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Applying insecticide to a cotton field in Colfax, La. Education Images/Getty Images

A global mask shortage may leave farmers and farm workers exposed to toxic pesticides

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As the COVID-19 pandemic spreads around the world, vital N95 masks and other personal protective equipment have been hard to come by, even for those who need them most.

The World Health Organization estimates that the crisis has driven demand for this equipment, known as PPE, **100 times higher than normal**. Even with dramatic increases in production, manufacturers have said they'll likely be **unable to meet demand** for the foreseeable future.

And the WHO has warned that the severe shortage is **putting the lives of health care workers at risk**.

But it's not just health care workers and other care providers who need PPE – especially those N95 masks, technically known as respirators. These devices are also vital to the safety of workers in a host of other industries, from building trades to agriculture.

As an entomologist who studies and teaches about **pesticide risk reduction**, I am particularly concerned about what the shortage may mean for farmworkers, whom the Department of Homeland

Author



Melanie Bateman

Lecturer in Integrated Crop Management, University of Neuchâtel

Security classifies as essential workers – people who remain on the job even where others have been told to stay home.

NFU Safety on the Farm: Handling Chemicals



Safe use of pesticides and agricultural chemicals requires knowing how to use, handle and store them, minimize exposure and handle accidents.

Pesticides used in US agriculture can impact respiratory health

Hundreds of thousands of farmworkers in the United States routinely encounter pesticides on the job. And some of the most widely used pesticides in the U.S. pose serious health risks, ranging from causing occupational asthma and respiratory irritation to death.

Epidemiological studies, including a long-term study of over 80,000 licensed pesticides applicators conducted by the National Institutes of Health, have found links between pesticides and respiratory problems, ranging from acute symptoms such as dry throat, difficulty breathing, chest pain, coughing and wheezing to chronic conditions like decreased lung function, occupational asthma, chronic obstructive pulmonary disease and lung cancer.

Another study by the National Institute for Occupational Safety and Health found that farmworkers had significantly elevated mortality for a number of respiratory conditions, including hypersensitivity pneumonitis (also known as “farmer’s lung”), asthma, bronchitis and pneumonia.

Masks can be vital to minimizing the risk. The current shortage of masks comes on top of other risks related to the current health emergency. For example, farm workers often have preexisting conditions, such as those affecting respiratory health, that are risk factors for coronavirus. Many live and work in crowded conditions, and have difficulty accessing medical care.



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Carmen works in an Oxnard strawberry crew inspecting every pack of strawberries from every worker. This is how she protects herself from #Covid19. Since her son's school has been cancelled, she set up a WiFi camera to make sure he's okay. #WeFeedYou / Carmen trabaja en una cuadrilla de fresas en Oxnard, CA revisando cada caja de fresas de cada trabajador. Así

En una cuadrilla de tresa en Oxnard, CA revisando cada caja de tresas de cada trabajador. Así es como se protege de #Covid19. Como la escuela de su hijo ha sido cancelada, ella instaló una cámara WiFi para asegurarse de que él esté bien. #WeFeedYou

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Masks protect farm workers too

Many farmers and farm workers, especially those who work with pesticides, carry N95 masks. These devices are made of non-woven polypropylene fiber and meet strict government standards for filtering out particles and droplets as small as 0.3 microns, or three one-thousandths of a millimeter. These are often part of a broader PPE kit that can include respiratory protection, gloves, headgear and body, foot and eye protection.

Under U.S. law, employers must provide appropriate PPE to workers who handle pesticides. The kind of protective equipment needed is determined by a pesticide product's level of toxicity for five types of acute exposure – oral, dermal, inhalation, eye irritation and skin irritation – as well as whether it is a gas, solid or liquid, and whether the work is being done outdoors or in an enclosed space.

Anyone who handles or assists with the application of pesticides is required to use filtering masks as good as N95s or better when they work with products which are lethal or toxic if inhaled, or if risk assessments identify other issues that need to be addressed.

Six steps to wearing the N95 mask



Proper use of an N95 mask.

Reducing risks by managing pests differently

As the U.S. growing season gets underway, early reports indicate that most farmers have the PPE they need for now. But each N95 mask should only be used for eight hours before being discarded, so with

a shortage of masks that is unlikely to abate soon, farmworkers are likely to be caught short. So far, local agricultural agencies have only provided limited guidance on how to address the shortage.

So what should farmers and farm workers do? Specific actions will depend on the crop and the pesticide product, but here are some general recommendations.

First, when labels require the use of masks, farmers and farm workers should not work without them. This is unsafe and often illegal. Some hazardous pesticides are only allowed in the market because it is assumed that the use of PPE will considerably limit exposure.

Nor should pesticide handlers use improvised masks. Bandannas and other kinds of ordinary cloth worn over the nose and mouth do not filter out harmful pesticide particles and droplets, and can even act as reservoirs for pesticide residues.

Instead, I believe farmers should consider reducing risks through adjusting their pest management practices. This is already a recommended best practice: The International Labour Organization's Code of Practice on Safety and Health in Agriculture states that the first line of defense against health effects caused by pesticides should be eliminating or reducing exposure to the hazard, and that PPE should only be used as a last resort.



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The U.S. Occupational Safety and Health Administration also advises that respiratory hazards should be addressed through a “hierarchy of controls.”

These reductions can be achieved in a number of ways. They include **integrated pest management**, an approach that finely tunes pesticide application and emphasizes least-risk options; engineering controls that limit contact with pesticides; and replacing highly hazardous pesticides with less hazardous control measures.

Potential substitutes that are generally considered to be **lower-risk pest management options** include microbials (pesticides with a microorganism as the active ingredient), pheromones and beneficial insects. Used together with good crop management, these products can help keep pest levels under control and reduce the need for other pesticides.

But even some of these options pose risks that require use of masks. For instance, repeated exposure to the proteins in some popular microbials can cause allergic sensitization and even lung inflammation.

An opportunity in a crisis

Millions of workers in many fields depend on N95 masks and other PPE for safety and health, including farmers and farm workers who have the vital role of feeding the world. Ramping up PPE production may help alleviate the current shortage, but I believe researchers and governments should also try to identify and promote suitable alternatives to pesticides that require such PPE in the first place.

[*You need to understand the coronavirus pandemic, and we can help.* Read [The Conversation's newsletter.](#)]

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