies effectively reduce pest pressure on the crop; pollinators increase yields that overcome crop damage, and strong insect communities effectively suppress pests in unpredictable ways. Natural enemies (1, 2), pollinators (1, 5), and insect community diversity (35, 36) are frequently reduced by neonicotinoid seed treatments in cropland. Soil communities in particular (Principle 1: stop tillage to improve soil life) are adversely affected by neonicotinoids (10, 37, 38). Furthermore, efforts to increase beneficial insects in cropland through promoting plant diversity (Principles 2 & 3; always have living roots on the ground and increase plant diversity on farms) are also counteracted by neonicotinoids. For example, wildflower plantings designed to promote pollinators, predators, and other beneficial insects are typically contaminated with neonicotinoids (39-41). This was true even in flowering conservation strips deployed on organic farms, and honey bee nutritional status declined as the toxin found in their bee bread increased. Similarly, when farmers attempt to interseed cover crops in between their corn rows to increase insect diversity, these untreated plants become contaminated with neonicotinoid seed treatments present in the soil (42). Finally, mammals are adversely affected by neonicotinoids (Principle 4: integrate livestock and crops), and thus neonicotinoid contamination of forage can harm livestock designed to promote pest management in cropland. The quantity of imidacloprid found in the spleens of white-tailed deer was correlated with reduced fawn survival, weight, hormone levels, and increased morphological abnormalities (43).



Give the years of experience in this system, it is clear that the benefits of systemic insecticides like neonicotinoids do not outweigh the risks of this technology. Neonicotinoids seldom help farmers, but by contaminating regenerative food systems, reduce alternative tools needed by progressive farmers. Farmers are being charged- often unknowingly or without alternatives- for using a technology that hurts the life on their farm and fails to provide any benefit. This is bad for farmers, and the EPA has an obligation to protect the nation's pollinators and environment from this unnecessary cost.

Sincerely,

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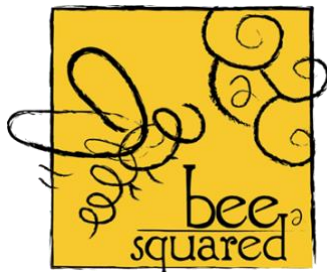
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