

June 7, 1982

NATIONAL CLEAN AIR COALITION  
FACT SHEET ON  
THE EFFECTS OF AIR POLLUTION ON FARM CROPS

Each year billions of dollars worth of farm commodities are lost to air pollution. Decreased yields attributable to air pollution are found in such basic crops as cotton, citrus fruits, soybeans, forage, wheat, and other grains.

In its present form, the Clean Air Act contains specific provisions to protect vegetation and air quality in rural areas. However, proposed weakening amendments to the Act would seriously jeopardize current levels of protection. These weakening amendments include:

- 1) Doubling the auto standard for NO<sub>x</sub> emissions thereby increasing ozone pollution
- 2) Repealing the percentage reduction requirement for new coal fired power plants thereby increasing SO<sub>2</sub> pollution
- 3) Delaying cleanup deadlines for ozone, SO<sub>2</sub> and NO<sub>x</sub> pollution
- 4) Weakening the PSD program in rural areas

Most of the damage to crops is caused by only a handful of pollutants: ozone, sulfur dioxide, and nitrogen oxides.

Ozone is formed through photochemical reactions with the products of fossil fuel combustion emitted by electric utilities and automobiles. The gas often forms far from the combustion source, posing a threat to agricultural regions. It damages plants by causing leaf drop and increasing susceptibility to disease and insects.

Sulfur Dioxide is the second most prevalent pollutant that affects crops yields. Those crops especially affected are green beans, soybeans, tomatoes, alfalfa, squash, and those where leaf appearance is an important factor -- lettuce, green onions, and spinach. Sulfur dioxide causes direct damage to plant leaves and has been shown to multiply ozone effects. If levels increase as a result of the shift to coal for heat and power, the combination of ozone and sulfur dioxide could cause even more crop loss.

The importance of nitrogen oxides as an air pollutant is not due solely to the direct damage it inflicts, but also to its contribution to the formation of acid rain and ozone.

THE EFFECTS OF HARMFUL AIR POLLUTANTS\*

I. Ozone

The National Crop Loss Assessment Program found that ozone pollution results in yield losses of \$1.9 to \$4.5 billion dollars a year for four crops: corn, wheat, soybeans and peanuts. These figures, based on 1978 data, show a loss of about 5% of the total U.S. agricultural production. They are based on a survey of one pollutant's effects on only four crops. Expanding these figures to other crops could mean approximately \$10 billion each year in lost productivity.

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\*This information is summarized from "Testimony for the Committee on Environment and Public Works of the United States Senate by Dr. Lance S. Evans" and "Air Pollution Impacts on Agriculture and Forests," CRS, April 13, 1982.

Soybeans, which are the most vulnerable crop to air pollution, are also the second most important cash crop in the U.S., valued at over \$14 million in 1979. They have no threshold level for ozone, meaning any concentration over .02 ppm causes a decrease in seed weight. (The current ozone standard under the Clean Air Act is .12 ppm.) In two recent studies, soybean yield increased 20-24% when ambient pollution was removed from the air. Another study suggested that soybean yield could decrease by as much as 6% for every 0.01ppm increase above 0.02 ppm. At the 0.12 ppm ambient standard, soybean yield could therefore be cut 50%.

Citrus is an important export item for the U.S. and covers 1.3 million acres of farmland. Symptoms of ozone pollution include leaf lesions, defoliation, and dropping of fruit. Though sulfur dioxide is not a problem in citrus growing regions as yet, rising levels of sulfur dioxide will occur as electrical generating plants in the Southeast are converted from gas to coal.

Forage production is the basis of the country's large animal industry. The major pollutants to effect forage are sulfur dioxide and ozone. Data shows, for example, rye grass approaches a 21% loss at sulfur dioxide levels lower than we experience in the Northeast. Other pollutants, such as fluorides, heavy metals, and nitroge oxides, cause damage mostly by settling on leaves and inhibiting photosynthesis. Toxic in concentrated form, they accumulate on forage and are ingested by animals as well.

Cotton is the nation's fourth biggest cash crop and the second most vulnerable to air pollution. Since 1966, yields have been decreasing despite better varieties, and research shows ozone is a contributing factor in this decrease.

Corn, valued at \$16 billion annually, is the number one cash value crop in the U.S. In areas of important corn production, such as the Midwest, there is increased potential for elevated ozone levels as more coal-fired utilities are built and the number of automobiles rises. Recent studies indicate that ozone concentrations of 0.1 ppm (0.2 ppm below the ambient standard) reduced seed yield in feed corn by 10-39%.

Wheat exposed to ozone levels 50% below the ambient standard suffered a 4% yield reduction. This suggests that ambient ozone levels in the East are sufficiently high to cause significant crop losses. Because of different meteorological conditions and lower ozone concentrations, the problem is not as significant in the Midwest and West.

## II. Acid Rain

Sulfur dioxide and nitrogen oxides combiner with moisture in the upper atmosphere and through complex chemical reactions form acid rain. While in a few laboratory tests acid rain has increased productivity in certain crops, its damaging effects to croplands and forests are significant. It sterilizes the soil by leaching important nutrients, and thus necessitates the use of costly lime and fertilizer applications to return the soil to its natural productivity. It accelerates the erosion of protective waxes from the leaf surfaces, damaging the leaf and increasing susceptibility to drought. And it mobilizes metals in soils, such as aluminum, which damage roots.

A recent study at Brookhaven National Laboratory exposed soybeans to rain with acidity levels common to the New York and New Jersey environment. Soybean yields decreased between 10 and 23% depending on the acidity level.