PSR® Physicians for Social Responsibility

United States Affiliate of International Physicians for the Prevention of Nuclear War

Health Implications of Global Warming: Shrinking the Food Supply

Global warming is acknowledged by scientists around the world to be a reality and to be caused primarily by human activity, especially the burning of fossil fuels. As the earth warms, the delicate balance of climate, weather events and life is disrupted. Consequences emerge that threaten human health and, ultimately, survival.

This is one of several fact sheets produced by Physicians for Social Responsibility that examine recent scientific evidence of global warming's impact on health. This fact sheet draws primarily on the Intergovernmental Panel on Climate Change (IPCC)'s 4th Assessment Report, Working Group 22.[i] Facts and citations are from that source unless otherwise indicated.

Warming will affect food production.

- Global warming will affect crop yields. Effects will be mixed, based on location and degree of warming.

- In low-latitude regions and seasonally dry areas, even "slight" warming is predicted to decrease yields.[ii]
    - The regions likely to face the biggest challenges in food security are Africa, particularly sub-Saharan Africa, and Asia, particularly south Asia.
    - Crop yields could decrease substantially across the African continent because of increased frequency of drought. Corn production could end in some areas. Livestock production could suffer as rangeland deteriorated or turned into unproductive shrub land and desert.
    - Rice production in Asia could decline. However, wheat production in China and India will increase if the CO2 'fertilization effect' takes effect.
- In mid- to high-latitude regions (such as the United States), it is predicted that "moderate" warming will benefit crop and pasture yields.[iii]
- However, once warming rises more than 3ºC (5.4ºF), it will have increasingly negative impacts in all regions, including North America.
- More even than changes in temperature and precipitation, food and forestry production -- and food insecurity -- are projected to be affected by the increased frequency and severity of extreme climate events.

Secondary impacts and multiple variables can increase risk and unpredictable outcomes.

- Climate change increases the risks of secondary impacts such as fires and outbreaks of pests and pathogens, with negative consequences for food, fiber and forestry.
- Multiple stressors (such as secondary impacts) increase overall sensitivity to climate change and reduce the resiliency of the agricultural sector.
- Climate change scenarios that incorporate several variables (for example, increased frequency of heat stress, plus droughts, plus flooding events) project greater reductions in crop yields and livestock productivity. They also indicate "the possibility for surprises,"[iv] that is, outcomes that may be unforeseen or hard to predict.

Small and subsistence producers –much of the developing world's population – are vulnerable.

- Subsistence farmers and small-scale agricultural producers, pastoralists and fisherfolk will be particularly vulnerable to climate change's effects. The IPCC predicts that they will suffer "complex, localised impacts of climate change."
- On a longer time frame, small producers will have to contend with diminished river flows, as high-mountain snow-pack shrinks; sea level rise, which may increase soil salinity and eventually flood low-lying coastal land; and a loss of agricultural labor as climate-responsive diseases such as malaria become more prevalent.
- Small producers typically produce relatively little surplus and live near the edge of survival. The narrow margin in their food production means they are constrained in their ability to experiment with new crops and techniques, and thus less able to adapt to climate change.

Wealthy countries are vulnerable too.

- The 2003 heat wave in Europe was implicated in the deaths of tens of thousands of people. It also correlated with notable drops in crop yields:[v]
    - In France, corn crop and forage production fell by 30% compared to 2002. Fruit harvests fell by 25%.
    - In Italy, a record drop of 36% occurred for corn grown in the Po valley.
- Corn, the most important crop in the U.S., is vulnerable to global warming.[vi]
    - Temperatures above 72ºF shorten corn's reproductive lifecycle, giving the grain less time to grow and decreasing yield. A study by the Lawrence Berkeley National Laboratory and the Carnegie Institution estimates that climate changes since 1981 have cost corn producers world-wide about $1.2 billion per year.
    - Weeds, pests and some leaf and root pathogens may proliferate more successfully and expand their ranges in response to increases in temperature and humidity. For example, corn farmers in the warmer southern parts of the U.S. apply pesticides more frequently than do farmers in northern states. If global warming results in the northward expansion of pest ranges, farmers in northern states may have to spray more, resulting in greater financial and environmental costs.
- Ground-level ozone has "significant adverse effects" on crop yields, pasture and forest growth. Ozone, which forms from certain pollutants in the presence of heat, is anticipated to rise due to global warming.
    - Studies show that ozone is toxic to soybeans, wheat, peanuts and cotton.[vii]
    - Rural areas in the Midwest and eastern U.S. already have high ozone levels. Increases in rural ozone levels could affect the profitability and competitiveness of important cash crops.[viii]
    - Elevated CO_2 levels may ameliorate the negative impacts from ozone, but not sufficiently. The IPCC projects that increasing ozone concentrations will have a negative impact on plant production, "with or without CO_2 increases, with or without climate change."[ix]

---

[i] Easterling, W.E., P.K. Aggarwal, P. Batima, K.M. Brander, L. Erda, S.M. Howden, A. Kirilenko, J. Morton, J.-F. Soussana, J. Schmidhuber and F.N. Tubiello, 2007: Food, fibre and forest products. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 273-313. Accessed online at http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter5.pdf

[ii] Ibid.

[iii] Ibid.

[iv] Ibid.

[v] Telleen-Lawton, T. Hotter Fields, Lower Yields: How Global Warming Could Hurt America's Farms.(2009) Environment America Research & Policy Center. Accessed online at http://www.environmentamerica.org/uploads/HG/UL/HGULGpH8lqB8pW07M41xnA/hotfields_lowyields.pdf.

[vi] Ibid.

[vii] Ibid.

[viii] Ibid.

[ix] Easterling, W.E., P.K. Aggarwal, P. Batima, K.M. Brander, L. Erda, S.M. Howden, A. Kirilenko, J. Morton, J.-F. Soussana, J. Schmidhuber and F.N. Tubiello, 2007: Food, fibre and forest products. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 273-313. Accessed online at http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter5.pdf