

Climate change and food security assignment



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August 2008 1 Climate Change and Food Security Prepared by Lauren Sacks and Cynthia Rosenzweig Introduction Over the past fifty years, human ingenuity has led to technological advances in agriculture that have dramatically increased crop yields. However, despite these improvements, agriculture is still highly dependent on climate since solar radiation, temperature, and precipitation are the main drivers of crop growth.

Since the industrial revolution, humans have been changing the global climate by emitting high amounts of greenhouse gases into the atmosphere, potentially resulting in higher global temperatures, changed hydrological regimes, and increased climatic variability. Climate change over the next century may have significant effects on food supply, i. e. , how much food is produced, as well as food security, i. e. how much food is available to people. How much, where, and when food supply and security will be affected by climate change are questions many scientists and policy-makers are examining. Global Warming and Food Security

It seems obvious that any significant change in climate on a global scale should impact local agriculture and thereby affect the world's food supply. Considerable study has gone into the questions of how farming might be affected in different regions, and by how much; and whether the net result may be harmful or beneficial, and to whom. Some of the major organizations studying the effect of climate change on agriculture include: ?? Food and Agriculture Organization ?? Columbia Center for International Earth Science Information Network (CIESIN) ?? The Intergovernmental Panel on Climate Change (IPCC) <http://www.climate.org/2002/topics/agricul/index.shtml> – <https://assignbuster.com/climate-change-and-food-security-assignment/>

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climate change, including global warming and increased climate variability, could result in a variety of impacts on agriculture. Some of these effects are biophysical, some are ecological, and some are economic (UNFCCC Climate Change Information Kit). They include: ?? A shift in climate and agricultural zones towards the poles ?? Changes in production patterns due to higher temperatures ?? A boost in agricultural productivity due to increased carbon dioxide in the atmosphere ?? Changing precipitation patterns Increased vulnerability of the landless and the poor. Rosenzweig and Hillel (1995) explain these and other ideas in *Potential Impacts of Climate Change on Agriculture and Food Supply*. In the early 1990's in a study sponsored by EPA, agricultural scientists in 18 countries estimated potential changes in national grain crop yields using crop models and the GCM scenarios at 112 sites worldwide (Rosenzweig and Parry, 1994) (Figure 3). The results of this global assessment suggests that a doubling of the atmospheric carbon dioxide concentration will lead to only a small decrease in the global crop production.

However, it appears that developing countries in lower latitudes will bear the brunt of these problems (Figure 4). Several factors contribute to the latitudinal differences in simulated yields. In high latitude regions, increased temperatures benefited crops otherwise limited by cold temperatures and short growing seasons. The climate change induced warming at low latitudes brought greater heat and water stress, resulting in greater yield decreases than at higher latitudes. <http://www.climate.org/2002/topics/agricul/index.shtml> – Accessed 26 August 2008 In addition, in Rosenzweig et al. , *Climate*

Change and Extreme Weather Events; Implications for Food Production, Plant Diseases, and Pests, the authors found that global food supply may be affected by an increase in extreme weather events and climate variability associated with global warming. Altered weather patterns can increase crop vulnerabilities to infection, pest infestations, and choking weeds. This will not only decrease yields of crops, but also force farmers to apply harmful and expensive pesticides and herbicides.

The increase in extreme weather events will affect both developed and developing countries, although developed countries have more resources to deal with vulnerabilities. Impacts of Climate Change on Food Security How will climate change alter the ability of the world's growing population to gain access to food? By integrating agricultural and socio-economic models, we can begin to predict if there will be an increase in hunger and famine as a result of global warming. Food security has been defined as "access by all people at all times to enough food for an active, healthy life" (World Bank, 1986).

The World Food Summit, convened in 1996 and in 2002 by the Food and Agricultural Organization of the United Nations (FAO) in Rome, highlighted the basic right of all people to an adequate diet and need for concerted action among all countries to achieve this goal in a sustainable manner. How vulnerable households, regions and countries are to climate change's impacts on agriculture will depend on their access to land, water, and government support and action. The World Food Trade Model, designated as the Basic Linked System (BLS), links countries through trade, world market prices, and financial power.

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The BLS estimates that in 1980, there were about 500 million people at risk of hunger in the developing world (excluding China). Without climate change, the number of people expected to be at risk of hunger in 2060 has been estimated at ~640 million. This is marked decrease from 23% of the population of developing countries to 6% (excluding China). <http://www.climate.org/2002/topics/agricul/index.shtml> – Accessed 26 August 2008 4

However, with unmitigated climate change, declines in yields in low-latitude regions (where many developing countries are located) are projected to require that net imports of cereals increase.

Higher grain prices will affect the number of people at risk of hunger. The number of hungry people in developing countries will increase by ~1% for every 2-2.5% increase in prices. This means that the number of people at risk of hunger grows by 10-60% in the scenarios tested, resulting in an estimated increase of between 60 and 350 million people in this condition (Rosenzweig and Parry, 1994). Mitigation and Adaptation Reducing Carbon Emissions One of the ways to prevent the effects of global warming is to decrease the amount of carbon dioxide and other greenhouse gases into the atmosphere.

The Kyoto Protocol is a document that came out of the U. N. sponsored Earth Summit in Rio de Janeiro in 1992. This agreement, which has been ratified by over 100 countries, seeks to limit the amount of CO₂ emitted into the atmosphere to 1990 levels. However, the United States, which emits 25% of all global greenhouse gases, has not yet ratified the Kyoto Protocol.

Adaptation to Global Warming Even if all CO₂ emissions stopped at this moment, the amount of CO₂ already emitted into the atmosphere will result

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in an enhanced greenhouse effect for the next 50 years. Thus, people will need to adapt to the effects of climate change.

Adaptation can be defined as “ any action that seeks to reduce the negative effects, or to capitalize on the positive effects, of climate change” (Riebsame et al. 1995). Adaptive actions may be either anticipatory or reactive in nature. An example of an anticipatory adjustment is the development of heat- and drought-tolerant crop varieties. The levels of adaptation undertaken by a region may have significant effects on how climate change will affect agriculture in that area. In Rosenzweig and Parry (1994) levels of adaptation were grouped into two levels. Level 1 adaptations include:

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August 2008 5 ?? shifts in planting date (?? 1 month) that do not imply major changes in crop calendar, ?? additional application of irrigation water to crops already under irrigation, ?? changes in crop variety to currently available varieties more adapted to the altered climate. Level 2 adaptations imply more substantial change to agricultural systems, possibly requiring resources beyond the farmers’ means, including: ?? investment in regional and national agricultural infrastructure ?? policy changes at the regional and national level

Level 2 represents a fairly optimistic assessment of world agriculture’s response to changed climate conditions. Adaptation, especially Level 2 adaptation, may significantly reduce the effect of climate change on agriculture and the number of people at risk of hunger (Figure 5). However, adaptation in developing countries, although it does reduce the negative effect of global warming, does not completely eliminate the potential

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increase in hunger (Figure 5). Conclusion In conclusion, global warming may result in detrimental effects on food supply and security, especially in developing countries.

Even if developing countries adapt to climate change, they will not be able to completely avoid the problems associated with climate change. Furthermore, these harmful outcomes of climate change in developing countries and potentially positive outcomes in developed countries will probably increase the gap in wealth, access to food, and health between rich and poor countries. This will affect the worldwide economy as emerging trade-partners are lost, hunger increases, and refugees leave regions harmed by global warming in search of food and resources.