



# Evaluating the lasting effects of the “Green Revolution”

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## Introduction

Although started in the 1940s with significant biotechnology contributions by Norman Borlaug, the “Green Revolution” is a broad term that refers to a period spanning the 1960s and 1970s during which farmers carried out wide agricultural experiments – including improved seeds, more advanced farm technology, the use of chemical fertilizers, and enhanced irrigation – with the goal of a greater crop yield to alleviate the food supply for a malnourished and hungry population. The effort was focused on the enhanced production of wheat, rice, and corn, specifically, primarily in Third World countries.

As with any revolution, this revolution came with many consequences. The goal of this research is to evaluate the environmental consequences of this recent agricultural shift. It is possible that consequences of the Green Revolution adversely contribute to global warming.

## Overall Positives and Negatives

### Positives

- grain production increased enormously
  - In India, the yield per unit of farmland increased 30 percent between 1947 and 1979
- industrial growth in many countries due to demand for water, fertilizer, etc.
  - Increased gross domestic product
  - new job opportunities
- fewer people living in poverty
- more immediate, nutritious food

### Negatives

- many small farmers forced off their land
- larger wage gap
- unequal asset distribution
- worsened absolute poverty
- problem of food insecurity remained high
- land damage and environmental degradation
  - Water contamination
  - Air emissions
  - Soil losses
  - Disappearing wetlands
  - Biodiversity loss

## Agriculture and Climate: Index Terms

- The percent of total greenhouse gas emissions worldwide that agriculture contributes as of 2004: 15
- The pounds of usable nitrogen produced from the energy from burning 2,200 pounds of coal: 5.5
- The average distance (in miles) that food is shipped in the United States from the point of production to the point of consumption: 1,300
- World Health Organization estimate (in 1990) of the number of severe acute pesticide poisonings that occur in developing countries each year: 3 million
- Percentage decline that developing countries are predicted to suffer in agricultural productivity by the 2080s due to global warming: 10 – 25

## Evaluating the Consequences

During the Green Revolution, agriculture became industrialized. As the use of technology and fertilizers increased crop yield to a large degree, many farmers were forced to purchase these utilities to keep up competitively; small farms that could not afford this were soon overshadowed by larger farms.

The increased use of farm technology also spread to the United States, where industrialized mega-farms overtook smaller family farms, beginning in the 1960s (Figure 1). Also, a significant proportion of subsidies are provided to large farmers due to the crops they plant and the amount they plant, making it easier for them to profit and buy out small farms (Figure 2). As a result of this shift, food must travel greater distances to reach the dinner plate, increasing fossil fuel emissions that contribute to climate change.

The amount of energy that is spent toward maintaining farming with more technology is very high. For example, in the United States alone, more than a third of energy use in agriculture is from the production of fertilizers and herbicides (Figure 3).

It must be noted that the use of such farm technology to increase yields is only a *temporary* solution because the environment and land that produces food is degraded. Industrialized farming comes with these “hidden costs,” including human health. An example of an environmental cost is fertilizer runoff, very soluble in water, ending up in local watersheds. Reaching waterways, aquatic life suffers due to eutrophication. Also, as farmland becomes arid and top soil is lost to erosion, salinization occurs through irrigation, soil is depleted of nutrients, and pests become resistant to pesticides, it becomes more difficult to find land on which to farm and produce the same amount and quality of food. When pests become resistant to pesticides, farmers often end up treating them more to have the same effect even though they kill vital microorganisms and other bacteria that retain nutrients in the soil, causing a negative feedback loop.

## Figures

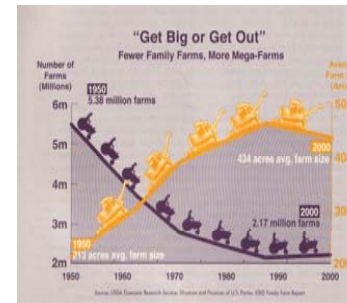


Figure 1: Number of farms (millions) and average farm size (acres) versus year in the U.S. Dark blue = family farms; Yellow = mega-farms. (Imhoff 40).

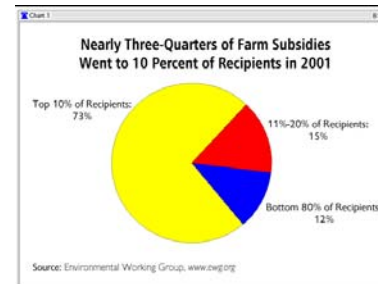


Figure 2: Farm Subsidies in 2001 (heritage.org).

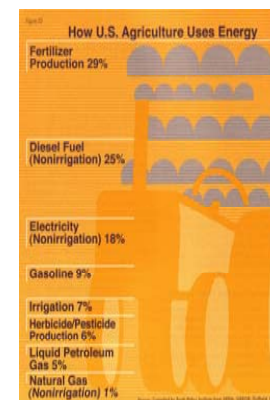


Figure 3: How U.S. Agriculture Uses Energy (Imhoff 104).

## Conclusions

While the Green Revolution had the goal of alleviating food insecurity by increasing crop yield, a different approach that addressed the root cause of the problem could have avoided enormous adverse effects of the agricultural shifts. Unforeseen environmental consequences that came about due to the widespread use of technology which affect society today will continue to have an effect in the future. This includes contributing fossil fuel emissions, which affect global warming.

Also, despite an increase in grain production and the subsequent temporary amelioration of poverty, the pushing of rural farmers off the land adds to making the Green Revolution an overall inefficient, short-term solution to the problem of food insecurity.

The long-term effects of the Green Revolution are more detrimental and widespread than the temporary increases in food production.

## Future Directions

Members in society on all spectrums of the agricultural production and consumption chain must recognize each others setbacks and work together to overcome these challenges. Farmers must work with producers to establish efficient means of distribution, such that environmental consequences will be minimal and the land will be preserved for future generations, the most number of people will be nourished as possible, and society members will make steady livings such that society can function in a positive, sustainable manner.

Furthermore, the root cause of massive food insecurity must be more thoroughly examined. The *distribution* of food versus mere increased production necessarily needs to be a central focus of future efforts. Likewise, efforts to ensure purchasing power so that citizens can purchase available food must be taken. These efforts must raise economic and political power of the poor so that they have access to food that is available.

This poster was developed as an assignment for Honors 295, Fall 2007, **Population, Environment, and Sustainability—Ethics for Living into the Future**. References can be obtained by contacting the author.

Useful websites:

<<http://www.ifpri.org/pubs/ib/ib11.pdf>> and  
<<http://www.foodfirst.org/issues/greenrevolution>>